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Understanding the effects of health education interventions helps advance work in public health by identifying the most effective strategies to reduce or prevent engagement in risky behaviors. In particular, studying interventions that focus on disproportionately affected populations reduces health disparities and targets the populations with the greatest need. Adolescents continue to represent a population that is disproportionately affected by several health outcomes, especially those related to risk-taking behaviors, such as motor vehicle accidents, suicide, substance use, and high-risk sexual interactions. According to the Youth Risk Behavior Surveillance System (YRBSS) conducted by the Center for Disease Control and Prevention (CDC), engagement in these high-risk behaviors differs according to race and ethnicity. In particular, adolescent youth who identify as Black are more likely to engage in high-risk sexual interactions when compared to their peers, adolescents who identify as white or Latino. This is particularly true in regards to the following behaviors, having had sex before the age of 13, having had sex with multiple partners, and for Black males, having ever had sex during high school. Fortunately, research has indicated that parental relationships and communication are influential when it comes to moderating adolescent behaviors. Specifically, when adolescents perceive their relationships with their parents as open, receptive, and comfortable they report more positively perceived communication with their parents. Similarly, when adolescents perceive their communication with their parent as open,

receptive and comfortable they report more positively perceived relationships. However, there are still questions around how the adolescent perception of communication with their parent – in particular their mother – changes over time as well as which factors most significantly influence adolescent perception of both general and sex-specific communication. This study determined the functional form of change in adolescent perception of general and sex-specific communication with their mother as a result of an intervention and follow-up over the course of two-years. In addition, it determined which covariates were most highly correlated with these trajectories of change over time. The piecewise latent growth models showed that adolescent perception of general communication with their mother was somewhat correlated with a life skills intervention rooted in problem behavior theory and was always correlated with adolescent perception of sex-specific communication. Biological sex, whether adolescents identified as either male or female, was also a significant factor, but only for the model on adolescent perception of sex-specific communication with their mother. Adolescent perception of the adolescent-mother relationship, however, was significantly positively correlated with both adolescent perception of general and sex-specific communication with their mother. Interestingly, age was not significantly correlated with adolescent perception of general or sex-specific communication with their mother. Overall, understanding how adolescent perception of communication with their mother changes over time as a result of an intervention helped determine which intervention methods worked well, which covariates were most important to highlight in educational opportunities, and how adolescent development influenced – if at all – educational practices.

UNDERSTANDING HOW ADOLESCENT PERCEPTION OF MOTHER-
ADOLESCENT COMMUNICATION CHANGES OVER TIME

by

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~ To my spouse, Scott, thank you from the bottom of my heart for your constant and loving pestering and support to help me “get it done.” To my children, Noah, Zachary, and Henry, thank you for your patience and being a part of this process. To my friend Jennifer, thank you for the numerous reviews and edits; I would not have made it to this point without you. Finally, to my mother, in your memory and honor I promise to continue my work in the world of public health

APPROVAL PAGE

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CHAPTER I

INTRODUCTION

Statement of the Problem

Adolescents continue to represent a high-risk population in regards to sexual health and engagement in high risk sexual behaviors (i.e. early sexual debut, unprotected sexual intercourse). According to the 2017 Youth Risk Behavior Surveillance System (YRBSS), 39.5% of high school students nationwide had ever had sexual intercourse (Kann, McManus, Harris et al., 2018). Of those students who had reported ever having sexual intercourse, 52.7% identified as Black males and 39.4% as Black females (Kann, McManus, Harris et al., 2018), indicating that adolescents who identify as Black are at an increased risk when it comes to sexual health and risky sexual behaviors. Of the 20 million new sexually transmitted disease (STD) cases, adolescents aged 15 to 24 years account for half of them (CDC, 2017). In 2016 adolescents 15 to 24 years of age accounted for 63.1% of chlamydia cases (an increase of four percent from the prior year) (CDC 2017) and increases in percentage of gonorrhea and syphilis cases among 15 – 19 year olds, 11.3% and 13% respectively (CDC, 2017). These numbers are more startling according to race and ethnic differences, with the rate of chlamydia cases for Black adolescent women five times the rate among their white counterparts, and for Black adolescent men the rate of chlamydia was nearly seven times that of their white counterparts (CDC, 2017).

Adolescent sexual health continues to be an area of concern particularly for adolescents who identify as Black. The data in the YRBSS 2017 report indicated that adolescents who identify as Black reported higher percentages than their white or Latino/a counterparts in the following areas: sex with four or more partners, being currently sexually active (sexual intercourse within the past three months), and engaging in sexual activity before the age of 13 (Kann, McManus, Harris et al., 2018). Thus, while overall adolescent sexual health is vital to address, the sexual health of African-American adolescents is of particular importance.

Research has determined that parent-adolescent communication can moderate adolescent engagement in high risk sexual behaviors by delaying sexual debut and increasing condom use (Afifi, 2008; APA, 2002; Holman and Kellas, 2015; Maria et al., 2015; Pluhar, 2004; Wilson et al., 2010). However, the most effective evidence-based programs were evaluated at specific time points or only compared participant data from pre and post intervention and do not look at models that depict slope or the participants' change over time. Given that adolescents are moving through strong developmental changes from early to mid to late adolescence, it is important to take into consideration their developmental process as they participate in interventions.

This secondary data analysis used a lens that incorporated social cognitive and problem behavior theories. Social cognitive theory demonstrates a strong reciprocal relationship between cognitive, behavioral, and environmental factors (Bandura, 1985). It also establishes relationships over time, as adolescents incorporate feedback and consequences from their environment, they internalize moral codes that are subsequently

reinforced by others (Blake, 2001) -- most often their parents and their peers. Problem behavior theory posits that adolescent behaviors are rooted within a network of psychosocial and behavioral variables that are usually determined by the adolescent lifestyle (Jessor, 2016). The theory simultaneously considers the social environment and the individual level determinants of action (Jessor, 2016). The current study analyzed how adolescent perception of parent-adolescent communication changed over a two-year period using latent growth curve modeling (LGCM). LGCM analysis allows a deeper understanding of program and intervention effectiveness.

Study Purpose, Outcomes, and Research Questions

Purpose. The overall purpose of this study is to re-examine longitudinal data from an HIV-prevention program implemented in 1999. The initial program was focused on HIV-prevention and it included several components rooted in social cognitive and problem behavior theories, including enriching mother-adolescent communication. This re-examination focused on adolescent perception of mother-adolescent communication and provided an enhanced understanding of the group and individual process of change in mother-child communication and how that process relates to individual differences, treatment conditions, and other social covariates, such as peer values.

Outcomes. The two main outcomes under study in this dissertation are: adolescent perception of general communication with their mother (measure: general communication) and adolescent perception of sex-specific communication with their mother (measure: sex-specific communication). The analysis applies a growth curve model to determine if there was change over time in the two outcomes based on the two

intervention groups compared to a control group, as well as other demographic and social covariates.

Research Questions

Primary Research Question = What is the functional form of change in the two outcomes (adolescent perception of general communication and sex-specific communication with their mother) as a result of a two-year intervention based on either social cognitive theory or problem behavior theory?

Sub-Questions

- 1A) What is the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception of general communication with their mother?
- 1B) What is the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception sex-specific communication with their mother?
- 1C) Do the trajectories of change in adolescent perception of general communication and sex-specific communication with their mother differ in parameters (intercept and slope)?
- 2A) How are demographic (gender, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of general communication with their?
- 2B) How are demographic (gender, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of sex-specific communication with their mother?

2C) How do the correlates of change in adolescent perception of general communication and sex-specific communication with their mother differ in size and direction?

3A) After controlling for the covariates discussed in RQ#2, how does treatment group assignment predict intercept and slope of adolescent perception of general communication with their mother?

3B) After controlling for the covariates discussed in RQ#2, how does treatment group assignment predict intercept and slope of adolescent perception of sex-specific communication with their mother?

3B) Does treatment group assignment have a different impact on change in adolescent perception of general communication versus sex-specific communication with their mother?

Overview of Methodology

The study was a secondary data analysis using latent growth curve modeling of a longitudinal dataset collected on adolescents and their mothers. The primary study was an HIV-prevention intervention that included three different intervention groups: one using social cognitive theory to promote mother-adolescent communication and relationship building, one focused on the development of life skills based in problem behavior theory, and a control group (DiIorio et al., 2002). The original study was centered on determining the effect of intervention on specific sexual health outcomes related to HIV-prevention and through a cross-sectional approach did not find any significant differences between the different intervention groups for the adolescents.

This secondary data analysis focuses on describing the change over time of adolescent perception of both general and sex-specific communication with their mother as a result of different interventions. This study uses growth curve analyses with the following covariates in the model development as both moderators and predictors: demographic data (gender and age), academic achievement and goals, adolescent perception of peer values, adolescent personal values, and adolescent perception of parenting. These covariates have been found in the literature to influence adolescent development and parent-adolescent relationships and communication (Dimler et al., 2017; Pluhar and Kuriloff, 2004; Whitaker and Miller, 2000; Wolfe, 2006).

Latent growth curve modeling tells us the shape of the curve from the data, how individuals change over time, and how individuals vary from the mean. In latent growth models we can include both antecedents and the outcomes of change, which allow us to predict the covariates that have the greatest influence on changing the independent variable being studied (Duncan and Duncan, 2004).

Definition of Terms

1. Close and connected relationship: For the purpose of this study, a “close and connected relationship” was defined as one in which the adolescent perceives his or her mother to express affection and warmth, thereby creating an open and supportive environment (Lezin, et al., 2004; Regnerus & Luchies, 2006).
2. Open and receptive communication: For the purpose of this study, “open and receptive communication” was defined as communication in which the adolescent

perceives his or her mother to be “knowledgeable, trustworthy, sincere and well-intentioned” (Jaccard, 2002).

3. Adolescent: According to the CDC, young teens are ages 12 to 14 years and teenagers are ages 15 to 17 (2017). For this study, the term adolescent refers to the study participants who were ages 11 to 16 throughout the entirety of the data collection.
4. Mother-adolescent general communication: This term refers to the adolescents' perception of comfort level with his or her mother, amount of openness, mother's receptivity, and mother's emotion during any conversation.
5. Mother-adolescent sex-specific communication: This term refers to the adolescents' perception of communication with his or her mother about sex -- specifically, mother's comfort level, mother's willingness to engage in conversations about sex, and whether the adolescent wants to participate in conversations about sex.

Organization of the Dissertation

The next chapter (Chapter 2) presents a review of available literature on adolescent development and parent-adolescent communication. In addition, it includes a discussion of social cognitive theory, the main theoretical framework used in developing the original Keepin' it R.E.A.L! (Responsible, Empowered, Aware, Living) intervention. Chapter 3 describes the original study design as well as the design of the current study. Latent growth curve modeling is the analytical technique to investigate the aforementioned research questions. Chapters 4 and 5 are two papers submitted for

publication that address my research questions. Chapter 4 is a paper on how adolescent perception of general and sex-specific communication with their mother changes over time including which covariates influence the change over time. Chapter 5 is a paper that describes using parallel piecewise latent growth modeling to determine if the trajectories of adolescent perception of sex-specific communication with their mother and adolescent perception of the relationship with their mother follow the same trend and are correlated. Chapter 6 is the epilogue where I discuss my results and limitations of the study.

CHAPTER II

LITERATURE REVIEW

This literature review focuses on factors that influence how adolescent perception of communication with their mother changes over time and identifies gaps that exist in our understanding of mother-adolescent communication. The review also examines how adolescent development, communication, and theory intersect with a focus on social cognitive theory (Bandura, 1985) and problem behavior theory (Jessor, 2016). When appropriate and able, the review focuses specifically on the Black adolescent population.

The first section discusses adolescent development. All changes related to adolescents are rooted in their naturally occurring physical, social, emotional, and cognitive changes. Adolescent development influences how adolescents view the world around them, including how they perceive their relationship and communication with their parent. Next, the review addresses social cognitive and problem behavior theories that are not only connected to adolescent development but were also used in the design of the original HIV-prevention intervention study. The last section examines the literature related to communication between adolescents and parents, which includes a discussion of parent adolescent relationships and is connected back to adolescent development and social cognitive theory. In general, open and receptive communication between parents and adolescents supports open relationships and results in healthier behaviors among adolescents (Jaccard, 2002; Pluhar 2004).

Part I: Adolescent Development

Adolescence is a time of continual social, emotional, and cognitive growth. In order to fully appreciate how adolescents navigate these transitions, we need to understand that physical, emotional, and social changes influence their experiences and ultimately impact their health (Halpern-Felsher, Millstein, and Irwin, 2002). According to the CDC, adolescents between the ages of 12 and 14 experience many of the following emotional and social changes: they are increasingly focused on themselves, demonstrate a greater interest in and focus on their peer group, and express less affection toward their parents (2017). As adolescents transition into the 15 to 17 years of age group, we see additional emotional and social changes: conflict with parents tends to decrease, they are increasingly independent, they continue to spend more time with their friends and peer group, and indicate a greater interest in romantic and sexual relationships (CDC, 2017). Each of these developmental changes and the context in which the change occurs offers an opportunity for adolescents to start making their own decisions about important issues affecting their lives (Wolfe et al., 2006). In fact, how adolescents interact with their environment may be “particularly critical for altering trajectories away from or toward certain problematic outcomes at this time of relatively rapid neural, behavioral and cognitive changes.” (Spear, 2013).

According to Bronfenbrenner’s model of human development as well as other socio-ecological models for health, we rely heavily on interpersonal interactions and relationships as well as our surrounding environment - including policy level factors - as we develop (Bronfenbrenner and Evans, 2000; McLeroy, Bibeau, Steckler, and Glanz,

1988). As adolescents are trying to find their place in the world and how it continues to connect with that of their parents, they are simultaneously moving into new spaces and relationships (Ryan and Deci, 2000). Adolescent development depends heavily on reciprocal interactions with people and environment. Thus, how these interactions play out influences how they are perceived and received, and influence the quality of the relationships that are established by adolescents with other people in their lives (i.e. peers and adults).

Adolescents are making a natural shift toward relationships with their peers and seeking peer approval can become increasingly important and emotionally driven (Blakemore and Robbins, 2012). As adolescents focus on their peers, they are exposed to different moral judgments and values, which will help them develop their own understandings of the world outside of family and self, and develop understandings of popularity, prestige, and acceptance (APA, 2002). As stated previously, Bronfenbrenner's theory identifies interactions with the environment and people as key components to development. The interactions at the intrapersonal level impact and are impacted by interactions at the interpersonal level and beyond. The relationships adolescents develop, especially within their peer culture, significantly influence their motives and beliefs toward healthy or harmful decisions (Wolfe et al, 2006). Adolescents' relationships with their peers then impact other relationships, including the parent-adolescent relationship. As researchers continue to understand the overall development of adolescents and the power of peer influence during adolescence, we can look at these developmental changes

as opportunities to ameliorate behaviors, perceptions, and trends that may have been previously established (WHO, 2014).

Peer relationships in adolescence. Developing peer relationships and ultimately romantic relationships are two main events that take place during adolescence. The majority of adolescents experience changes in their family relationships as they focus more on their peers and building capacity for intimacy with other youth (Smetana, 2011; Wolfe et al., 2006). Their reliance on their peers and their desire to develop a shared culture with their peers influences adolescent behaviors and choices. Further, when adolescents are speaking to their parents and reporting an increase in their conversations with their mothers, they are still reporting a preference for speaking with their peers (DiIorio, 2007). In addition, it seems that the conversations they have with their peers increase in numbers as adolescents get older (DiIorio, 2007). While evidence suggests peer relationships play a vital role in adolescent development and are seen as a key “organizing principle” for adolescents and their networks (Collins and Sroufe, 1999), the evidence also demonstrates the critical influence of the parent-adolescent relationship for both positive adolescent development and subsequent behaviors (Wolfe et al., 2006).

