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The Role of Emotion in Adolescent Sexual Decision Making

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The Role of Emotion in Adolescent Sexual Decision Making

By

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Abstract

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Although school-based sex education remains an important tool to improve adolescent health outcomes, new efforts are needed to improve its impacts. A primary reason that school-based sex education falls short may stem from the fact that the current theoretical foundation of most curricula asserts that sexual decision-making is primarily a rational, deliberative process. Far from being only a rational process, a number of affective (emotional and motivational) factors also influence adolescent sexual decision-making. The cognitive, hormonal, emotional, and physical changes that accompany the onset of puberty and occur throughout the teenage years play a significant role in aspects of adolescent sexual risk taking. Emerging brain development research and neuroscience suggest that changes in rational, affective, and social processing play a critical role in influencing adolescent behavior. While the current understanding of the neuroscience may be too formative at this time to directly translate into policy and practice, this dissertation begins to explore how conceptual and empirical advances in understanding adolescent brain development may provide new perspectives that encourage the testing of innovative approaches to sex education, which in turn may lead to more effective behavioral interventions.

The aim of this dissertation is to enhance policy and practices aimed to improve adolescent sexual health by expanding the theoretical scope of adolescent school-based sex education programs. In this body of work, I integrate concepts from the fields of neuroscience, behavioral science, public health and neuroeconomics in order to bring a better understanding to the role of emotions in adolescent sexual decision-making. To this end, in the first component of this dissertation, I explored how existing neuroscience research can be used to better inform sex education policies and practice. In the second portion of the dissertation, I tested how emotions impact adolescent risk taking in a computerized task and discuss the implications of the results in understanding the gap between intentions and behaviors in adolescent sexual decision-making. In the experiment, adolescents planned how they would wager their choices, and how they would advise a friend to wager, in three rounds based on the outcome from prior rounds. Not anticipating the negative emotional outcome of a loss in prior rounds, adolescents took greater risks than they had planned. In contrast, their advice to a peer did not reflect the same significant increase in risk-taking. In the final component of the dissertation, I conducted

a qualitative assessment of the role of peer influence on adolescents' early experiences in romantic and sexual relationships and discuss how this interacts with the developmental factors contributing to adolescents' unique vulnerability to peer influence. Recognizing that this dissertation is only the first step in a long line of inquiry to better understand the role of affect in adolescent sexual decision-making, I propose directions for future research and ways to improve sex education practices and policies.

This dissertation is dedicated to my family. Without all of your love and support, this would never have been possible.

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I. Introduction[1]

"The United States spends about a billion dollars a year on programs to counsel adolescents on violence, gangs, suicide, sex, substance use and other potential pitfalls. Few of them work." (Dobbs, 2011, p. 59)

Policy makers, public health professionals and parents have engaged in an unending quest to understand and explain adolescent risk-taking behavior. Parents and health professionals have strived to provide appropriate scaffolding to improve adolescent decision-making. And yet, despite valiant efforts, adolescents often appear to ignore or defy the structure around them designed to improve their health outcomes. One area of adolescent decision-making that has received extensive scholarly and familial attention is the realm of sexual health. Establishing policies and programs to improve health indicators related to adolescent sexual health presents some unique challenges. Policies to prohibit sexual behavior among adolescents are inappropriate, unrealistic and unenforceable. As a result, efforts have aimed at improving the health indictors, including sexually transmitted infections (STIs) and unwanted pregnancy, related to adolescent sexuality. These programs often perceive adolescent sex and sexuality as inherently risky and detrimental to adolescent health. The classification of adolescent sexual activity as deviant behavior has resulted in significant policy and programmatic decisions that shape today's current sex education efforts (Brindis & Ott, 2002). In this dissertation, I approach adolescent sex and sexuality as a basic human right and a natural part of adolescent development. While maintaining this sex positive approach, the current sexual health status of U.S. adolescents clearly provides compelling reasons why improved interventions are needed. Despite recent decreases, the U.S teen pregnancy rate continues to be one of the highest in the developed world (Guttmacher Institute, 2013). While adolescents, aged 15–24 years, represent 25% of the sexually active population, they account for nearly 50% of the 18.9 million newly diagnosed STI cases each year (Guttmacher Institute, 2013). Almost 17% of the new HIV/AIDS cases diagnosed in the U.S. in 2008 were among youth between the ages of 13–24 years old (Guttmacher Institute, 2013), signaling that many were exposed to the virus earlier in their adolescence. These statistics persist despite the fact that the overwhelming majority of young people living in this country receive some type of sex education before leaving high school (Landry, Darroch, Singh, & Higgins, 2003).