Peer influence on personal values. A key construct of adolescence is the need for adolescents to learn how to develop and implement their own principles and boundaries and make their own independent decisions (Wolfe et al., 2006). Adolescents place a high level of importance on their peers’ values and expectations, which can influence the development of their own personal values and subsequently determine how they go about making the choices they do. These interactions and the social environment

they construct influence adolescent behaviors and choices. However, it is important to remember that the social and cultural interactions in which adolescents engage are only fully adopted by the adolescent if they identify with the information and incorporate it into their way of life (Moses and Kelly, 2016).

Peer influence on behaviors. Adolescent cognitive development is a continual process which is not complete until the mid-twenties. Combined with the social pull toward peers, adolescent health behaviors are complicated. Data have shown that adolescents have a propensity for behaviors that result in reward (Spear, 2013), in particular immediate or instant reward (Blakemore and Robbins, 2012), and these behaviors peak during the adolescent years (Spear, LP, 2013). When adolescents are surrounded by their peers, they are more likely to engage in risky behaviors (taking three times the number of risks) than when they are alone or with adults (Gardner, 2005). Several studies have indicated that associating with peers who are engaging in or talking about risky behaviors, specifically sexual behaviors, increased the likelihood that adolescents would also engage in those behaviors (Gutman et al., 2017; Simons et al., 2016). According to Moses and Kelly (2016), among a population of African American young adolescents, the more frequently the participants discussed sexual topics with their peers, the more likely they were to engage in sexual activity. In the end, when adolescents are alone with their peers, they are more likely to make hasty decisions than when an adult is present.

An opportunity exists to ameliorate peer influenced decisions by enhancing the parent-adolescent relationship. Research indicates that the parent-adolescent relationship

and parent-adolescent communication are not only conduits in mediating peer influence, but also help narrow the gap between physical, social, and emotional development, and improve overall health choices and behaviors (Afifi, 2008; Holman and Kellas, 2015; Maria et al., 2015; Pluhar, 2004; Wilson et al., 2010). Parents and other adults play an important role in supporting adolescents as they experiment with different friend and peer groups (APA, 2002). Adolescents want and need adults in their lives, especially their parents; they recognize that these adults can nurture and help guide and support them (APA, 2002).

[A] growing body of evidence underscores the benefit of adults developing partnerships with adolescents in a positive youth development approach that emphasizes adults honoring, respecting and valuing each adolescent's emerging identity to increasingly support autonomy. (Pittman, Martin, and Yolahem, 2006).

If adolescents can improve, enhance, or perceive that their relationship and communication with their parent(s) improves over time, there will be positive change for the adolescent's behaviors and overall health. According to Wolfe et al. (2006), adolescents benefit from open discussions on the pressures they encounter. However, in order to develop a sense of open communication and communicate effectively with adolescents, adults need to generate an emotional bond with the adolescent, be flexible and patient, and expect to put forth effort in making communication happen (APA, 2002). Social cognitive theory can be useful in our examination of the formation of relationships between mothers and their adolescent children, especially as it relates to the importance of the adolescent perception of parental views and actions (Wolfe et al., 2006).

Parenting and Adolescence

The perceived parent-adolescent relationship plays a significant role in adolescent development and adolescent perception of parent-adolescent communication. Withers et al. (2016), identified four dimensions of the parent-adolescent relationship that are important: emotional closeness, autonomy, communication, and conflict. Using these four dimensions, Withers et al. (2016) determined in their research that there were four categories of parent-adolescent relationships: secure, avoidant, anxious, and detached. Adolescents who identified themselves as fitting into the secure category demonstrated the greatest amount of closeness with their parent and experienced the least amount of depression, delinquency, and aggression (Withers et al., 2016). The value of the parent-adolescent relationship is quite significant and the more positively adolescents perceive that relationship, the more positive their physical and mental health outcomes (Ohannessian, 2013; Spilt et al., 2014).

In addition, parental awareness is vital to mediating adolescents' behaviors. The more aware parents are of their child's behavior, the less likely the child is to engage in deviant behavior and in order to be more aware, there needs to be increased communication between the parent and adolescent (Harris, Bolland, and Vazsonyi, 2016). What is not clear is whether there is a one-size fits all approach to parenting or if there are consistent differences in parenting approaches across racial and ethnic groups. According to a recent study conducted by Holden et al. (2017) comparing parenting approaches and closeness of parent-adolescent relationships between African American, European American and Mexican American mothers, there were few differences across

the three groups. Each group of mothers reported similar discipline techniques, likelihood to reflect and self-correct their parenting approaches, and closeness of relationships with their adolescent (Holden et al., 2017).

Social cognitive theory. Social learning theory and social cognitive theory state both that “learning occurs through observations, personal and vicarious experiences, and interactions with the surrounding environment.” (Blake, 2001). Over time, as adolescents incorporate feedback and consequences from their environment, they internalize moral codes that are subsequently reinforced by others (Blake, 2001).

Because social cognitive theory demonstrates a strong reciprocal relationship between cognitive, behavioral, and environmental factors (Bandura, 1985), it is important for us to examine the influence of environmental sources of information from parents and peers. Peers and parents are the most commonly cited sources of information adolescents rely on when it comes to navigating values, norms, and social expectations around sexual attitudes and behaviors (Holman and Kellas, 2015). We know that when adolescents rely solely on their peers for information, they are more likely to engage in risky behaviors and have permissive attitudes toward sex compared to when they rely on their parents for information ($r = 0.36, p < 0.001$ compared with $r = -0.16, p < 0.05$) (Holman and Kellas, 2015). Research has demonstrated that the parent-adolescent relationship may be more influential on adolescent behaviors than previously considered (Hutchinson, 2003; Ogle et al., 2008). Given that social context is incredibly important to adolescents and that observational learning influences how adolescents shape and develop their skills (Bandura, 2001), if parents are able to modify the social context, for example, by

engaging in conversation about risky behaviors early with their adolescent, the adolescent is less likely to rely on peers not only for information but also in terms of influencing behaviors (Pluhar, 2004).

Social cognitive theory demands that we model relationships and communication skills to provide opportunities for observational learning which will in turn result in improved adolescent health outcomes. For example, parents have a positive influence on delaying sex and reducing risky behaviors associated with sexual initiation (O'Donnell, 2008). According to Whitaker and Miller and their cross-sectional study of 907 adolescents, when parents talk with their adolescents about initiating sex, adolescents report having fewer lifetime sexual partners ($M = 3.47$) compared to adolescents who did not talk with their parents ($M = 4.43$) (2000). Further, Whitaker and Miller found that parental communication moderated adolescent perception of peer norms -- adolescents who had not talked with their parents about sexual initiation had a steeper slope ($b = 0.628$) related to estimated age of peers' sexual debut compared to adolescents who had talked with their parents ($b = 0.149$) (2000). Through communicating early and often, parents establish a closer relationship with their child (Hutchinson, 2003), which in turn reduces the likelihood of sexual initiation (Aronowitz et al., 2006).

Communication about values has a strong influence on adolescent risk behavior. In a longitudinal study of 10,000 7th through 11th graders from the Add Health study, teens were over six-fold less likely to engage in sexual activity if they felt that their mothers disapproved of sexual activity, compared with those who felt their mothers did not disapprove (Romer, 2003). Parents who communicate their expectations clearly, who

express their concern for their children, and who monitor their offspring are more likely to raise competent children with less involvement in problem behaviors than parents who practice other communication and child-rearing strategies (ed Romer, 2003). Parents need to respect the developmental transitions of their adolescent (Wolfe et al., 2006) and acknowledge that adolescents process information differently than adults (PBS, 2002).

When adolescents respond to information and process their feelings, they rely more heavily on their amygdala, which guides our “gut” reactions compared to adults who use their frontal cortex (PBS, 2002). Knowing that adolescents perceive and process information differently means that how parents communicate and more importantly how adolescents perceive parental communication are key to modifying risky behaviors.

Perceived negative tone leads to misunderstandings, whereas perceived positive tone leads to further discussion (Aronowitz and Agbeshie, 2012); when parents lecture their children, the likelihood of adolescents reporting that they have engaged in sexual activity increases by 86% (Rogers et al., 2015).

Health interventions and prevention programs can help build social capital and social support systems, including those within families. One way in which social support systems can be developed or enhanced using social cognitive theory is by focusing on the parent-adolescent relationship as well as parent-adolescent communication. According to Simons, Sutton, Simons, Gibbons, and Murry (2016), supportive parenting – especially when rooted in social learning theory – was most influential in reducing adolescent risky sexual behaviors.

Problem behavior theory. Problem behavior theory also connects adolescent behaviors and choices to the perception of the parent-adolescent relationship and subsequent perceived parent-adolescent communication. According to problem behavior theory, adolescent behaviors are rooted within a network of psychosocial and behavioral variables that are usually determined by the adolescent lifestyle (Jessor, 2016). The theory simultaneously considers the social environment and the individual level determinants of action (Jessor, 2016). In particular, problem behavior theory posits that health compromising behaviors tend to covary as do health enhancing behaviors (Jessor, 2016). Therefore, negative behaviors can be addressed through the promotion of health enhancing behaviors.

Part II: Communication

This section of the literature review focuses on mother-adolescent communication. The focus is on mothers because adolescents report greater and more frequent communication with their mother compared to other adults. The review of the literature on communication details the importance of open communication and the components that go into developing open lines of communication. However, the review is rooted in our understanding of adolescent development and social cognitive theory as well as the influence of the mother-adolescent relationship on communication. Given that adolescents change over time and relationships with their mothers are likely to change over time, communication that is established when adolescents are younger may also change over time. Therefore, as each of the following components of communication (frequency, timing, comfort, and style) is discussed, it needs to be considered through the

lenses of both adolescent development and social cognitive theory so that we are reminded of the developmental nature of adolescence and the benefits of using aspects of social cognitive theory to enact behavior change.

Effective communication can have a powerful influence on connecting people. According to Wolfe et al. (2006), “adolescents benefit from open discussion about the pressures they face.” Establishing an open and receptive line of communication between a parent and adolescent, when adolescents perceive their parent to be knowledgeable, trustworthy, sincere, and well-intentioned (Jaccard et al., 2002), can help mediate the social, emotional, and physical challenges adolescents are encountering through this developmental stage. However, because adolescent perception of open communication is connected with the parent-adolescent relationship, parents and other adults need to practice listening, respecting differences, communicating with kindness and respect, and incorporating an understanding of adolescence (APA, 2002; US DOE, 2003) in order to more effectively communicate with adolescents. According to several research studies, when adolescents perceive communication as open and receptive, they report closer parent-adolescent relationships and positive health outcomes (Pluhar, 2004; US DOE, 2003; Wilson & Donenberg, 2004). Youth who were more satisfied with their relationship with their mother were more likely to perceive her as more knowledgeable and thus were more likely to delay initiating sexual activity (Ethier et al., 2016).

According to Bersamin (2008), adolescents continue to be influenced by their parents even if parents do not think they are having an effect on their adolescent’s behavior. We know that adolescents exert more competence and confidence when they

feel emotionally close and connected to their parents (Ohannessian, et al., 1998).

Adolescent perception of closeness has been determined by asking adolescents to rate the warmth and affection of their relationship with their parent as well as answer questions such as “my mother makes me feel wanted” (Ohannessian, et al., 1998). Other research has defined parent-adolescent closeness as “feelings of affection, connectedness and warmth.” (Regnerus & Luchies, 2006, p. 161). Parent-child connectedness is determined not only by parent-adolescent closeness, but also whether adolescents perceive their environment as supportive, open, protected, and encouraging (Lezin, et al., 2004). As stated in the previous section, understanding adolescent development is central to developing and maintaining supportive and positive parent-adolescent relationships and is connected to more effective communication. Developing this connection can translate to adolescents being more consistently exposed to communication, listening to communication, understanding what is said, and accepting the information they hear as valid, each of which is essential in order for adolescents to actually attend to communication from their parents (Jaccard, 2002).

It may seem simple and easy to practice the aforementioned skills in order to improve communication between adults and adolescents. However, communication is complicated by “differences in perceived and actual communication” (Bersamin, 2008). Simply bringing adolescents and parents together is not enough; they need support and structure to better understand how to effectively communicate with each other (Lederman, 2008). Research has indicated that the following four areas are important when it comes to establishing effective, open, and receptive lines of communication

between adults and adolescents: frequency, timing, comfort, and style. Style is particularly important to understand since perception plays such a large and important role in whether communication is effective or not (Jaccard, 2002).

Frequency. Improving or increasing the frequency with which parents communicate with adolescents is a common starting point for many parents wanting to change how they communicate. The more parents initiate conversations, the greater the likelihood that adolescents will reciprocate and trust what their parents have to say. Structured health education interventions can help increase the frequency with which parents and adolescents communicate; when parents are included in modeling, demonstration, and rehearsals related to communication practices, they increased the frequency with which they communicated with their adolescent (Blake et al., 2001). Increasing frequency of communication between mothers and adolescents also influences the mother-adolescent relationship. A result of a worksite-based intervention with parents demonstrated that increased occurrence about sex-related topics in conversation between parents and adolescents resulted in reported closer parent-adolescent relationships and increased openness around communication (Martino, 2008).

Based on our understanding of adolescent development, adolescents have the potential to make safe and healthy choices when they have a strong values system and maintain close relationships with their parents (Ethier et al., 2016; Rogers et al., 2015). Therefore, increased frequency of communication between parents and adolescents not only improves communication and relationships but may also influence the adolescent's choices and behaviors. There have been some conflicting reports around the frequency

with which Black youth engage in communication about sex with their parents. According to Widman et al. (2014), Black youth discuss sex related topics with their parents more frequently than their counterparts of other racial or ethnic backgrounds. However, Somers et al. (2006) indicated that Black youth reported fewer overall conversations with their parents about sex-specific topics.

In spite of some mixed results, there have been overall positive outcomes associated with increased frequency of communication about sex between parents and adolescents. According to Hutchinson (2003), the more sex-related topics (e.g., AIDS, STDs, sexual intercourse, birth control, condoms) a mother reported ever speaking with her daughter about, the more likely the daughter was to engage in protected sexual intercourse and have fewer sexual partners. In fact, with every one-point increase in the communication score (calculated by adding up the yes / no responses, 1 = yes, 0 = no) for each topic, the less likely the daughter was to engage in unprotected sexual intercourse and less likely to have multiple sexual partners (Hutchinson, 2003). Other studies - one using longitudinal data focused on mother-daughter dyads (Kapungu, 2010) and another that reviewed parent-based interventions (Maria et al., 2015) also found that, with increases in reported communication between adolescents and their mothers, there were decreases in engagement in risky sex-related behaviors. Increased frequency allows for consistent discussions that can reinforce concepts from previous conversations (Ashcraft and Murray, 2016).

Timing. Starting the conversations early between parents and adolescents helps develop a closer parent-adolescent relationship (Strom, 2002). Several studies have demonstrated that beginning the conversations about sex during preadolescence is the ideal time (Guilamo-Ramos 2007, Jaccard and Levitz, 2013; Wyckoff et al., 2008). Early initiation also helps to normalize parent-adolescent communication, especially when it relates to more sensitive topics including sex-related topics. Early parent-adolescent communication is also shown to build relationship and communication skills and thereby reduce or eliminate barriers to communication during later phases of adolescent development (Guilamo-Ramos et al., 2012; Pluhar, 2004; Silk & Romero, 2014; Wilson, 2010).

While frequency and timing each contribute to creating open and receptive communication between parents and adolescents, their effectiveness is also highly correlated with how parents and adolescents are communicating with each other (Aronowitz and Agbeshie, 2012; Pluhar, 2004). Thus, the level of comfort the adolescents and parents feel as well as the style the parents use to communicate becomes increasingly important and is inherently connected to adolescent development and social cognitive theory (Aronowitz and Agbeshie, 2012; Ethier et al., 2015; Rogers et al., 2015).