Although school-based sex education remains an important tool to improve adolescent health outcomes, new efforts are needed to improve its impacts. A primary reason that school-based sex education falls short stems from the fact that the current theoretical foundation of most curricula asserts that sexual decision-making is primarily a rational, deliberative process. Far from being only a rational process, a number of affective (emotional and motivational) factors also influence adolescent sexual decision-making. The cognitive, hormonal, emotional, and physical changes that accompany the onset of puberty and occur throughout the teenage years

[1] Since this dissertation includes three articles for publication, portions of this introduction also appear in subsequent chapters.

play a significant role in aspects of adolescent sexual risk taking. Thus, one approach to advancing current understanding of these complex issues is to leverage rapidly emerging knowledge in developmental affective neuroscience over the past 15 years, which suggests some potentially promising innovations that may inform new educational, behavioral, social, and environment directions to address these adolescent health problems. Emerging brain development research and neuroscience suggest that changes in rational, affective, and social processing play a critical role in influencing adolescent behavior (Crone & Dahl, 2012; Steinberg, 2005). While the current understanding of the neuroscience may be too formative at this time to directly translate into policy and practice, this dissertation begins to explore how conceptual and empirical advances in understanding adolescent brain development may provide new perspectives that encourage the testing of innovative approaches to sex education, which in turn may lead to more effective behavioral interventions.

The aim of this dissertation is to enhance policy and practices aimed to improve adolescent sexual health by expanding the theoretical scope of adolescent school based sex education programs. In this body of work, I integrate concepts from the fields of neuroscience, behavioral science, public health and neuroeconomics in order to bring a better understanding to the role of emotions in adolescent sexual decision-making. Each of these fields holds a unique perspective and body of knowledge that can contribute to improving the impact of adolescent sexual health interventions. My hope is that this expanded understanding of adolescent sexual decision-making will serve as the foundation for improved policies and practices aiming to improve the sexual health of U.S. teens. To this end, this dissertation includes three papers:

Paper #1: Exploration of relevant developmental neuroscience and implications for sex education policy and practice.

In this portion of the dissertation, I propose ways to integrate existing knowledge on adolescent development behavior from neuroscience and behavioral science into policies and practices to improve classroom based sex education. I have divided this paper into three key components:

1. A review of the state of the state of U.S. school based sex education.
2. A review of existing knowledge about adolescent brain development from behavioral and neuroscience research and the implications for understanding adolescent sexual decision-making.
3. Exploration of how to integrate emerging neuroscience into sex education policy and practice.

Paper #2: Use of a risk-choice monetary computer task to explore the role of emotions in adolescent intentions and behavior.

In this portion of the dissertation, I tested how emotions impact adolescent risk taking in a computerized task and discuss the implication of the results in understanding the gap between intentions and behaviors in adolescent sexual decision-making. In the experiment, adolescents

planned how they would wager their choices in three rounds based on the outcome from prior rounds. In addition, they advised a friend to make strategic choices in the same situations. In the Round 2, not anticipating the negative emotional outcome of a loss in Round 1, adolescents took greater risks than they had planned. In contrast, their advice to a peer did not reflect the same significant increase in risk-taking. In this paper, I use the results of this study to discuss three main questions:

1. How do emotions influence the gap between intention and risk-taking behavior?
2. How does emotion deferentially affect a decision for oneself versus advice to a peer?
3. Using a developmental framework, how can sex education efforts better address the gap between intention and behavior?

Paper #3: A qualitative exploration of the role of peer influence in adolescent romantic and sexual behavior.

In this final paper, I conducted a qualitative assessment of adolescents' early experiences in romantic and sexual relationships. During adolescence, young people increase the amount of time that they spend with their peers and their peers suddenly have a new and different influence on their lives. Simultaneously, important social, emotional and cognitive changes occur during adolescence contributing to increased vulnerability to peer influence. The concept of peer influence in romantic relationships and sexual behavior emerged as one of the key themes of the interviews. This study explores three main questions:

1. How do both romantic and platonic peers influence decisions to engage in early romantic relationships?
2. How are young adolescents motivated by the need to emotionally and physically please their romantic partners?
3. As adolescents experience developmental trajectory of adolescence and gain experience and perspective, how do adolescents change their perceptions of peer influence in their early relationships and sexual behavior?