Comfort. The level of comfort associated with communication refers to both the comfort of the parent and the adolescent and can be connected to frequency and timing. Data from observational studies and reviews have indicated that the greater the comfort level of both the parent and adolescent the more likely parent-adolescent communication was to occur (Afifi, 2008; Lefkowitz, 2002; Maria et al., 2015). When parent-adolescent

communication is framed as a natural and normative process, especially with more sensitive topics like those involving sex, both parents and adolescents report feeling more comfortable with the process (Coffelt, 2010). In addition, numerous studies (i.e., those focused on mother-daughter dyads, parents only, as well as comprehensive reviews) have demonstrated that initiating parent-adolescent communication early was associated with increased comfort levels around parent-adolescent communication (Afifi et al., 2008; Martino, 2008; Pluhar, 2004) as well as closer parent-adolescent relationships (Inazu and Fox, 2003).

Increased parental comfort benefits both the parent and adolescent. Parents are more confident initiating conversation and during conversation, and adolescents are more likely to perceive their parent as confident and competent. Frequency and timing both influence comfort. Starting early and communicating often allows for the parents and adolescents to have more practice communicating, especially on topics that may be harder to talk about. Overall, when parents were more comfortable, or at a minimum their adolescent perceived them to be more comfortable, the communication between the parent and adolescent was more likely to happen (Zamboni, 2009) and was more likely to be associated with positive health outcomes (Eastman, 2006; Maria et al., 2015). Furthermore, parent-child sex communication was perceived to be of higher quality when adolescents perceived their parent to be knowledgeable as well as portray confidence and comfort (Harris, 2016).

Style. How parents' communication is presented and subsequently perceived by adolescents plays a significant role in the effectiveness of the communication and

relationship development. The parent's style of communication consists of the three previous constructs - frequency, timing, and comfort. In addition, style needs to incorporate an understanding of adolescent development. Adolescents process and perceive information differently (PBS, 2002) as their brains are open to opportunities and flooded with emotion (Spear, LP, 2013). Their changing development influences how communication is perceived (largely influenced by the parents' communication style) and how it is subsequently used. Adolescents may not perceive vague allusions, moral instruction, and conversations that take place among larger groups' conversations as sex communication (Ritchwood et al., 2017). In order for the delivery of information to be most effective, parents need to offer clear, accurate, and developmentally appropriate information (Ashcraft and Murray 2016).

An interactive parent-adolescent communication style, rather than didactic, is more likely to lead to a positive parent-adolescent relationship (Lefkowitz, 2002; Pluhar, 2004). When interactive, parent-adolescent communication is more like a discussion in which both parents and adolescents listen and provide opportunities for each to contribute to the conversation (Pluhar, 2004). Didactic communication, however, is more like a lecture from the parent to the adolescent and the adolescents disengage, avoid eye contact, and do not contribute to the conversation (Pluhar, 2004). Other authors (Afifi, 2008; Lefkowitz, 2002; O'Donnell, 2008) have confirmed the findings of Pluhar's observational study and added that, when parents dominated the conversation, adolescents' level of anxiety increased during parent-adolescent communication (Afifi, 2008).

In addition to the parent's communication style with their adolescent being more inclusive, engaging, and interactive, the adolescent's perception of parental confidence and competence were important. Highly correlated to a parent's style of communication was whether an adolescent perceived their parent as confident and competent and subsequently trusted their parent (Afifi, 2008; Guilamo-Ramos et al., 2006). When there was no or little trust between the parent and adolescent, and when there was a perceived lack of parental confidence and competence, adolescents were more likely to be anxious and avoid parent-adolescent conversations (Afifi, 2008).

The effectiveness of parent-adolescent communication, especially about sex-related topics, is highly correlated with the nature of the parent-adolescent relationship as perceived by the adolescent (Guilamo-Rarmos et al., 2006; Jaccard, 1995; Lippold, 2016; Pluhar, 2004; Whitaker, 1999). The more positively the adolescent perceives the relationship, the more effective the communication (Afifi, 2008). Ultimately it is a bidirectional process in which supportive parenting, which involves a close parent-adolescent relationship, is more effective in reducing adolescent risky sexual behaviors. However, the support only happens if adolescents communicate with their parents and communication happens when parents are warm and supportive (Simons et al., 2016). However, because adolescents are changing throughout the period of adolescence and their knowledge around behaviors is changing, parents also need to change in how they communicate and relate with adolescents (Akers et al., 2011).

The correlation between relationship, communication, and perception is important to understand because none of the characteristics of parent-adolescent communication or

relationships is most effective in isolation and each builds on the other. This interdependence also helps eliminate many of the perceived barriers parents and adolescents face when it comes to communicating with one another -- not being ready to talk, especially about sex-related topics, not having time to talk, and not knowing how to talk with each other (Wilson, 2010). When parents are viewed by their adolescent as open and approachable, the parental (and adolescent) comfort levels improve, thereby increasing the frequency and ease with which parents and adolescents communicate (Afifi, 2008; Lefkowitz, 2002; Maria et al., 2015; Pluhar, 2004). However, each of these communication variables - frequency, timing, style, and comfort - are likely to be moderated by various factors related to the adolescent and parent (e.g. gender, age, values, peers). Given what we know about adolescent development and how it influences adolescent relationships (peer and adult), communication, and behaviors, further study on how parent involvement can moderate these complex interactions is important.

Part III: Next Steps

Throughout the research on parent-adolescent communication and relationships, data have most consistently indicated that open and receptive communication and relationships lead to more positive health outcomes for adolescents. However, research has been focused on cross-sectional studies (Holman and Kellas, 2015; Wilson and Donenberg, 2004), parent only interventions (Maria et al., 2015; Martino, 2008; Wilson, 2010), predominantly white populations (Holman and Kellas, 2015) and relatively small numbers (Holman and Kellas, 2015; Kapungu, 2010; Pluhar, 2004). Therefore, providing an analysis of longitudinal data (DiIorio, 2003), using newer and more sophisticated

analytical techniques, increasing representation of Black families (DiIorio, 2003), and focusing on the adolescent perspective as it relates to parent-adolescent communication (Miller-Day et al., 2013) will all add to the current research around adolescent communication.

CHAPTER III

METHODOLOGY

The methodological approach of this research was a secondary analysis using latent growth curve modeling of a longitudinal dataset collected on adolescents and their mothers. The data collected for this study focused on attitudes and behaviors associated with an HIV prevention program that involved three different intervention strategies. Data were collected over a two-year period in an effort to better understand how changes in behaviors and attitudes differed according to intervention strategy. The goals of the project were to “promote delay of sexual intercourse among 11- through 14-year old adolescents and to enhance the mother’s involvement in postponing sexual debut.” (DiIorio, 2002). One way to promote the mother’s involvement in delaying her adolescent’s first sexual encounter is by enhancing the parent-adolescent relationship and improving the adolescent perception of parent-adolescent communication. Growth curve analyses of these data focus on change over time in communication variables related to adolescent perception of parent-adolescent communication over a two-year period after intervention.

Design of the Primary Study

The original HIV prevention study was conducted in 1999 (see DiIorio et al., 2002 for more detail) with adolescents and their mothers who were recruited through a national organization located in the southeastern United States. There were 11 total sites

associated with the national organization that participated in the initial study. Each site was randomly assigned to participate in either a control group or one of two intervention groups - one based on social cognitive theory and one based on problem behavior theory (see Table 1 for group descriptions). Mothers and their adolescents participated in a baseline interview, followed by the intervention, and then follow up interviews. The mothers had follow up interviews at approximately four and 12 months and the adolescents at four, 12, and 24 months (see Table 2 for sample demographic data).

*Table 1. Characteristics of Keepin' it R.E.A.L.! Intervention and Control Groups
(from DiIorio et al., 2002)*

Session	Social Cognitive Group		Life Skills Group		Control Group
	Mothers	Adolescents	Mothers	Adolescents	Mothers and Adolescents
1	HIV/AIDS Introduction		Introduction Likes/dislikes of parenting	Program introduction	HIV video, facilitated discussion on HIV transmission and safer sex practices
2	Puberty	Peer pressure	Personal and parenting goals	Tobacco use	
3	Communication skills		Significant personal events and impact on parenting	Alcohol and drug use	
4	Talking about sex		Nurturing your adolescent to successful adulthood	Violence	
5	Difficult topics	Sexual decision making	Personal childhood experiences and influence on parenting	Sexual intercourse	
6	Putting it all together		Personal and parenting strengths	School performance	
7	Condom use skills	Consequences of sexual intercourse	Pot luck with adolescents	Pot luck with mothers	
Additional activities	None		None	Visit to senior citizen center Exposure to different careers Community service College trip	None
Mediating variables	Self-efficacy Outcome expectancies Sex-based communication		Self-esteem Future time perspective Stress Parenting		
Number of sessions	7		7		1
Length of sessions	2 hours		2 hours		1 hour

Table 2. Descriptive Characteristics of Participant Sample

Variable	Frequency	Percentage
Adolescent Participants (<i>N</i> =612)		
Age		
11	213	34.8
12	156	25.5
13	142	23.2
14	101	16.5
Sex		
Male	371	60.6
Female	241	39.4
Race		
African American	601	98.2
White	6	1.0
Other	5	0.8
Mother Participants (<i>N</i> =491)		
Mother's Education		
Less than high school	55	11.2
High school	164	33.4
Some college	188	38.3
College / higher	84	17.1
Mother's Marital Status		
Married	163	33.2
Separated	56	11.4
Divorced	127	25.9
Widowed	19	3.9
Never married	126	25.7

Results from the Primary Study

Each of the intervention groups (see Table 1) was designed with the intention to influence self-efficacy, outcome expectations, sex-based communication, self-concept, future time perspective, stress, and parenting skills (DiIorio, 2002). The adolescent measures included in the study were: intimate sexual behaviors, sexual intercourse, condom use, intentions to have sex and use condoms, sexual possibility situations, self-efficacy for abstinence, outcomes expectations, and communication about sex. The mother measures included in the study were: self-efficacy, outcome expectations, and communication about sex. Measures included for both adolescents and mothers were: comfort talking about sex and HIV knowledge (DiIorio et al., 2006).

The final model included age and gender as the covariates for adolescent outcomes. Further analysis of adolescent data using one-way analysis of variance and chi-square statistics to identify group differences examined adolescent variables related to intention and communication variables collected at the 24-month follow up interview (DiIorio et al., 2006). The analysis indicated that overall, self-efficacy and outcome expectations for abstinence increased over time for all adolescents and mothers, and there were no differences in abstinence rates across the intervention groups for adolescents (DiIorio et al., 2006). However, among adolescents and mothers, there was a greater increase in HIV knowledge for participants in the SCT group, and a greater increase in condom use among adolescent participants in the LSK group. In addition, “mothers showed substantial increases over time in comfort talking about sex and self-efficacy” especially the mothers in the SCT group (DiIorio et al., 2006). Further,

the adolescents' reported comfort in talking with their mothers about sex did not change over time, nor were there significant differences in the perception of comfort by adolescents in the program. (DiIorio et al., 2006).

While the initial research study was able to demonstrate improvements in some mother and adolescent behaviors based on intervention group, there are questions that may be able to be answered with different analytical techniques. For example, it is possible that the overall effect of the interventions on communication between mother and adolescent may have been diluted as a result of the assessment used to gather data and, with more nuanced analytical tools, these details may become apparent. In fact, the mothers in the control group reported that they felt the assessment provided them tools they could use to talk with their adolescent about HIV and sex (DiIorio et al., 2002). Using a latent growth curve approach to analyze the change in parent-adolescent communication related to intervention group will help uncover any changes over time between and within the groups.

Design of Current Study

This current study is a secondary data analysis of the Keepin' it R.E.A.L.! dataset, which was collected over a two-year period beginning in 1999. The overall purpose of this study is to re-examine the original longitudinal data to gain a better understanding of the group and individual process of change in parent/child communication and how that process is related to individual differences, treatment conditions, and other social covariates, such as peer values.

The two main outcomes under study in this dissertation are: adolescent perception of general communication with mother (general communication) and adolescent perception of sex-related communication with mother (sex-specific communication). The general communication outcome is a summative, self-report scale composed of 18 Likert style items answered on a scale of 1 (never true) to 5 (always true). The sex-specific communication outcome is a summative, self-report scale composed of six Likert style items answered on a scale of 1 (strongly disagree) to 5 (strongly agree). Three items in the sex-specific communication outcome needed to be re-coded in order for the scale to accurately align with the statement. Scales at time one show acceptable internal consistency reliability (Cronbach α = 0.893 and 0.685 respectively).

The sample population and characteristics are the same as those in the original study and are presented in Table 2.

Research Questions

Primary Research Question

What is the functional form of change in the two outcomes (adolescent perception of general communication and sex-specific communication with their mother) as a result of either of a two-year intervention based on social cognitive theory or problem behavior theory?

Sub-Questions

- 1A) What is the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception of general communication with their mother?
- 1B) What is the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception of sex-specific communication with their mother?
- 1C) Do the trajectories of change in adolescent perception of general communication and sex-specific communication with their mother differ in parameters (intercept and slope)?
- 2A) How are demographic (gender, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of general communication with their mother?
- 2B) How are demographic (biological sex, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of sex-specific communication with their mother?
- 2C) How do the correlates of change in adolescent perception of general communication and sex-specific communication with their mother differ in size and direction?
- 3A) After controlling for the covariates discussed in RQ#2 how does treatment group assignment predict intercept and slope of adolescent perception of general communication with their mother?

3B) After controlling for the covariates discussed in RQ#2 how does treatment group assignment predict intercept and slope of adolescent perception of sex-specific communication with their mother?

3C) Does treatment group assignment have a different impact on change in adolescent perception of general communication versus sex-specific communication with their mother?

Measures and Covariates

Demographic. Age was assessed directly in the interview by asking for the participant's date of birth. Biological sex was predetermined and participants were separated by male / female prior to beginning the interview.

Academic. GPA was assessed by asking the participant to recall how well he or she had done in school over the past three months. Options included statements such as, "I get mostly A's," "I get mostly A's and some B's," I get mostly C's," etc. A participant's aspiration for academics was assessed by asking, "How far would you like to go in your education?" with responses such as, "You don't care if you graduate from high school" to "You intend to graduate from graduate / professional school."

General communication. General communication was assessed by an 18-item scale based on both Armsden and Greenberg's Inventory of Parent and Peer Attachment (1987) as well as Barnes and Olson's Parent-Adolescent Communication Scale (1982). These items measure the adolescent's perception of general communication with his or her mother, which includes comfort level, openness, mother's receptivity, and emotion. Sample items include, "You can talk to your mother about things that are important to

you," "Talking over problems with your mother makes you feel uncomfortable," and "You can tell your mother how you feel about sensitive topics such as abortion, racism, and drugs." Each item is measured on a scale from 1 (never true) to 5 (always true) with higher scores indicative of a more positive general communication pathway between mother and adolescent (DiIorio et al., 2002). Cronbach $\alpha = 0.893$.

Sex-specific communication. Communication about sex was assessed using six items that were developed by the researchers. These items measure the adolescent's perception of communication about sex with his or her mother and addresses comfort level, openness, mother's willingness to communicate about sex, and whether the adolescent is interested in engaging in communication about sex. Sample items include, "You feel comfortable talking to your mother about sex-related issues," "You feel your mother talks openly to you about sex," and "You really do not want to talk to your mother about sex." Each item is measured on a scale of 1 (strongly disagree) to 5 (strongly agree) with higher scores indicating a more positive sex-related communication pathway between mother and adolescent. Cronbach $\alpha = 0.685$.

Peer values. Peer values were assessed by an eight-item scale that replicated the statements of the personal values but instead inserted [your friends]. Sample items include, "Your friends think teenagers should not have sex at all before they are married," and "Your friends think it is OK for teenagers to have sex if they use birth control." Each item is measured on a scale of 1 (strongly disagree) to 5 (strongly agree). Three items needed to be reverse coded so overall higher scores indicate a more conservative set of perceived peer values. Cronbach $\alpha = 0.833$.

Personal values. Personal values were assessed by an eight-item scale developed by the researchers. These items measure the adolescent's values toward sexual intercourse. Sample items include, "Teenagers should not have sex at all before they are married," "It is OK for teenagers to have sex if they use birth control," and "Having sex is a normal part of growing up for teenagers." Each item is measured on a scale of 1 (strongly disagree) to 5 (strongly agree). Three items needed to be reverse coded so that overall higher scores indicate a more conservative set of personal values. Cronbach $\alpha = 0.816$.

Analytic Plan

All data used in analyses include pre- and post-intervention data and were analyzed unconditionally and subsequently according to correlates and treatment group. Prior to running each model in MPlus Editor Version 6 (MPlus), descriptive data were obtained in IBM SPSS Statistics Version 25 (SPSS). SPSS was also used to transform variables and export them to MPlus.

Latent growth curve modeling. The analysis used a latent growth curve modeling approach. Latent growth modeling (LGM) is an ideal analytic approach to examine longitudinal data as it offers researchers greater flexibility than ANOVA and multiple regression analyses. LGMs are often used to analyze repeated measurements of individuals over longer periods of time (Bollen and Curran, 2006; Kohli and Harring, 2012). This approach allows for the analysis to be person-centered so that relationships among and within individuals, which may vary over time, can be more accurately examined (Jung, 2008; Ram, 2007).

The goal of the growth curve modeling is to estimate individual parameters of change (intercept and slope, or nonlinear change) over time (Kohli and Harring, 2012). LGMs are able to relate repeated measures to latent variables (those that are inferred and not directly observed) allowing for the “study of intra-individual stability and change and are specifically designed to portray the overall shape of developmental trajectories.” (Morin, et al., 2010).

LGMs are particularly helpful in answering questions related to the shape of the line or curve that is fit to the data. The shape of the curve helps us understand how individuals change over time and how individuals vary about the average form of change; latent growth curve models estimate the individual parameters of change, the functional form of change, and examine correlates of change, which include both antecedents of change and outcomes of change. In addition to the intra-individual change over time, inter-individual change (between person variability) and group statistics can be reported, including the mean growth rate (slope) and the mean starting point (intercept) (Curran, 2010; Ram, 2007) and how the rates change over time (Curran, 2010). LGMs also allow for the study of predictor variables related to individual differences, allow for the estimated individual growth parameters to become independent and dependent variables, and can include both static and time-varying variables (Duncan and Duncan, 2004; Ram, 2007; Simons-Morton, 2004). Finally, one of the biggest advantages of using a latent growth model is the ability to predict which covariates have the greatest influence on change in the variable studied over time (Voelkle, 2007).

Models

Figure 1. Model Addressing the Following Question, “What is the Direction of Change and Magnitude of Interindividual Variability of Unconditional Change over Time in Adolescent Perception of General and Sex-specific Communication?”

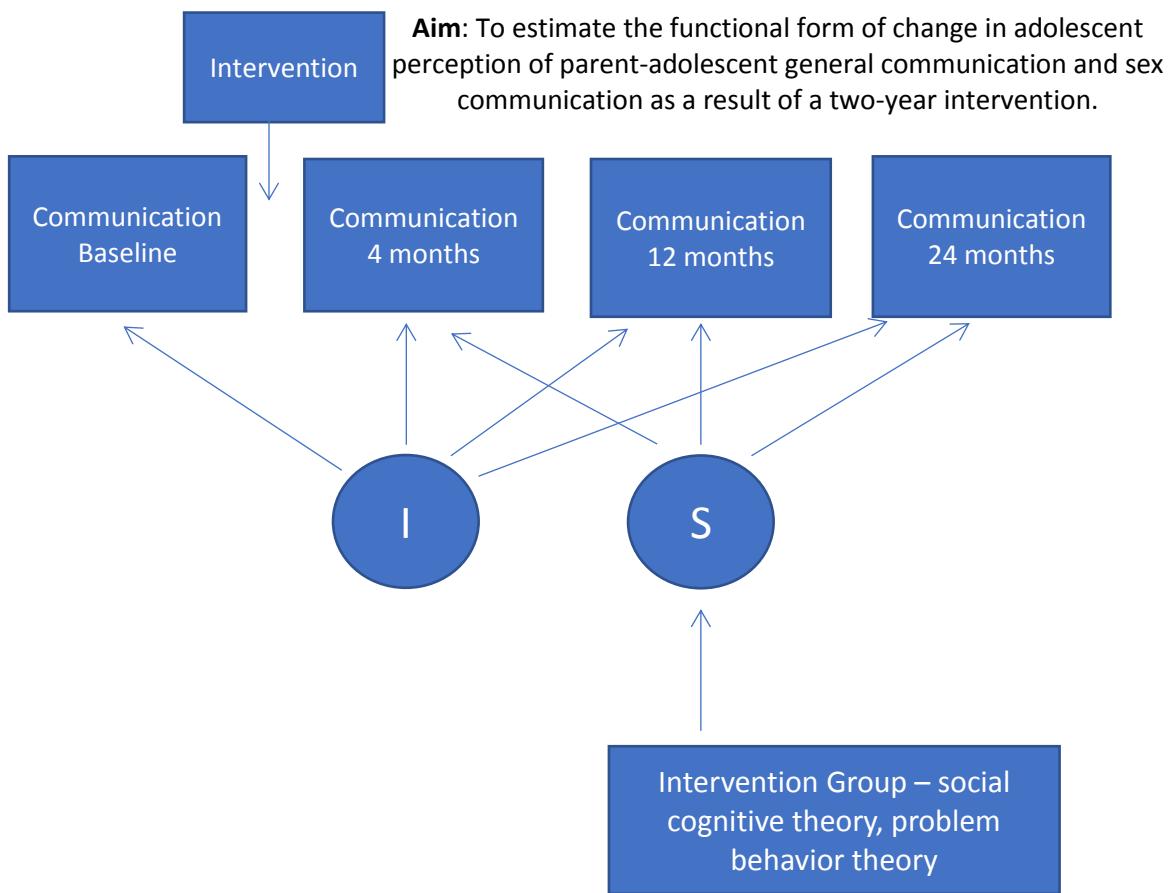


Figure 1. This model addressed the overall aim of the study, to estimate the functional form of change in adolescent perception of parent-adolescent general communication and sex- communication as a result of a two-year intervention. The specific questions addressed in this model were:

- 1A) What was the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception of general communication with their mother?
- 1B) What was the direction of change and the magnitude of interindividual variability of unconditional change over time in adolescent perception of sex-specific communication with their mother?
- 1C) Did the trajectories of change in adolescent perception of general communication and sex-specific communication with their mother differ in parameters (intercept and slope)?

In this model, adolescents were assessed at baseline and after the initial survey, both adolescents were engaged in an intervention according to their random assignments to one of three groups – social cognitive theory, life skills, or control. At approximately four months, 12 months and 24 months after the intervention was completed, adolescents participated in a one-on-one interview to complete a questionnaire. While this model incorporated treatment group, the goal was to have a foundational understanding of the shape and trajectory of the data. The intervention group with the greatest slope over the two years was possibly the best intervention to be implemented with this population.

Figure 2. Model Addressing the Following Question, “How are Different Covariates (Age, Biological Sex, Personal Values, Etc.) Correlated with Trajectories of Change over Time in Adolescent Perception of General and Sex-specific Communication with their Mother?”

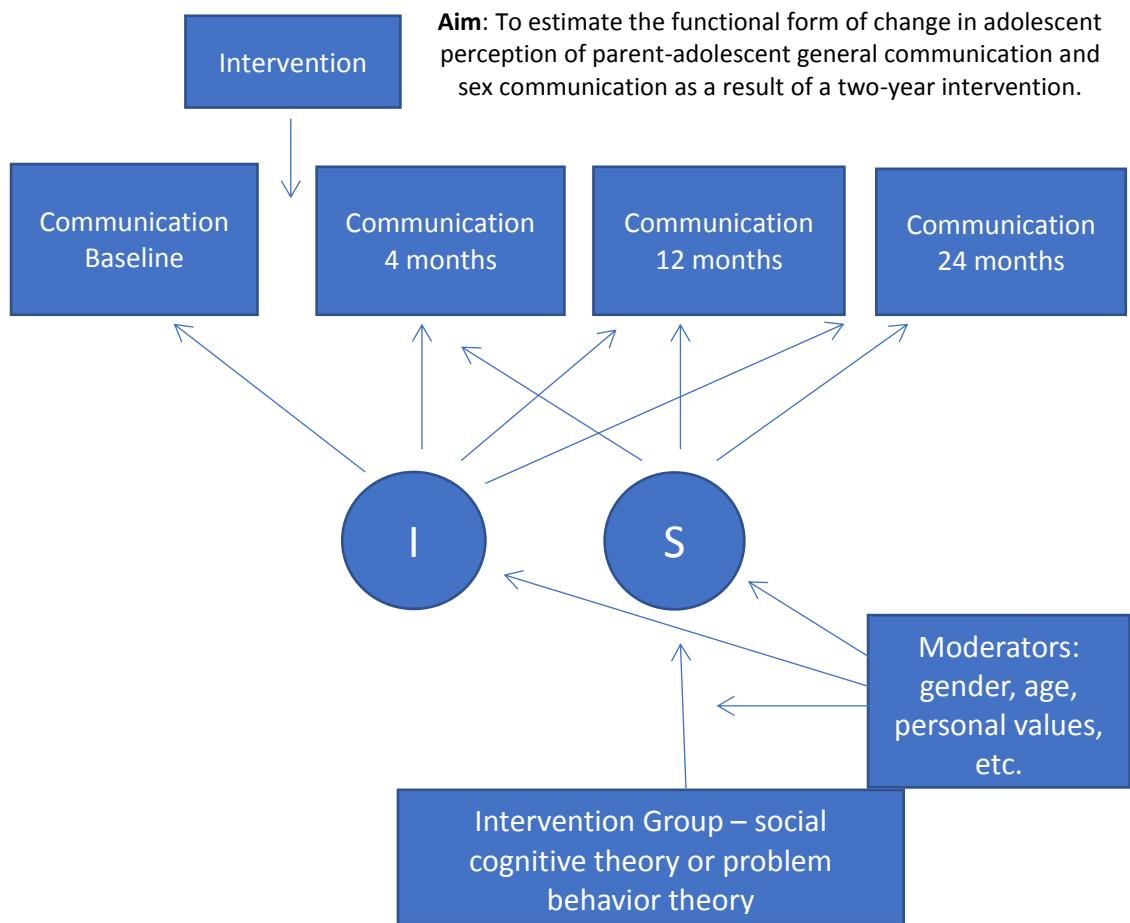


Figure 2. This model addresses the same overall aim, but asks different questions:

- 2A) How are demographic (biological sex, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of general communication with their mother?

2B) How are demographic (biological sex, age), academic (GPA, aspiration), and social (perception of peer values, personal values) factors correlated with trajectories of change over time in adolescent perception of sex-specific communication with their mother?

2C) How do the correlates of change in adolescent perception of general and sex-specific communication with their mother differ in size and direction?

In this model, adolescents were assessed at baseline and, as in model 1, after the initial survey, an intervention took place based on random assignment to either a social cognitive theory, life skills theory, or control group. Adolescents were then interviewed at approximately four months, 12 months, and 24 months after the completion of the intervention. In this model, moderating variables such as biological sex, age, mother's educational status, and academic aspirations were all considered as influencing factors on adolescent perception of communication. Each of these factors was brought into a model to see how it influenced the change in adolescent perception of communication with mothers over the course of two years. It was hypothesized that the slope of the model for the perception of communication with mothers would vary, shifting from positive to negative dependent upon one or more of the aforementioned variables.

Figure 3. Model Addressing the Following Question, “How Did Treatment Group Assignment Predict Intercept and Slope of Adolescent Perception of General and Sex-specific Communication with their Mother?”

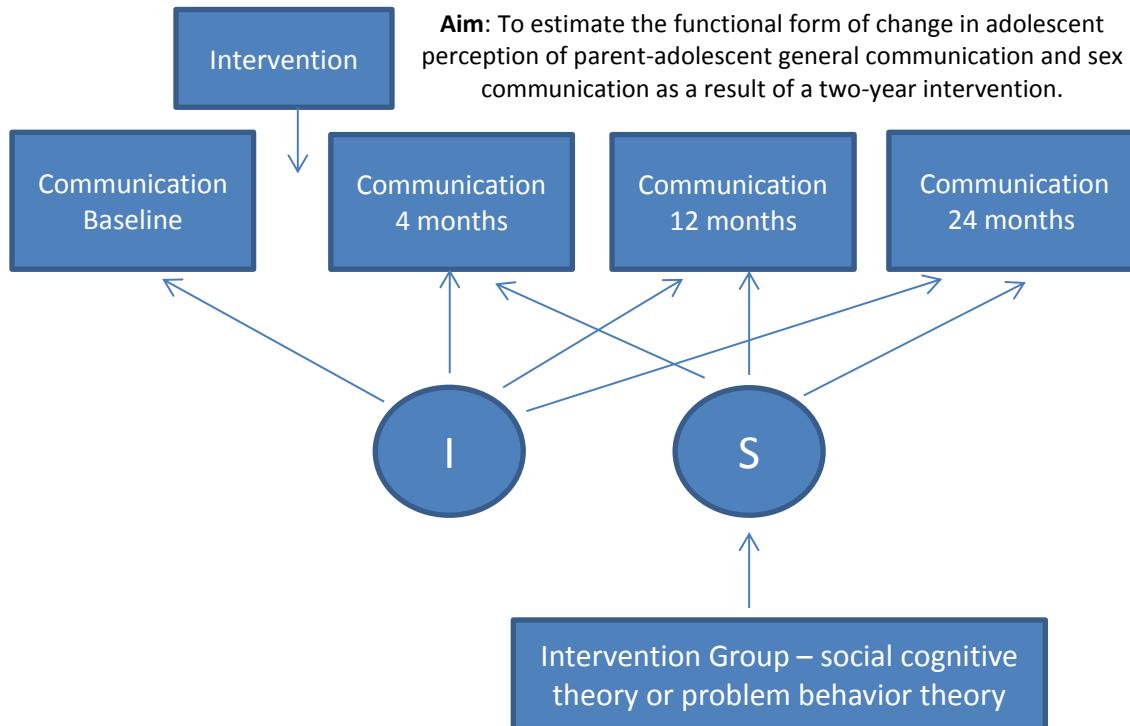


Figure 3. This model addresses the same overall aim and the final research questions:

- 3A) After controlling for the covariates discussed in research question #2, how does treatment group assignment predict intercept and slope of adolescent perception of general communication with their mother?
- 3B) After controlling for the covariates discussed in research question #2, how does treatment group assignment predict intercept and slope of adolescent perception of sex-specific communication with their mother?

3B) Does treatment group assignment have a different impact on change in adolescent perception of general communication versus sex-specific communication with their mother?

In this model, adolescents were assessed at baseline and as in previous models, after the initial survey, an intervention took place based on random assignment (social cognitive theory, life skills, or control). Adolescents were then interviewed at approximately four months, 12 months, and 24 months after the completion of the intervention. According to this model, the slope, or change over time in perceived communication, was influenced by the intervention group. Given that the social cognitive theory and life skills groups provided more extensive programming and opportunities to practice communication skills, it was hypothesized that those groups would have a greater positive change in perceived communication between adolescent and mother over the course of the two years when compared with the control group.

Limitations

This study has several limitations; however, each is addressed below. The first limitation of the data being approximately 20 years old is addressed through the discussion of adolescent development and the fact that the original study (DiIorio, 2002) continues to be cited in current research. However, it is important to note that even though the process of adolescent development remains relatively the same twenty years later, the process in which adolescents access information and communicate is different. Access to social media and technologically advanced devices would both play a role in perceived communication that cannot be addressed using the data from the original study.