Background

School-based sex education aims to improve the outcomes of adolescent sexual behavior by offering teens information and skills to help improve their sexual decision-making. Today, 33 states and the District of Columbia have policies mandating school based HIV education, which include information about HIV infection and prevention (Guttmacher Institute, 2012). Twenty-one states and the District of Columbia have mandates that extend to general sex education, which vary widely but may include requirements on covering abstinence, contraception, anatomy, healthy decision-making, sexual coercion, communication, sexual orientation, and consequences of teen pregnancy (Guttmacher Institute, 2012). School based sex education falls into two primary categories: abstinence only education and comprehensive sex education. Over the past 20 years, there has been an extensive effort and considerable scholarly and

practice-focused literature dedicated to trying to determine how well sex education works (Kirby, 2008; Kirby, Laris, & Rolleri, 2007).

The majority of behavioral interventions aimed at improving the outcomes of adolescent sexual decision-making are grounded in a cognitive decision making model (Kirby et al., 2007). Social learning theory (Rotter, 1954), including social cognitive theory (Bandura, 1991) and self-efficacy theory (Bandura, 1977), provides the theoretical foundation of the majority of adolescent sex education programs (Kirby et al., 2007). Other significant theories that have informed current sex education efforts include the theory of reasoned action (Fishbein, 1979) the health belief model (Rosenstock, 1974); the theory of planned behavior (Ajzen, 1985); and the information-motivation-behavioral skills model (Fisher & Fisher, 1992) (Kirby et al., 2007). These theories, while diverse, are all based in the assumption that adolescent sexual behavior results from rational deliberation of pros and cons that leads to a planned intention and subsequent behavior (Gibbons, Houlihan, & Gerrard, 2009). These theories predict that providing adolescents with information, skills, self-efficacy, and opportunities to plan ahead will improve their capacity to make informed sexual decisions. Unfortunately, current research indicates that few interventions, even those deemed as best practices, significantly and sustainably help adolescents delay the initiation of sex, improve condom and contraceptive use, decrease the number of sexual partners, or improve the sexual identities of youth (Kirby, 2008; Steinberg, 2008).

Despite efforts to evaluate both abstinence only education and comprehensive sex education, the results have been confusing and often inconclusive. The greatest impacts of sex education have been seen in changes in adolescents' sexual knowledge and intentions (Kirby et al., 2007; Kohler, Manhart, & Lafferty, 2008). Unfortunately, these changes in knowledge have not directly translated into changes in adolescent sexual behavior or sexual health outcomes. While some research has suggested that sex education may help delay the onset of sexual activity and increase use of contraception at first intercourse (Mueller, Gavin, & Kulkarni, 2008), other research has demonstrated that sex education has little or no effect on delaying the initiation of sexual activity (DiCenso, Guyatt, Willan, & Griffith, 2002; Scher, Maynard, & Stagner, 2005; Silva, 2002) or increasing use of contraception (DiCenso et al., 2002). Studies examining teen pregnancy rates have yielded mixed results, with some studies showing no effect from health education (DiCenso et al., 2002; Kirby et al., 2007) and others showing promising reductions (Kohler et al., 2008). Overall, current sex education efforts have not led to profound reductions in adolescent pregnancy or sexually transmitted infection (STI) rates or increases in age of first coitus (DiCenso et al., 2002; Hauser, 2004; Kirby et al., 2007) and even for interventions that have had some impact, it is unclear what led to the behavior change (Kirby et al., 2007). The interventions that have demonstrated more promising impacts on adolescent sexual outcomes were broad, developmental interventions (e.g. Children's Aid Society (Philliber, Kaye, Herrling, & West, 2002), Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002)) and service learning interventions that included voluntary community service with a structured opportunity for reflection on the service experience (e.g. Teen Outreach Program (Allen & Philliber, 2001)) (Kirby, 2002). These broad

based approaches adopt a youth development framework both providing supports and services, building upon existing youth strengths and assets (Brindis, 2006). While the reason for demonstrated effectiveness of these programs is not completely clear, experts have proposed that the positive outcomes are linked to meaningful relationships with caring adults, increased self-efficacy, focus on helping others, increased future orientation, and increased time in supervised, engaging activities – all of which contribute to the emotional development of adolescents. A primary challenge of these service learning and comprehensive programs lies in the fact that they require a great deal of financial and personnel resources to implement multiple, complex program components and show reduced effectiveness if not implemented entirely as designed (Kirby, 2002). While efforts to employ rigorous evaluation methods of sex education programs have improved over recent years resulting in more reliable results, these evaluations demonstrate a persistent gap between the delivery of sex education and improved adolescent health outcomes.