Yet, reanalyzing the data and asking different questions, still provided valuable insight into adolescent perception of communication with their mother.

Additionally, because the sample was drawn through a national organization, the adolescents and mothers involved in the original study may have had greater access to resources than other populations in the southeast United States. However, the data still contribute to the literature by providing an opportunity to analyze longitudinal data related to parent-adolescent communication among a population that is not studied as often as populations disproportionately impacted by negative health outcomes. Finally, all data collected based on recall and perception will be subjective. The subjectivity limits how the data can be used in terms of generalizing to a larger population. However, we can use the data and analyses to better understand what worked for this population and determine how to modify interventions to address the needs of other high-risk populations. In particular, these data will contribute to the literature and add to our understanding of the nuances of how adolescents perceive and receive information from their mother, how that perception changes over time, and which covariates influence that change.

CHAPTER IV

PAPER ONE:

A SECONDARY DATA ANALYSIS OF HIV-PREVENTION INTERVENTIONS: USING LATENT GROWTH MODELING TO BETTER UNDERSTAND HOW ADOLESCENTS PERCEIVE COMMUNICATION WITH THEIR MOTHER OVER A TWO-YEAR PERIOD

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Abstract

Background: Understanding the effects of health education interventions helps advance work in public health by identifying the most effective strategies to reduce or prevent engagement in risky behaviors. In particular, studying interventions that focus on disproportionately affected populations helps reduce health disparities and target the populations with the greatest need. **Purpose:** This study determined the functional form of change in adolescent perception of general communication with mother and sex-specific communication with mother as a result of an intervention and two-year follow-up and identified which covariates are correlated with these trajectories of change over time.

Methods: This secondary data analysis used latent growth curve modeling to determine the change in adolescent perception of mother-adolescent general and sex-specific communication over a two-year intervention study. Both unconditional and conditional models were generated using MPlus. **Results:** Adolescent perception of general communication with their mother was somewhat influenced by a life skills intervention

and always correlated with adolescent perception of sex-specific communication. Biological sex only influenced adolescent perception of sex-specific communication with their mother. **Discussion:** This study confirmed that the adolescent perception of communication with their mother is highly correlated with adolescent perception of the mother-adolescent relationship, somewhat dependent on biological sex and academic aspirations, and that sex-specific communication is correlated with peer values.

Translation to Health Education Practice: Understanding how adolescent perception of communication with their mother changes over time as a result of an intervention helps determine which intervention methods work well, which covariates are most important to highlight in educational opportunities, and how adolescent development influences educational practices.

Background

Understanding the effects of health education interventions helps advance our work in public health by identifying the most effective strategies to reduce or prevent engagement in risky behaviors. In particular, studying interventions that focus on disproportionately affected populations helps reduce health disparities and target the populations with the greatest need. Adolescents in general represent a group disproportionately affected by several risky behaviors, such as drug and alcohol use, unprotected or non-consensual sexual activity, accidents, and texting and driving. The CDC's Youth Risk Behavior Surveillance System studies many of these risky behaviors on a regular basis to look for trends based on several different characteristics, including biological sex, race, ethnicity, and sexuality. In regards to race and ethnic identity,

adolescents identifying as Black reported increased engagement in sexual activity compared to adolescents identifying as white or Hispanic (Kann, et al., 2018) but decreased engagement in some other risky behaviors (i.e. texting while driving, alcohol use, and cigarette use).

Black adolescents, in particular Black males, are not only more likely to engage in sexual intercourse when compared to their Hispanic and white counterparts (for males: 52.7%, 44.1%, and 38.5% respectively; for females: 39.4%, 38.5%, 38.7%, respectively), but they are disproportionately impacted by negative health outcomes associated with sexual intercourse.

Increased sexual activity, including early engagement in sexual activity – prior to age 13 – which is more likely to include Black adolescents compared to white or Hispanic adolescents (7.5%, 2.0%, and 4.0%, respectively) has the potential to lead to negative health outcomes, for example sexually transmitted infections. Overall, Black adolescents were disproportionately affected by sexually transmitted infections whether their sexual activity was higher or comparable to their peers of different racial and ethnic identities. Of all reported gonorrhea cases among adolescents, over half were among Black adolescents (CDC, 2017) and the rate of chlamydia cases among Black females in 2016 was 5.1 times that of their white counterparts and for males it was 6.1 times that of white adolescent males (CDC, 2017).

Adolescent development. To better understand why adolescents continue to represent a high-risk population, it is helpful to consider adolescent development as a whole. Adolescence is a time of continual social, emotional, and cognitive growth.

According to Bronfenbrenner's model of human development, we rely heavily on interpersonal interactions and relationships as well as our surrounding environment as we develop (Bronfenbrenner & Evans, 2000; McLeroy, Bibeau, Steckler, & Glanz, 1988). Adolescents are making a natural shift toward relationships with their peers and seeking peer approval can become increasingly important and emotionally driven (Blakemore & Robbins, 2012).

Peer relationships. Peer relationships can highly influence adolescent personal values and behaviors. Adolescents have a propensity for behaviors that result in immediate reward (Spear, 2013). In addition, they are more likely to engage in or make impulsive decisions when they are alone with their peers compared to when an adult is present (Spear, 2013). African American adolescents' sexual behaviors are more likely to be influenced and informed by social norms and attitudes toward sex compared to other ethnic groups (Shepherd, Sly, & Girard, 2017). Overall, evidence suggests peer relationships play a vital role in adolescent development and are seen as key "organizing principles" for them and their networks (Collins & Sroufe, 1999). However, research has also indicated that the parent-adolescent relationship is critically influential not only for positive development, but also for subsequent adolescent behaviors (Wolfe, Jaffe, & Crooks, 2006).

Parent relationships and communication. Overall, parent-adolescent relationships are important for adolescent development and decision-making. In order for these relationships to be most effective and supportive, adolescents' perception of the relationship needs to be positive as it is their perspective that determines the quality of

the parent-adolescent relationship (Dimler, Natsuaki, Hastings, Zahn-Waxler, & Klimes-Dougan, 2017; Simons, Sutton, Simons, Gibbons, & Murry, 2016). Depending on the adolescent perspective, enhancing the parent-adolescent relationship may ameliorate peer-influenced decisions. Among a predominantly white adolescent population, the adolescent perception of the parent-adolescent relationship determined the adolescent behavior (Dimler et al., 2017) and it was ok if adolescents and parents disagreed on the quality of the relationship as long as adolescents were viewing the connection positively (Dimler et al., 2017; Harris, Bolland, & Vazsonyi, 2017). Further, other research indicates that the greater the parental awareness or monitoring of the adolescent's behaviors and choices, the less likely the adolescent was to engage in deviant or negative behaviors (Harris et al., 2017).

One pathway to enhancing the parent-adolescent relationship is through parent-adolescent communication. Adolescents benefit from open and honest discussions with their parents especially about stressors and pressures they face (Wolfe et al., 2006). When adolescents perceive their communication with their parent as open and receptive, they report closer parent-adolescent relationships and more positive health outcomes (Pluhar & Kuriloff, 2004; US DOE, 2005; Wilson & Donenberg, 2004). Some research has suggested that healthy and positive parent-adolescent communication may result in reduced negative adolescent mental health outcomes (Ohannesian, 2013). The overall effectiveness of parent-adolescent communication is correlated with the parent-adolescent relationship both of which are highly dependent on the adolescent's perspective (Guilamo-Ramos et al., 2006; Jaccard, 1995; Lippold, Fosco, Ram, &

Feinberg, 2016; Pluhar & Kuriloff, 2004; Whitaker & Miller, 2000). The correlation between relationship, communication, and perception is important to understand since none of the factors are most effective in isolation. Considering these relationships within the context of adolescent development is also critical given that throughout adolescence children are changing socially, emotionally, physically, and cognitively.

Theory. According to social cognitive theory (SCT), social context is important to adolescent development. Learning through observation of others influences how adolescents shape and develop their skills (Bandura, 2001). Peers and parents are the most commonly cited sources of information adolescents rely on when it comes to navigating their social context, which includes values, norms, and social expectations around sexual attitudes and behaviors (Holman & Kellas, 2015), which means that parents may be able to modify the adolescent perspective of and experience with their social context (Pluhar & Kuriloff, 2004). Health interventions and prevention programs rooted in social cognitive theory can help build social capital and social support systems, especially with the family, focusing on parent-adolescent relationships and parent-adolescent communication.

Problem behavior theory also connects adolescent behaviors and choices to the perception of the parent-adolescent relationship and subsequent perceived parent-adolescent communication. According to problem behavior theory, adolescent behaviors are rooted within a network of psychosocial and behavioral variables that are usually determined by the adolescent lifestyle (Jessor, 2016). The theory simultaneously

considers the social environment and the individual level determinants of action (Jessor, 2016).

These theories guided the development of the original HIV-prevention interventions evaluated by DiIorio and her colleagues (see DiIorio et al., 1999 for details) and provided important context for understanding how adolescent perception of communication with their mother changes over time.

Purpose

This paper is a re-analysis of intervention effects using latent growth curve modeling to better understand how adolescent perception of general and sex-specific communication changes over a two-year period. This study sought to accomplish the following objectives: first, to determine the functional form of change in adolescent perception of general communication with mother and sex-specific communication with mother as a result of an intervention and two-year follow-up and, second, to determine which covariates are correlated with these trajectories of change over time.

Methods

Participants and procedure. The participants were predominantly Black adolescents who were 11 to 14 years of age at the beginning of the study. In addition to the adolescent participants, their mothers also participated in the intervention study; however, this study focused only adolescent data and will refer only to the adolescent data throughout with the exception of some socio-economic factors related to mothers that may influence adolescent behaviors and outcomes. The majority of the adolescent participants were male (60.5%). Overall, mothers were well educated and employed; 26%

of mothers completed high school, 43.9% completed some schooling past high school, and 66% of mothers held jobs. Participants were recruited through a national organization in a major city in the southeastern United States. A total of 624 adolescents and their mothers were initially recruited but only 600 met all eligibility requirements. At each wave of data collection, some participants were lost to follow up and 521 remained at the final data collection time point, 24 months post intervention. Eleven different sites were used and each site was randomly assigned to implement either the life skills intervention, the social cognitive theory intervention or the control (see DiIorio, 1999 for detail).

Participants and their mothers met with interviewers prior to the implementation of the intervention and completed a lengthy questionnaire to provide baseline data. After the intervention, participants and their mothers completed the same questionnaire with interviewers at the following time points: four months after the intervention, 12 months after the intervention and 24 months after the intervention.

Measures.

Demographic. Demographic variables, including age and biological sex, were assessed directly by asking for the participant's date of birth and how they identified in regards to their biological sex. Participants were then separated by male and female prior to the beginning of the interview process. In SPSS participants were excluded from future analysis if they were under the age of 11 and biological sex was coded with female equal to one and male equal to zero.

Academic. GPA was assessed by asking the participant to recall how well he or she had done in school over the past three months. Options included statements such as,

“I get mostly A’s,” “I get mostly A’s and B’s,” and “I get mostly C’s.” A participant’s aspiration for academics was assessed by asking, “How far would you like to go in your education?” with responses ranging from, “You don’t care if you graduate from high school” to “You intend to graduate from graduate / professional school.”

General communication. Adolescent perception of general communication with their mother was assessed by an 18-item scale based on both Armsden and Greenberg’s Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987), as well as Barnes and Olson’s Parent-Adolescent Communication Scale (Barnes & Olson, 1982). These items measured the adolescent’s perception of communication with their mother, which included the adolescent’s perception of both their own and their mother’s comfort level and openness and mother’s receptivity and emotion. Sample items included, “You can talk to your mother about things that are important to you,” “Talking over problems with your mother makes you feel uncomfortable,” and “You can tell your mother how you feel about sensitive topics such as abortion, racism, and drugs.” Each item was measure on a scale from one (never true) to 5 (always true) with higher scores indicative of a more positively perceived general communication relationship (DiIorio, et al., 2002). Some of the responses were reverse coded to ensure that the scores were representative of their meaning.

Sex-specific communication. Communication about sex was assessed by six items that were developed by the original researchers (DiIorio et al., 2002). These items measured the adolescent’s perception of sex-specific communication with their mother, which included the adolescent’s perception of both their own and their mother’s comfort

level and openness and mother's receptivity and emotion. Sample items included, "You feel comfortable talking to your mother about sex-related issues," "You feel your mother talks openly to you about sex," and "You really do not want to talk to your mother about sex." Each item was measured on a scale of one (strongly disagree) to five (strongly agree) with higher scores indicative of a more positively perceived sex-specific communication relationship. Some items were reverse coded to ensure that the scores were representative of their meaning.

Personal values. Personal values were assessed by an eight-item scale developed by the original researchers (DiIorio et al., 2002). These items measured the adolescent's values toward sexual intercourse. Sample items included, "Teenagers should not have sex at all before they are married," "It is OK for teenagers to have sex if they use birth control," and "Having sex is a normal part of growing up for teenagers." Each item was measured on a scale of one (strongly disagree) to five (strongly agree). Three items were reverse coded so that overall higher scores were indicative of a more conservative set of values toward sexual behaviors.

Peer values. Peer values were assessed by an eight-item scale developed by the original researchers that replicated the statements of personal values but inserted [your friends] (DiIorio et al., 2002). Sample items included, "Your friends think teenagers should not have sex at all before they are married," "Your friends think it is OK for teenagers to have sex if they use birth control." Each item was measured on a scale of one (strongly disagree) to five (strongly agree). Three items were reverse coded so that

overall higher scores were indicative of a more conservative set of perceived peer values toward sexual behaviors.

Parenting. Adolescent perception of the mother-adolescent relationship was assessed by a 14-item scale developed by the original researchers (DiIorio et al., 2002). Sample items included, “You can count on your mother to help you when you have a problem,” “Your mother knows where you are after school,” and “When you break a rule, your mother punishes you.” Each item was measured on a scale of one (strongly disagree) to five (strongly agree).

Data analysis. All data used in analyses included pre and post-intervention data and were initially analyzed unconditionally and subsequently according to correlates and treatment group. Prior to running all models in MPlus Version 6 (MPlus), descriptive data were obtained in IBM SPSS Statistics Version 25 (SPSS).

The analyses were conducted using latent growth curve modeling. Latent growth curve modeling is an ideal analytic approach to examine how individuals change over time as it offers researchers greater flexibility than other analytical methods used to study change such as Repeated Measures ANOVA. These models are often used with repeated measures of individuals over longer periods of time (DiIorio et al., 2002). The goal of growth curve modeling is to determine the shape of the curve in order to estimate individual parameters of change (intercept and slope) over time (DiIorio et al., 2002). Latent growth curve modeling is considered a person-centered approach and allows for heterogeneous groups of individuals to be represented in developmental trajectories (Muthen and Muthen, 2000). These models focus on relationships among individuals and

allow for the study of predictor variables related to individual differences, allow for the estimated individual growth parameters to become independent and dependent variables, and they can include both static and time-varying variables (Duncan & Duncan, 2004; Kohli & Harring, 2013; Muthén and Muthén, 2000; Simons-Morton, Chen, Abroms, & Haynie, 2004).

The specific latent growth curve models that were run for this study were piecewise models, which are particularly helpful when there are data that may correspond to multiple developmental stages from which repeated measures are taken (Ram & Grimm, 2007). The dataset includes responses from participants ranging in age from 11 to 16 and includes measures aimed at determining the long-term effectiveness of an intervention. Each phase of the piecewise model was specified to correspond to a particular form of the overall process with the knot or changepoint of the model specified *a priori* at time point two (DiIorio et al., 2002; Ram & Grimm, 2007). The variance of the first slope was fixed at zero, which is common practice for this kind of analysis when one of the pieces has only two time points for the analysis (Chou, Yang, Pentz, & Hser, 2004). All models employed the maximum likelihood missing data procedure common to MPlus (Muthén & Muthern, 1998-2017). This procedure uses all available data points from all participants and assumes that data are missing at random.

Results

Each unconditional piecewise model had two growth factor measurements represented by the different slopes. The intercept for each unconditional model is the baseline average across participants. The growth factor for the first model is adolescent

perception of general communication with mother and the growth factor for the second model is adolescent perception of sex-specific communication with mother.

The CFI and RMSEA statistics indicate that the unconditional piecewise growth models fit the data well. In regards to adolescent perception of general communication with their mothers, adolescents' perceptions have an overall negative trend, becoming more negative over time. The second slope, indicating change in adolescents' perceptions from four months after the intervention to 24 months after the intervention, is significantly more negative than the first indicating an increasingly negative perception of general communication between adolescents and their mothers over a two-year period. Neither slope is significant for the sex-specific communication model, which indicates that adolescents do not perceive any significant change in their sex-specific communication with their mothers over the two-year period. However, it is interesting that initially the slope is positive and then over time it becomes negative.

In addition to running the unconditional models (see Table 3), fully populated models were run with the time-invariant and time-varying covariates of interest. Those that were inconsistently related with either adolescent perception of general communication or sex-specific communication with their mother were trimmed from each of the respective models. The loadings in Figures 4 and 5 represent the covariates that were most consistently significantly associated with adolescent perception of general and sex-specific communication, respectively, with their mother. Some additional covariates were left in the second and third models because they provided contextual significance even if they were not statistically significant.

Table 3. Summary of Unconditional Models for Adolescent Perception of General and Sex-specific Communication and Relationship with Mother

	Model Fit			Baseline – 4 months	4 months – 24 months
	CFI	RMSEA	Intercept	Slope 1	Slope 2
General communication	0.998	0.024	4.207	-- 0.006	-- 0.013*
Sex specific communication	1.000	0.000	3.456	0.009	-- 0.002
<i>*p-value = 0.000</i>					

General communication. The goal of the analysis was to create a model that included covariates that significantly influenced adolescent perception of general communication with their mother. However, this trimmed model (see Figure 4) for adolescent perception of general communication with their mother was a better fit when the covariates for biological sex and intervention group remained in the model even though they were not consistently statistically significant. The overall slope for the first piece of the model (baseline to four months post-intervention) was positive (0.124), indicating a positive change over time in adolescent perception of general communication with their mother, yet not significant. However, the second piece of the model had a negative slope (-0.044) and was significant, indicating that between four and 24 months post intervention there was a statistically significant decline in adolescent perception of general communication with their mother.

The model included different time invariant covariates that influenced the overall slope. Both academic aspirations and being assigned to the life skills intervention group

had initial negative and significant associations with the slope from baseline to four months post intervention, an indication that during this time period those covariates accounted for a more negative adolescent perception of general communication with their mother. These results were especially unexpected in regards to assignment to the life skills intervention group. Aspects of the life skills intervention were intended to bring about positive change in several areas of the adolescents' lives including their perception of their general communication with their mother. However, it is possible, and hypothesized, that the participants re-evaluated their responses after the initial survey and provided a more accurate and realistic portrayal of their perceived communication with their mother after the intervention resulting in the negative slope. None of the time-invariant covariates were significantly associated with the second slope of the model.

The time-varying covariates were more consistently significantly associated with adolescents' perception of general communication with their mother. Adolescent perception of parenting and adolescent perception of sex-specific communication with mother were both highly correlated with adolescents' perception of general communication with their mother at each time point. In addition, adolescent perception of their peer values was also (and only) significantly associated with adolescent perception of general communication with their mother at the second time point (four months post intervention). It is evident that how adolescents perceive their relationship with their mother influences their perception of their general communication with their mother and adolescents' perception of sex-specific communication is significantly interconnected with their perception of general communication with their mother.

Figure 4. Model with Time Invariant and Time-varying Covariates on Adolescent Perception of General Communication with their Mother

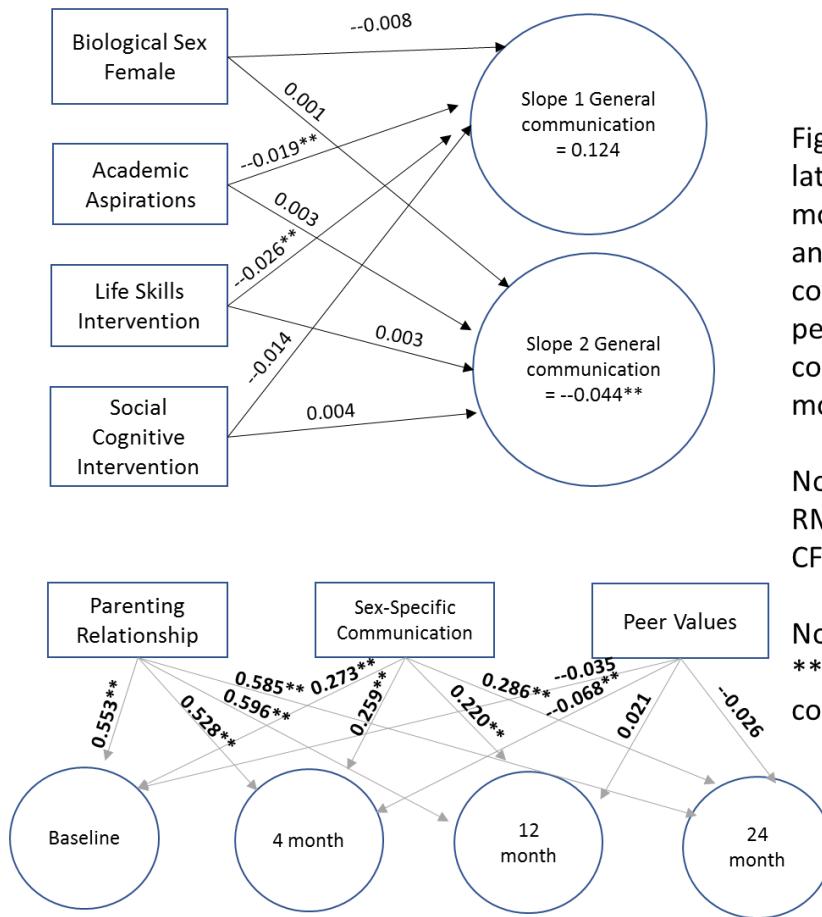


Figure 4. Final conditioned latent growth curve models of time-invariant and time-varying covariates and adolescent perception of general communication with their mother.

No. of Obs. = 285

RMSEA = 0.064

CFI = 0.946

Note: * $p < .10$, ** $p < .05$, *** $p < .001$. Standardized coefficients are shown.

Sex-specific communication. As with adolescent perception of general communication with their mother, the goal of the analysis was to generate a trimmed model for adolescent perception of sex-specific communication with their mother that included the most statistically significant covariates (see Figure 5). Overall, the model for adolescent perception of sex-specific communication with their mother was a stronger fit when both intervention groups remained in the model even though they were not statistically significant. The overall slope for this model was small, but positive for both

pieces of the model, an indication that adolescent perception of sex-specific communication with their mother followed a slight upward, albeit non-significant, trend.

The time invariant covariates of biological sex and academic aspirations significantly influenced the slope for the model of adolescent perception of sex-specific communication with their mother. For the first piece of the model (baseline to four months post intervention), both covariates significantly influenced the overall slope positively – adolescent females were more positive about their perception of sex-specific communication with their mother compared to adolescent males and higher academic aspirations were correlated with a more positive adolescent perception of sex-specific communication with their mother. However, in the second piece of the model, the overall slope was still positive (albeit not significant), but the influence of the biological sex and academic aspirations covariates on the model indicated that adolescent females had a more negative perception of sex-specific communication with their mother compared to adolescent males and that higher academic aspirations were also associated with a more negative perception of sex-specific communication with their mother.

Most of the time-varying covariates were significantly associated with adolescent perception of sex-specific communication with their mother. The model suggested that perceived peer values were significantly and negatively associated with how the adolescent participants perceived their sex-specific communication with their mothers. At each time point the adolescent perception of peer values is negatively associated with the perception of sex-specific communication with their mother, which is consistent with the literature (DiIorio, 2007; Smetana, 2011; Wolfe, et al., 2006) that states peers have a

strong, usually negative, influence on values and behaviors associated with sexual intercourse. However, adolescent perception of the parent-adolescent relationship was also significantly associated with how adolescents perceived sex-specific communication with their mother at the latter time points, which is also consistent with literature (Ohannessian, 2013; Withers, et al., 2016) that states parents can positively influence their adolescents' values and perceptions of sex possibly ameliorating the peer influence. In this model, each value for adolescent perception of the parent-adolescent relationship was positive, indicating a positive shift in adolescent perspective at each time point, whereas the values for perceived peer values are all negative. Lastly, as expected, there was a consistent correlation between adolescents' perception of general communication with their mother and sex-specific communication with their mother at every time point.

Figure 5. Model with Time Invariant and Time-varying Covariates on Adolescent Perception of Sex-specific Communication with their Mother

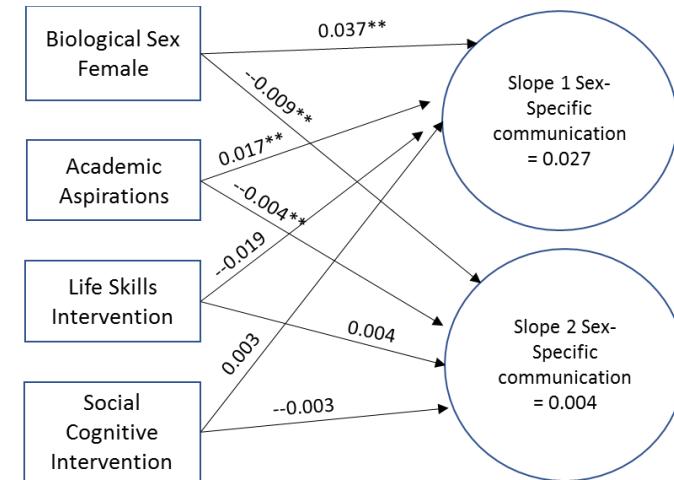
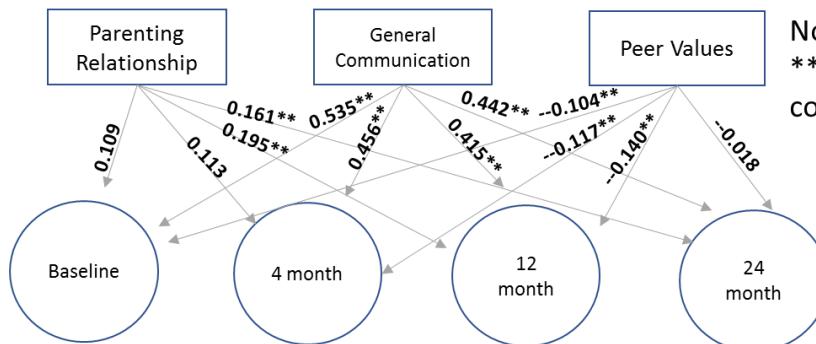


Figure 5. Final conditioned latent growth curve models of time-invariant and time-varying covariates and adolescent perception of sex-specific communication with their mother.

No. of Obs. = 295
RMSEA = 0.039
CFI = 0.965



Note: * $p < .10$, ** $p < .05$, *** $p < .001$. Standardized coefficients are shown.

Discussion / Conclusion

The use of latent growth curve modeling increased our understanding of adolescent perception of general and sex-specific communication with their mother especially as their perception relates to various covariates. Adolescent perception of mother-adolescent communication is highly influential in how adolescents interact with and learn from their mother as well as their surrounding environment (Bandura, 2001; Bronfenbrenner & Evans, 2000). This study confirmed that the adolescent perception of

both general and sex-specific communication with their mother is highly correlated with adolescent perception of the mother-adolescent relationship, associated with biological sex and academic aspirations, and that adolescent perception of sex-specific communication with their mother is correlated with peer values.

It was evident that there was a strong correlation between adolescents' perception of general communication with their mother and their perception of sex-specific communication with their mother. It makes sense that a positive perception of general communication would yield a positive perception of sex-specific communication as a positive perception of general communication provides a solid foundation for sex-specific communication to take place. Adolescents' perception of their relationship with their mother was significant at nearly every timepoint for both perception of general communication and perception of sex-specific communication with their mother. This finding is consistent with the literature (Dimler et al., 2017; Pluhar & Kuriloff, 2004; Simons et al., 2016) on adolescent-parent relationships, which notes that parent-adolescent relationships perceived by adolescents to be open, receptive, and comfortable beget opportunities for more positively perceived parent-adolescent communication. The correlation confirms that there is value in continuing to study and develop programming around the parent-adolescent relationship.

Interestingly, adolescents' academic aspirations were also associated with the shape of the curve for both adolescent perception of general communication with their mother and sex-specific communication with their mother. Adolescents' academic aspirations were both negatively and positively associated with the trajectories of

adolescent perception of the different types of communication depending upon the piece of the model. The change over time of adolescents' perception of sex-specific communication with their mother was positively associated with academic aspirations in the first piece of the model and negatively associated with academic aspirations in the second piece of the model. It is possible adolescents initially over-estimated their academic aspirations and subsequently re-evaluated their responses. While the model does not indicate how adolescents' perception of academic aspirations changed over time, it does demonstrate that how adolescents perceive the importance of their academic aspirations is a significant differentiating factor in how their perception of communication with their mother changes over time.

An unanticipated result of this study was the negative association between the life skills intervention group and adolescent perception of general communication with their mother. The interventions based on social cognitive theory and problem behavior theory (life skills group) were designed to promote positive changes in adolescent behavior. The association was negative and significant only for the first piece of the model and only for adolescent perception of general communication with their mother. It is speculated that the intervention, along with the extensive questionnaire administered at every time point, encouraged adolescents to re-evaluate their perception of their communication with their mother and portray a more realistic – in this case negative – view of their perceived communication.

Biological sex, specifically identifying as female, was significantly correlated with adolescent perception of sex-specific communication only. Adolescent females'

perception of sex-specific communication with their mother was more positive for the first part of the model – from baseline to four months post intervention, but then shifted significantly to more negative when compared to adolescent males for the second part of the model – four months to 24 months post intervention. According to some research focused on sex-specific conversations between Black adolescent females and their mothers, the adolescents reported wanting more direct and specific information about sex when communicating with their mothers (Akers, Schwarz, Borrero, & Corbie-Smith, 2010) and were frustrated when their mothers focused on negative and fear-based outcomes associated with sex (O’Sullivan, Meyer-Bahlburg, & Watkins, 2001). In regards to this study, it is possible that the female participants felt similarly about their sex-specific conversations with their mothers and felt, in spite of the interventions, their mothers were not approaching the sex-specific communication in a way conducive to their receiving the information. It is also possible that as the female adolescents in this study got older, they were seeking greater autonomy and independence, which may have resulted in the mothers resorting to more fear-based tactics to dissuade their daughters from engaging in sexual activity.

Overall this study reinforced the need to promote positive parent-adolescent relationships especially as perceived by adolescents, suggested that peer relationships continue to play important indirect and direct roles in shaping the lives of adolescents (Blakemore and Robbins, 2012; Spear, 2013; Wolfe et al., 2006), and that adolescents identifying biologically as female may need a different approach in how their mothers communicate with them about sex-specific topics. In order for adolescents to perceive

their relationship with their mother as positive, the relationship needs to ensure openness, comfort, and respect (Jaccard, 2002). The challenge arises, however, in that each of these characteristics needs to be perceived as such by the adolescent and not the parent alone; a challenge that encourages promoting communication, time and developing understanding between the mother and adolescent (Afifi, 2008; Lefkowitz, 2002; Martino, 2008; Pluhar, 2004). Furthermore, continuing to understand how and look for ways to positively influence adolescents' relationships with their peers and how they perceive their peers' values will allow for opportunities to promote positive associations with adolescent perception of sex-specific communication with their mothers. How adolescents perceived their peers' values was particularly important when it came to their perception of sex-specific communication with their mother, an indication that this particular topic is more likely influenced by the social norms adolescents learn from their friends.