While the challenge of bridging the gap between health education, intentions and behavior is not unique to adolescents or to sexual behavior, both the development occurring during adolescence and the factors specific to sexual decision-making adds to the complexity of developing effective interventions. Adolescence is a period of incredible transformation during which adolescents experience a number of cognitive, hormonal, and physical changes that influence their sexual decision-making. Adolescence begins with the hormonal and physiological changes associated with puberty and ends with a social transition to adulthood. The onset of puberty not only affects physical maturation, but also influences the brain--activating changes in drives, emotions, goals and motivations (Crone & Dahl, 2012). By mid-adolescence, young people have similar cognitive capacities to adults and usually understand risks associated with sexual activity (Cauffman & Steinberg, 1995). Despite the belief expressed in prior theories, adolescents *do* understand the consequences of risk-taking, *do not* view themselves to be invincible, and *are not* overly aggressive or sexual as a result of raging hormones (Cauffman & Steinberg, 1995; Forbes & Dahl, 2010). The sexual health outcomes for adolescents suggest that other factors outside of rational decision-making significantly influence adolescent sexual behavior, despite their capacity to make rational decisions.

For the purposes of this dissertation, decision-making refers to the internal cognitive process of determining whether to engage in various sexual behaviors and the process of determining personal boundaries, protective actions, and acceptable level of risk associated with behaviors. Affect refers to emotions, mood, feelings and other general affective states that can contribute to motivation to engage in or avoid an action or behavior (Cohen, Pham, & Andrade, 2008). Affective states and affective development can simultaneously influence adolescent decision making in multiple ways. Affective development, influenced by environment, culture, and individual development, can shape an individual's internal decision-making process and self-concept related to sexual behavior. Recent developments in neuroscience have highlighted that the interactions between the maturation of cognitive, affective, and social processing during adolescence appear to play a key role in understanding and addressing some aspects of adolescent sexual behavior (Crone & Dahl, 2012). The time of adolescence spotlights the

importance of neural plasticity, a process through which thinking and learning transform the brain's physical structure and functional organization (Galván, 2010). Experiencing new attractions, motivations, and desires for experiences, sexual decision-making becomes incredibly complex for adolescents to navigate.

Adolescent Social, Emotional and Cognitive Development

The development of various functional regions of the brain coupled with the development of the interconnectivity between these regions contributes to increased flexibility, sensation seeking, reward sensitivity, and risk taking during adolescence (Crone & Dahl, 2012). Adolescent cognitive development includes the maturation of the prefrontal cortex (PFC) and the temporoparietal junction, which are integral to managing impulse control (Casey, Jones, & Hare, 2008; Crone & Dahl, 2012). These parts of the brain also contribute to the development of social skills and capacities, specifically related to one's ability to engage in pro-social behavior (Crone & Dahl, 2012; Eisenberg, Fabes, & Spinrad, 2007). While it would appear that increased cognitive control would lead to decreased risk taking, other factors interact with this process. A simultaneous maturation of aspects of the systems involved in affective processing and regulation, leads to increased reward-seeking and sensation-seeking behavior in adolescents (Casey et al., 2008). Adolescents, despite their increasing self-control, are highly motivated to find novel, exciting, and sensual experiences (Casey et al., 2008). Neuroscience has focused on this development and activation occurring in the ventral striatum (VS) – the reward center of the brain – and its connection to the prefrontal cortex (Crone & Dahl, 2012). In exploring anticipation of rewards, studies have focused on the development and activation of the ventral striatum (VS) (Bjork, Smith, Danube, & Hommer, 2007; Crone & Dahl, 2012; Eshel, Nelson, Blair, Pine, & Ernst, 2007), the anterior insula (AI) (Van Leijenhorst et al., 2010; Volz & Von Cramon, 2006), and the orbitofrontal cortex (OFC) (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011). This research has showed that compared to adults, adolescents experience decreased striatal activation when anticipating rewards and increased striatal activation when experiencing rewards (Crone & Dahl, 2012; Spear, 2013; Van Leijenhorst et al., 2010).