Limitations

This study presents several limitations. The first limitation of the data being approximately 20 years old is addressed through the discussion of adolescent development, suggesting that adolescent development has not changed dramatically over the past 20 years. While overall the process of adolescent development has not changed, the ways in which adolescents engage with their environment, including communicate with one another, have changed. Enhanced technology and the emergence of social media have contributed to new and different forms of communication. Acknowledging this shift is important, but does not detract from the value of analyzing data collected prior to these technological advances.

Additionally, because the sample was drawn through a national organization, the adolescents and mothers involved in the original study appear to have had greater access to resources, based on their reported educational and socio-economic levels, than other populations in the southeast United States. Some maternal data gathered as part of the original study indicated that two-thirds of the mothers were employed and nearly all of the mothers were educated at or above the high school level. Higher socio-economic and education levels commonly translate to greater access to resources as well as greater importance placed on education and opportunities for their children (Davis-Kean, 2005; Prickett and Augustine, 2015). However, the data still contribute to the literature by providing an opportunity to analyze longitudinal data related to mother-adolescent communication among a unique population that may not be studied as often. A final limitation is that all data were collected based on recall and perception and thus are subjective. While the subjectivity limits how the data can be used in terms of generalizing to a larger population, better understanding of specific populations, including those that represent a higher socio-economic status and educational background is still pertinent to our overall perspective on adolescent perspective of mother-adolescent communication. These analyses can be used to better understand what worked for this population and determine how to modify interventions to address the needs of other high-risk populations.

Translation to Health Education Practice

Understanding how adolescent perception of communication with their mother changes over time as a result of an intervention helps determine which intervention

methods work well. Using a latent growth curve modeling approach helps determine which covariates are most important to highlight in educational opportunities, and how adolescent development influences educational practices.

Adolescent perception of parent-adolescent communication is intricately connected to adolescent perception of parent-adolescent relationships and subsequently correlated with changes in adolescent behaviors and health outcomes (Dimler et al., 2017; Pluhar & Kuriloff, 2004; Simons et al., 2016; US DOE, 2005; Wilson & Donenberg, 2004). This study indicated that the adolescent perception of their relationship with their mother was significantly associated with how they perceived their communication with their mother. In addition, the analyses found significant associations between the following outcome variables and covariates: adolescent perception of general communication with their mother and academic aspiration and adolescent perception of sex-specific communication with their mother and biological sex and adolescent perception of peer values. These findings present the following opportunities for health education.

First, to enhance and focus on adolescent-parent communication and relationships, health education efforts can develop programs, interventions, and outreach opportunities that emphasize among parents the value of how adolescents perceive what they say and do. Second, health education efforts need to be more aware of the role academic aspirations play in any intervention and programmatic efforts. Academic aspirations, while significantly correlated with adolescents' perception of communication with their mother, were mixed in their direction of influence. The goal would be for the

association to be consistently positive and the conversations around academic goals positively drive adolescents to make healthier and more positive choices and encourages communication with their mother. Finally, health education efforts can continue to enhance the parent-adolescent relationships and communication pathways in order to mediate how perceived peer values influence not only parent-adolescent communication but also, in many instances, adolescent behaviors and health outcomes. Given the importance of the adolescent perspective throughout this study, it would behoove health educators to take a participatory approach in developing programs and intervention efforts that incorporate adolescent needs and wants.

CHAPTER V

PAPER TWO:

USING LATENT GROWTH CURVE PARALLEL PROCESS MODELING TO UNDERSTAND THE RELATIONSHIP BETWEEN ADOLESCENT PERCEPTION OF THE MOTHER-ADOLESCENT RELATIONSHIP AND ADOLESCENT PERCEPTION OF SEX-SPECIFIC COMMUNICATION WITH THEIR MOTHER

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Abstract

Using different analytic approaches to re-evaluate data can benefit how we understand health education interventions. This secondary data analysis assessed the relationship among adolescent perception of sex-specific communication, adolescent perception of the mother-adolescent relationship, and different covariates such as biological sex (male or female in this instance) and intervention group. The study used a latent growth curve modeling approach, specifically employing a piecewise parallel modeling process. Participants were predominantly adolescents who identified as Black, and ranged in age from 11 to 16 throughout the duration of the study. A strong correlation between adolescent perception of sex-specific communication with their mother and the adolescent perspective of the mother-adolescent relationship was evident throughout all piecewise parallel models. Additionally, there were significant differences in the slopes for both adolescent perception of the mother-adolescent relationship and adolescent perception of sex-specific communication with their mother across the

different intervention groups. Confirmation that the adolescent perspective is significant in regards to communication with their mother as well as the development and quality of the relationship indicates the need to continue to develop opportunities to engage adolescents and parents in public health interventions.

Background

Piecewise parallel modeling is a useful analytical approach to studying two conditions simultaneously. It offers the possibility to determine if explanations or predictors of change for both variables are the same, similar or disparate. Prior research has indicated a correlation between adolescent – parent relationships and adolescent – parent sex-specific communication. Piecewise parallel models will demonstrate whether the changes over time in these variables follows the same trajectory and which predictors of change are most significant.

Studying the correlation between parent-adolescent relationships and parent-adolescent communication is particularly important given that adolescents are disproportionately affected by negative outcomes associated with risky sexual behaviors. Over half of the 20 million new sexually transmitted disease (STD) cases in 2016 were among 15 to 24-year-old adolescents and 13 to 24-year-old adolescents accounted for 21% of all new HIV infections (Center for Disease Control and Prevention, 2017).

The effects of engaging in risky sexual behaviors are amplified when further examined by race. Adolescents who identify as Black are not only more likely to engage in sexual behaviors, but the rate of chlamydia cases among Black females in 2016 was 5.1 times that of their white counterparts and for males it was 6.1 times that of white

adolescent males (CDC, 2017). Additionally, of all reported gonorrhea cases among adolescents, over half were among adolescents who identified as Black (CDC, 2017). Finally, adolescents who identified as Black were more likely to have reported having had sex before age 13 (Kann, McManus, Harris, et al., 2018).

Parent relationships and communication. Overall parent-adolescent relationships are important for adolescent development and decision-making. How adolescents perceive their relationship with their parent determines the quality of the adolescent-parent relationship (Dimler, Natsuaki, Hastings, Zahn-Waxler, & Klimes-Dougan, 2017; Simons, Sutton, Simons, Gibbons & Murry, 2016). The relationships between adolescents and parents are most effective and supportive when adolescents discern the connection with their parent as positive, which in turn may ameliorate peer-influence decisions. Dimler et al. determined among a predominantly white adolescent population that the adolescent perception of the parent-adolescent relationship positively modified the adolescent behavior (2017). In fact, it was ok if adolescents and parents disagreed on the quality of the relationship as long as adolescents were viewing the connection positively (Dimler et al., 2017; Harris, Bolland, & Vazsonyi, 2017). Further, other research indicates that the greater the parental awareness or monitoring of the adolescent's behaviors and choices, the less likely the adolescent was to engage in deviant or negative behaviors (Harris et al., 2017).

The adolescent-parent relationship can be enhanced through consistent, supportive, and open parent-adolescent communication. Adolescents benefit from open and honest discussions with their parents especially about stressors and pressures they

face (Wolfe, Jaffe, & Crooks, 2006). According to adolescents across several studies, when they perceived their communication with their parent as open and receptive, they reported closer parent-adolescent relationships and more positive health outcomes (Pluhar & Kuriloff, 2004; U.S. Department of Education, 2005; Wilson & Donenberg, 2004). The correlation between relationship, communication, and perception is important to understand since none of the factors are most effective in isolation (Guilamo-Ramos, Jaccard, Dittus, Bouris, Holloway, & Casillas, 2006; Jaccard, 1995; Lippold, Fosco, Ram, & Feinberg, 2016; Pluhar & Kuriloff, 2004; Whitaker & Miller, 2000).

Theory. According to social cognitive theory (SCT) social context is important to adolescent development. Learning through observation of others influences how adolescents shape and develop their skills (Bandura, 2001). Peers and parents are the most commonly cited sources of information adolescents rely on when it comes to navigating their social context, which includes values, norms, and social expectations around sexual attitudes and behaviors (Holman & Kellas, 2015). The parent-adolescent relationship is one avenue through which parents may be able to modify the adolescent perspective of and experience with their social context (Pluhar & Kuriloff, 2004). Health interventions and prevention programs rooted in social cognitive theory can help build social capital and social support systems, especially with the family, focusing on parent-adolescent relationships and parent-adolescent communication.

Problem behavior theory also connects adolescent behaviors and choices to the perception of the parent-adolescent relationship and subsequent perceived parent-adolescent communication. According to problem behavior theory, adolescent behaviors

are rooted within a network of psychosocial and behavioral variables that are usually determined by the adolescent lifestyle (Jessor, 2016). The theory simultaneously considers the social environment and the individual level determinants of action (Jessor, 2016).

Purpose

The purpose of the current study was to use latent growth curve modeling to assess the relationship among the adolescent perception of adolescent-mother general communication, adolescent-mother sex-specific communication, and the adolescent perception of the adolescent-mother relationship in the context of an intervention study. Piecewise parallel process modeling was used to determine if consistent increases or decreases across time were evident for each target variable and whether or not growth trajectories differed as a result of intervention group each of which was rooted in one of the aforementioned theories.

Methods

Participants and procedure. The majority of the participants identified as Black adolescents who were 11 to 14 years of age at the beginning of the study. In addition to the adolescent participants, their mothers also participated in the intervention study. The majority of the adolescent participants were male (60.5%). Overall, mothers were well educated and employed; 26% of mothers completed high school, 43.9% completed some schooling past high school and 66% of mothers held jobs. Participants were recruited through a national organization in a major city in the southeastern United States. A total of 624 adolescents and their mothers were initially recruited but only 600 met all

eligibility requirements. At each wave of data collection, some participants were lost to follow up and 521 remained at the final data collection time point, 24 months post intervention. Eleven different sites were used and each site was randomly assigned to implement either the life skills intervention, the social cognitive theory intervention, or the control (see DiIorio 1999 for detail).

Participants and their mothers met with interviewers prior to the implementation of the intervention and completed a lengthy questionnaire to provide baseline data. After the intervention, adolescents and their mothers completed the same questionnaire with interviewers at the following time points: four months after the intervention, 12 months after the intervention and 24 months after the intervention (mothers only completed the interview through 12 months). All data used for this study were from the adolescent participants with the exception of some demographic measures.

Measures.

Demographic. Biological sex was the demographic variable of interest for this study and was assessed directly in the interview by asking each participant how they identified in regards to their biological sex. Participants were then separated according to their identified biological sex prior to the beginning of the interview process. All adolescent participants identified as either male or female. In SPSS, biological sex was coded with female equal to one and male equal to zero.

General communication. The original Keepin' It R.E.A.L! study used an 18-item scale developed from Armsden and Greenberg's Inventory of Parent and Peer Attachment (1987) as well as Barnes and Olson's Parent-Adolescent Communication

Scale (1982). The statements gauged the adolescent's perception of communication with their mother, which included the adolescent's perception of both their own and their mother's comfort level and openness as well as their mother's receptivity and emotion. Sample items included, "You can talk to your mother about things that are important to you," "Talking over problem with your mother makes you feel uncomfortable," and "You can tell your mother how you feel about sensitive topics such as abortion, racism, and drugs." Each item was measured on a scale from one (never true) to 5 (always true) with higher scores indicative of a more positively perceived general communication relationship (DiIorio et al., 2002). Some of the responses were reverse coded to ensure that the scores were representative of their meaning.

Sex-specific communication. Communication about sex was assessed by a six-item scale created by the original research team (see DiIorio et al., 2002). These questions measured the adolescent's perception of sex-specific communication with their mother, which included the adolescent's perception of both their own and their mother's comfort level and openness in discussing sex-specific topics as well as their mother's receptivity and emotion when discussing sex-specific topics. Sample items included, "You feel comfortable talking to your mother about sex-related issues," "You feel your mother talks openly to you about sex," and "You really do not want to talk to your mother about sex." Each item was measured on a scale of one (strongly disagree) to five (strongly agree) with higher scores indicative of a more positively perceived sex-specific communication relationship. Some items were reverse coded to ensure that the scores were representative of their meaning.

Parenting. The original Keepin' It R.E.A.L.! research team developed a 14-item scale to assess adolescents' perceptions of the mother-adolescent relationship. Sample items included, "You can count on your mother to help you when you have a problem," "Your mother knows where you are after school," and "When you break a rule, your mother punishes you." Each item was measured on a scale of one (strongly disagree) to five (strongly agree).

Data analysis. All data used in analyses included pre- and post-intervention data and were initially analyzed using unconditional models and subsequently with correlates and by treatment group. Prior to running all models in MPlus Version 6 (MPlus), descriptive data were obtained in IBM SPSS Statistics Version 25 (SPSS).

The analyses used a piecewise parallel latent growth curve modeling approach. Latent growth curve modeling is particularly useful in examining longitudinal data as it offers greater flexibility than other analytical methods used to study change, such as Repeated Measures ANOVA. Latent growth curve models are often used with repeated measures of individuals over longer periods of time (Kohli & Harring, 2013). The goal of growth curve modeling is to determine the shape of the curve in order to estimate individual parameters of change (intercept and slope) over time (Kohli & Harring, 2013). Using latent growth curve models analyses can determine predictor variables related to individual differences, use the estimated individual growth parameters as either independent or dependent variables, and the models can include both static and time-varying variables (Duncan & Duncan, 2004; Ram & Grimm, 2007; Simons-Morton, Chen, Abroms, & Haynie, 2004).

As mentioned, this study used piecewise parallel process models that were run in MPlus. These models estimated the parameters of the latent growth curves for each outcome in a single model and simultaneously estimated the relationships of the parameters of one outcome's curve with the parameters of the other (Mitchell, Beals, & Kaufman, 2006). Incorporating the piecewise component allowed the data to be compared based on different segments of time; in this case, the first segment of baseline to four months post intervention and the second segment of four months post intervention to 24 months post intervention. All models used the maximum likelihood procedure employed by MPlus (Muthen & Muthen, 2002), which used all available data points from each participant and assumed that data were missing at random.

Results

The piecewise parallel process model was run three different ways for this study. Initially the unconditional parallel model was run between adolescent perception of the adolescent-mother relationship and adolescent perception of sex-specific communication with their mother. The results of the unconditional model are in Table 4. The standardized correlation coefficient indicates that the two variables are highly correlated ($0.765, p\text{-value} = 0.000$). Further, all pieces of the model are changing over time in the same direction: slope one for both adolescent perception of sex-specific communication with their mother and adolescent perception of the adolescent-mother relationship was positive whereas slope two for both variables was negative.

Table 4. Unconditional Piecewise Parallel Model

No. Observations = 383, Model Fit: RMSEA = 0.053, CFI = 0.974		
Variable	Slope 1	Slope 2
Sex-specific communication	0.008	--0.002
Adolescent perception of parent relationship	0.002	--0.008**
** <i>p-value</i> < 0.05		

After the unconditional model was run, several covariates of interest were added into the model and the slopes for the second pieces of each model were regressed on one another. The results of this model are in Table 5. Overall, the model was a good fit even though the CFI value was slightly lower than 0.95. Again, there was a strong correlation between the slope for adolescent perception of sex-specific communication with their mother and adolescent perception of the mother-adolescent relationship (0.713, *p-value* = 0.000). In addition, participants in the life skills intervention group as well as females were significantly different from the control group and males respectively for the initial time period in regards to adolescent perception of sex-specific communication with their mother. Those in the life skills intervention group experienced a more negative change over the first time period than participants in the control group. Females, however, experienced a more positive change over the first time period compared to males. During the second period of time for the adolescent perception of sex-specific communication with their mother, females experienced a shift and their slope was more negative compared to those of males, indicating that over time their perception becomes

increasingly more negative. There was no significant difference in the covariates with regard to the adolescent perception of the mother-adolescent relationship in this model.

Table 5. Piecewise Parallel Model with Covariates

No. Observations = 383, Model Fit: RMSEA = 0.063, CFI = 0.936					
Sex-specific communication: Slope 1 = 0.013, Slope 2 = 0.008**					
Adolescent perception of parenting: Slope 1 = 0.016, Slope 2 = --0.013*					
Sex-specific communication			Adolescent perception of parenting		
Variable	Estimate 1	Estimate 2	Variable	Estimate 1	Estimate 2
Social Cognitive Theory	--0.002	0.000	Social Cognitive Theory	--0.002	0.004
Life Skills Group	--0.041**	0.005	Life Skills Group	--0.018	0.008*
Female	0.042**	--0.013	Female	--0.018	0.002
** <i>p</i> -value < 0.05, * <i>p</i> -value < 0.10					

A final piecewise parallel model was run that incorporated the grouping function so that the model could be evaluated by intervention group. The results of this model are shown in Table 6. This model terminated normally and the fit parameters were within acceptable ranges (RMSEA = 0.073 and CFI = 0.931), but there were some modifications that needed to be made to the model in order for the fit to be improved. In the model syntax, the adolescent perception of sex-specific communication at time point three was also correlated with adolescent perception of the mother-adolescent relationship at time point three. While this is not necessarily an ideal modification to make, it is acceptable within latent growth modeling practices.

The standardized correlation coefficients were all statistically significant, indicating that these variables were correlated with one another for each intervention group. However, the correlation coefficient was higher for the control group than the social cognitive or life skills group. It is also noteworthy that slope two for the social cognitive group is less negative than the slope for the control group in regards to adolescent perception of sex-specific communication, a qualitatively important notation. Participants in the life skills group experienced a positive change for slope two for adolescent perception of sex-specific communication, which was significant at the *p*-value < 0.10 level. Finally, even though the adolescent perception of sex-specific communication and the mother-adolescent relationship were significantly correlated, there was greater difference between the slopes for these parameters, especially for the participants in the life skills group.

Table 6. Piecewise Parallel Model by Intervention Groups

No. of Observations: Control = 114, SCT = 126, LSK = 143			
Model Fit: RMSEA = 0.073, CFI = 0.931			
Results are all standardized			
Sex-specific communication	Adolescent perception of parenting		
	Slope 2	Slope 2	Correlation coefficient
Control	-- 0.313	-- 0.662	0.979**
SCT	-- 0.052	-- 0.329**	0.648**
LSK	0.340*	-- 0.168	0.642**
**p-value < 0.05, *p-value < 0.10			

Discussion

How we approach the development of public health interventions is of particular importance in the adolescent population. While other research (Dimler et al., 2017; Guilamo-Ramos et al., 2006; Pluhar & Kuriloff, 2004; Whitaker & Miller, 2000) has indicated the importance of adolescent perception of the mother-adolescent relationship in how adolescents perceive mother-adolescent sex-specific communication, modeling the two variables in a parallel piecewise growth model allowed for further understanding as to how the two variables change over time in relation to one another as well as in relation to different time-varying and time-invariant factors. This study validated that the adolescent perspective is significant in regards to sex-specific communication with their mother as well as the mother-adolescent relationship and that the two are highly correlated with one another. Overall the two trajectories changed in the same direction over the two-year period of time; however, it is important to note that the overall change was only *statistically* significant for the adolescent perception of the mother-adolescent relationship. This trend, where only one of the variables experienced statistical significance, continued throughout each model, but changed from adolescent perception of the mother-adolescent relationship to adolescent perception of mother-adolescent sex-specific communication depending on the model.

Modeling these variables and covariates in a piecewise parallel model not only allowed for further understanding as to how the covariates relate to the outcome variables and how the outcome variables change over time in relation to one another, but also how the covariate changes parallel one another.

In regards to the specific covariates that were included in the different models, there were some unexpected results. In the first full model, there was an initial negative impact on the trajectory for both adolescent perception of sex-specific communication and adolescent perception of the mother-adolescent relationship for participants in the life skills intervention group. It is possible that those individuals realized they were not communicating or relating as positively as previously thought after they experienced the intervention and they subsequently modified their responses in future interviews. While the participants in the social cognitive group experienced a similar trend, theirs was neither as great of a difference nor statistically significant. This realization may have been more profound in the life skills intervention group because adolescents and mothers were not working together as often, leaving greater opportunity for both adolescents and their mothers to learn from their peers about different experiences.

Females experienced a greater change in their perception of sex-specific communication with their mother over the two-year period, starting off demonstrating more positive change during the first time period and becoming more negative in their perception over time during the second time period when compared to their male counterparts. However, their perception of the mother-adolescent relationship changed in the opposite direction, and even though neither change was statistically significant, qualitatively it is important to note, especially when the overall correlation between the two outcome variables maintained statistical significance. Some literature has indicated that African American adolescent females are more hesitant to communicate openly with their mothers when their mothers are strict and use fear tactics when communicating

about sex (Pluhar & Kuriloff, 2004), which may have led to the more negative perception of their mother-adolescent relationship, but does not align with the more positive perception of sex-specific communication. The strong and statistically significant correlation between the two outcome variables suggests that the shift in variables would have been more aligned. Additional studies are needed to better understand this significant trend for females, especially the nuances in how their perception of the mother-adolescent relationship and sex-specific communication with their mother align as well as how the specific components of the interventions may have influenced their change over time.

Finally, there is more to be learned in how each of the outcome variables changes over time in relation to one another based on intervention group. Even though both slopes for the participants in the social cognitive intervention group are negative, the slope for adolescent perception of sex-specific communication is qualitatively larger than the slope for adolescent perception of the mother-adolescent relationship. Of even greater interest is the stark difference in slope between adolescent perception of sex-specific communication and perception of the mother-adolescent relationship for the participants in the life skills group; overall the two outcome variables are highly correlated and yet the slope for the perception of sex-specific communication is positive while the slope for adolescent perception of the mother-adolescent relationship is negative. This difference may indicate that the life skills intervention addressed more specific skills associated with mother-adolescent communication and was less focused on enhancing the mother-adolescent relationship.

Limitations

This study presents several limitations. The first limitation of the data being approximately 20 years old is acknowledged and partially addressed through the discussion of adolescent development as well as the recognition that re-evaluating old data can continue to provide contributions to current research. While adolescent development has not changed dramatically over the past 20 years, the ways in which adolescents – and often their parents – communicate has shifted with the introduction of technological advances. Unfortunately, the role of technology – including social media – cannot be addressed in this paper; however, using different analytic approaches allows for a new and different perspective on the foundational components of adolescent perception of mother-adolescent communication.

Additionally, this research is limited in its generalizability given that the sample was drawn through a national organization, which may mean the adolescents and mothers involved in the original study had greater access to resources than other populations in the southeast United States. However, the data still contribute to the literature by providing an opportunity to analyze longitudinal data related to mother-adolescent communication. Furthermore, studying well-educated and financially stable populations that identify as Black does not occur as often and provides valuable comparison data.

All data were collected based on recall and thus perception was subjective. The subjectivity limits how the data can be used in terms of generalizing to a larger population. Finally, there were minor modifications made to the model in order to improve the overall fit, which, even though acceptable in latent growth curve models,

may have limited how the data could be interpreted. However, we can use the data and analyses to better understand what worked for this population and determine how to modify interventions to address the needs of other high-risk populations.

CHAPTER VI

EPILOGUE

As stated throughout the introduction and literature review, in spite of consistent efforts, adolescents continue to represent a high-risk population and are more likely to engage in high-risk behaviors, including high-risk sex behaviors. While all adolescents are considered to be at a point in their lives during which their decision-making skills put them in a high-risk group, adolescents who identify as Black are at greater risk for some behaviors, including those related to sexual activity, when compared to their white and Hispanic peers (Kann, McManus, Harris et al., 2018). Of the nearly 40% of high schoolers nationwide who reported ever having had sexual intercourse, over half identified as Black adolescent males (Kann, McManus, Harris et al., 2018). The numbers for Black adolescent females were more consistent with their white and Hispanic peers, but were just slightly higher at 38.9% (Kann, McManus, Harris et al., 2018). An increased likelihood of engaging in sexual activity increases the chance of incurring negative health consequences related to those behaviors. Therefore, continuing to review interventions focused on modifying behaviors and better understanding the processes by which behaviors may change are important aspects of public health research.

As was discussed in the literature review, research has determined that parent-adolescent communication can moderate adolescent engagement in high risk sexual behaviors by delaying sexual debut, increasing condom use, and enhancing the parent-

adolescent relationship (Afifi, 2008; APA, 2002; Holman and Kellas, 2015; Maria et al., 2015; Pluhar, 2004; Wilson et al., 2010). However, most effective evidence-based programs were evaluated at specific time points or only compared participant data from baseline to post-intervention and did not look at models that depict slope, or the participants' change over time. Given that adolescents are moving through developmental changes from early to mid to late adolescence, it is important to take into consideration their developmental process, or time, as they participate in interventions and look at how their behaviors, choices, and perception change over time.

In addition to considering adolescent development as a contextual piece to this research, the secondary data analysis incorporated both social cognitive theory and problem behavior theory. Both theories were used in the development of the different interventions implemented during the original Keepin' it R.E.A.L! study. It has been demonstrated through research that incorporating these theories into intervention and program development enhances the impact on parent-adolescent relationships and communication (Bandura, 2001; Jessor, 2016). Specifically, social cognitive theory has demonstrated a strong reciprocal relationship between cognitive, behavioral, and environmental factors (Bandura, 1985). In addition, over time as adolescents incorporate feedback and consequences from their environment, they internalize moral codes that are subsequently reinforced by others (Blake, 2001), most often their parents and their peers. Problem behavior theory has indicated that adolescents engage in high-risk or problem behaviors in concert as adolescents who engage in one high-risk behavior are likely to engage in multiple high-risk behaviors. This theory also stipulates that environmental and

relational factors are important in determining and modifying behaviors, especially for adolescents (Jessor, 2016).

The information gleaned from this study can be incorporated into what is known about adolescent development, especially in terms of newer research around adolescent brain development as well as into research that incorporates the use of technology – specifically cell phones and social media – for communication. Furthermore, continuing to use analyses that can determine the change over time in the data (slope), such as latent growth curve modeling, can allow us to better understand program and intervention effectiveness.

Review of Key Findings

Research questions 1A – 1C. The overall trend for the unconditional piecewise model for adolescent perception of general communication with their mother was negative, indicating that as adolescents moved through the two-year period of the study their perceived general communication with their mother declined. This could also indicate that as adolescents got older there was a shift in their communication with their mother as a result of their increased autonomy and independence, or possibly as a result of their increased connection with their peers. There was no statistically significant change in the unconditional model for adolescent perception of sex-specific communication with their mother. The slopes were in different directions for the two pieces of the model, but both were nearly zero.

Research questions 2A – 2C and 3A – 3C. Several covariates were found to have significant relationships with both adolescent perception of general communication

with their mother and sex-specific communication with their mother. In regards to general communication, the participants in the life skills intervention group had a more negative slope when compared to the participants in the control group. It is hypothesized that the intervention actually increased the participants awareness as to what constitutes positive and healthy general communication with their mother, which in turn caused the adolescents to be more realistic in their subsequent interviews with researchers. In addition, academic aspirations were associated with changes in perceived general communication with their mother. Again, the association was not in the expected direction, which indicates a possibility that the intervention and or questionnaire triggered a shift in how the participants answered the questions and assessed themselves.

The covariates that were found to correlate with adolescent perception of sex-specific communication consistently included biological sex, adolescent perception of the mother-adolescent relationship, and peer values. There was a shift for female adolescents in regards to the sex-specific communication in that they were initially perceiving their communication with their mother more positively than males and then, as time progressed, their perception became more negative. Perceived peer values were significantly associated with the perception of sex-specific communication, which denotes that peers are highly influential in regards to learning about and initiating sexual activity.

Finally, when running the piecewise parallel models, it was confirmed that the variables of interest – adolescent perception of the mother-adolescent relationship and adolescent perception of sex-specific communication with their mother – were overall

positively correlated with one another and both curves followed a similar trajectory in the same direction in the unconditional model. However, there were differences in the trajectories based on biological sex and covariates that were similar in nature to the findings in the other piecewise latent growth curve models.

Research Significance

This study adds to the literature in that it provides additional information for a population, adolescents identifying as Black whose mothers are well educated, financially stable, and may have access to resources, that is not as readily studied in the research and yet can be impacted by negative health outcomes. In addition, the analytic approach of latent growth curve modeling provided a new perspective on previously implemented and studied HIV-prevention interventions. Applying different analytic approaches to previously collected data provides a new lens through which we can evaluate interventions and determine program or intervention effectiveness. For instance, through the piecewise and parallel modeling it was determined that the life skills intervention rooted in problem behavior theory significantly influenced the participants in that group. Therefore, developing interventions that focus on adolescents and parents but allow them to meet separately to learn from one another may benefit adolescent health outcomes. Further, previously collected datasets may benefit from additional analyses using newer approaches so that we can continue to learn more about how interventions work with different populations. Finally, continuing to develop interventions and research studies that collect data longitudinally not only allow for more analytical opportunities, but also provide a deeper understanding of how behaviors change.

Limitations of the Data

This study presents several limitations. The data were collected in the late-1990's and may have, over the course of 20 years, lost some relevancy to the attitudes and behaviors of adolescents today. However, in an effort to minimize this limitation, I provide background information on adolescent development in the literature review, which indicates that while we know more about adolescent development, the process of development has not changed dramatically over the past 20 years. According to Gutman et al, while adolescents today may demonstrate slight differences in some measures related to their development, there is little indication that the overall patterns and trends of adolescent developmental change is significantly different (2017). Unfortunately, I was unable to incorporate any piece about the use of technology and social media, which are important components of the lives of most adolescents in today's world. If the data were more recent it's probable that it would have included this kind of information.

Additionally, the sample was drawn from a national organization that supports families, which may indicate that the sample population had greater access to resources than other, potentially more vulnerable populations in the southeast United States. However, it is important to note that studying families with greater access to resources is an important process. These families may or may not be using their resources to their potential and in spite of access may still incur negative health outcomes associated with the same risky behaviors as other, more vulnerable, populations.

Finally, it is important to note that the data collected were subjective because they were based on adolescent recall and perception. While this was certainly a limitation for

generalizability to a larger population, the data still contribute to understanding the nuances of how adolescents' perceive and receive information from their parents, how that perception changes over time, and which covariates influence that change.

Recommendations & Future Research

Additional research on the adolescent perspective would benefit our ability to better mediate some of the negative health behaviors that adolescents experience. Given what we know about adolescent development, it would benefit researchers to engage in a participatory approach so that the adolescent perspective continues to be included and respected. Furthermore, additional research on other adolescent-adult relationships would add to the literature, such as father-adolescent and teacher-adolescent.

As previously noted in the limitations, future research needs to incorporate technology and the use of social media platforms into studies. We need to continue to understand how adolescents are using technology and social media as means of communication, what kind of communication it represents for them, and how it influences the development of their relationships. In addition to communication, asking questions about how adolescents use technology and social media to gather information, specifically around sex-related topics, would add depth to our understanding of their knowledge, behaviors and actions as well as their willingness or need to communicate with their parents about the topic.

Finally, the more often longitudinal data can be used, the more detailed our understanding of how effective interventions and programs are in modifying the behaviors of interest. Therefore, it is suggested that continued efforts are made to design

research studies that collect longitudinal data. Longitudinal data provide a more comprehensive view of how behaviors change over time and what factors are involved in mediating that change. Since adolescence is a time period so deeply rooted in change it is imperative to incorporate time and developmental processes into the development of research questions and analytic processes.

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