The presence of peers can further enhance the drive toward reward-seeking behaviors as peer presence simulates the reward circuitry in the brain (Sunstein, 2008). Recently, peers and social context have been found to be more influential on adolescent decision-making than hormone levels or other pubertal changes (Forbes & Dahl, 2010). This may be due to the fact that adolescents are still working to shape a cohesive self-image and therefore engage in frequent social comparisons (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). As youth move into late adolescence and have increased their social competence and social interaction skills, they are less likely to be heavily influenced by peer presence (Eisenberg, Morris, McDaniel, & Spinrad, 2004; Gerrard et al., 2008). While a full review of the literature on brain development is beyond the scope of this dissertation, see Crone & Dahl (2012) for a review of existing literature on how structural and functional brain development links informs a better understanding of adolescent behavior.

A second factor contributing to unsafe sexual behavior during adolescence is lack of life experience – and specifically the emotional learning that results from life experience. While adolescents have adult-like cognitive capacities, they lack life experience to use during decision-making (Cauffman & Steinberg, 1995). Research has suggested that cognitive based theories are less effective at predicting behavior when behaviors are new or unpracticed (Gibbons et al., 2009). When adolescents lack experience in making a decision related to a specific behavior, their willingness or openness to engage in a behavior, rather than their behavioral intention or plan to engage in a behavior, is more likely to predict their behavior, resulting in less forethought and contemplation prior to taking action (Gibbons et al., 2009). In younger adolescents, behavioral willingness, which is more readily influenced by affect and mood, is a better predictor of behavior than behavioral intention but this is heavily moderated by context (Gibbons, Gerrard, Reimer, & Pomery, 2006). When context can be controlled, behavioral intention becomes a better predictor of behavior (Gibbons et al., 2006). This may result from the fact that adolescents with high behavioral willingness and low behavioral intention have not thought through behaviors and consequences so are more heavily influenced by environment (Gibbons et al., 2006). In a risk promoting environment, adolescents with high behavioral willingness but low behavioral intention may be less prepared to avoid unhealthy situations because their lack of intention inhibits preparation and precaution (Gibbons et al., 2009). When employing cognition during decision-making, lack of life or situation specific (e.g. one may have experience putting a condom on a model in a well-lit classroom, but not have the experience of putting on a condom in a dark room, in the presence of an intimate partner while being sexually aroused) experience may result in adolescents putting greater weight onto the benefits of engaging in a behavior than onto the risks associated with the behavior (Rivers, Reyna, & Mills, 2008). This unbalanced weighting can explain how emotions play a role in decision-making.

States of high emotional arousal also have the potential to overwhelm self-regulation processes resulting in increased risk taking even for young people who have clear intentions to avoid risks and cognitively understand the potential costs associated with a specific behavior (Rivers et al., 2008). Emotional weighting of pros and cons of a decision as well as general feeling states when making a decision can significantly impact the potential for risk-taking behavior (Rivers et al., 2008). Examination of the social, emotional, and cognitive development of adolescents offers some explanation about why adolescents engage in more risk taking than adults. Research suggests that emotions occurring in anticipation of, during, or when recalling an event can facilitate rational decision-making when an individual has the life experience to accurately predict the consequences of a decision (Mitchell, Thompson, Peterson, & Cronk, 1997; Slovic, Finucane, Peters, & MacGregor, 2007; Wirtz, Kruger, Napa Scollon, & Diener, 2003). However, these same emotional responses can be misleading when the decision-maker lacks the necessary life experience to make accurate predictions (Slovic et al., 2007). In comparison to adults, adolescents are in a critical developmental period when they are gaining life experience in making sexual decisions, thus emotions may have a greater influence in adolescent decision-making.

While little research has been conducted in this area to date, new directions in brain development research and neuroscience suggest that the direction and magnitude of emotions during decision-making may play a critical role in influencing adolescent sexual behavior (Slovic et al., 2007; Wiers, Houben, Roefs, Hofmann, & Stacy, 2010). When all people, including adolescents, make decisions, they engage in a weighting process of evaluating risk and benefit (Alhakami & Slovic, 1994). This weighting process includes the evaluation of both facts and rational thoughts as well as the weighting of emotional and affective factors (Alhakami & Slovic, 1994). Little is known about the emotions involved in adolescent sexual decision making. In an attempt to improve the efficacy of programs designed to improve adolescent sexual health outcomes and adolescent sexual decision-making, this dissertation explores the role of affect and emotions in adolescent sexual decision-making. The goal of this project is to provide a theoretical foundation for the development of improved behavioral interventions designed to influence adolescent sexual health outcomes.

As a highly affective and sensual experience that requires significant weighing of various risk and rewards, sex creates both an opportunity for physical and psychological excitation and sensuality and a continued opportunity for novel experiences with new partners and/or new activities. Despite current knowledge about the interaction between emotions, affect and cognition in sexual decision making, the primary reason that adolescent sex education falls short stems from the fact that the current theoretical foundation of sex education asserts that sexual decision-making is primarily a rational, deliberative process (Reyna & Farley, 2006). Far from being only a rational process, a number of developmental and social factors also influence adolescent sexual decision-making. Due to the fact that adolescents have less experience with sex, and have less mature emotional regulation than adults due to development of the prefrontal cortex and limbic systems, rationally based theories fall short of accurately predicting adolescent sexual thoughts and behavior (Gibbons et al., 2009). The limitations of the rational based theoretical framework have crippled the impact of sex education programs. Recognizing that policies shaping current sex education practices are continually responsive to social and political climates, this dissertation aims to expand understanding of the role of affective factors in adolescent sexual decision-making in order to inform future policy and programming for improved sex education efforts.

Affect and Emotion in Decision Making

Most cognitive based theories have failed to adequately account for the role that affect has in influencing decision-making (Gibbons et al., 2009). Affect, which includes emotions and moods, can be defined as an internal feeling state (Cohen et al., 2008). While moods are low intensity, generalized affective states lacking a specific source (Cohen et al., 2008), emotions are high intensity, short duration, high arousal, consciously felt experiences in response to an external event that result in an action tendency (Cohen & Areni, 1991). Emotion and affect are intimately intertwined with cognition during the decision making process in many ways. Affective responses often occur before and pre-empt cognitive responses (Zajonc, 1980). Even when individuals have a rational explanation for their decision-making processes, this

explanation is often developed after the outcome of the decision is realized (Zajonc, 1980). This is particularly true for decisions related to social interaction such as those related to sex and sexuality. Affect is the primary driving force in social interactions and influences the majority of social outcomes (Zajonc, 1980). The power of affect is so strong that it often persists even after an individual receives cognitive information that counters, disproves or invalidates the original affective response (Zajonc, 1980). To further strengthen the power of emotions, neurological research has demonstrated that it is possible for the emotional pathways of the brain to be activated, and result in subsequent behavior, without stimulation of the rational, cortical centers of the brain (LeDoux, 2003; Loewenstein, Weber, Hsee, & Welch, 2001). This often occurs in situations of high arousal (LeDoux, 2003; Loewenstein et al., 2001). If this occurs when contemplating or engaging in sexual behavior, then cognitive behavior change interventions may not have any marked influence on behavioral outcomes.

Emotions can be closely linked to how decisions are made and whether health messages are effective. For people who have high intentions to use condoms or employ some other health promoting behavior, using a high-fear arousing message may help them increase compliance with their behavioral intentions (Keller & Block, 1999). In contrast, for people who have low intentions to use condoms or employ health promoting behaviors, high fear arousing materials may lead to affect-based dissonance strategies resulting in decreased compliance with desired behaviors (Keller & Block, 1999). As a result, understanding the interplay between emotion and cognition is critical to ensure that sexual health interventions can be appropriately tailored to have the desired behavioral outcomes. Accounting for the multiple factors involved in decision-making, including behavioral intention and willingness, is also essential. Failing to address emotional or affective aspects of decision-making appropriately may result in interventions that have little or even undesirable effects on behavior.

When all people, including adolescents, make decisions, they engage in a weighting process of evaluating risk and benefit. This weighting process includes the evaluation of both facts and rational thoughts as well as the weighting of emotional and affective factors (Alhakami & Slovic, 1994). Rather than decision-making being an arbitrary process, research points to the fact that overall, individuals attempt to maintain some consistency across their judgments and behavioral outcomes (Alhakami & Slovic, 1994). When engaging in the decision-making process, individuals do not consider rational or emotional factors or factors of risk and benefit independently and instead weight these factors through an interrelated process in an attempt to maintain some internal consistency (Alhakami & Slovic, 1994).

During decision-making, affective states and emotions may confound the risk-benefit assessment process and lead to behavioral outcomes that do not align with rational factors (Alhakami & Slovic, 1994). At times, behavioral outcomes, especially for adolescents, seem completely devoid of a rational decision-making process. Some research suggests that at times, emotion may directly influence behavioral outcomes through pathways that circumnavigate the decision-making process (Loewenstein et al., 2001). This may explain some of the disassociation that young people have described related to sexual intentions, sexual decision-

making, and sexual behaviors (Tolman, 2005). As a result, appropriately addressing emotion and affective weighting is key to influencing behavior change. Despite the emerging body of evidence on the role of affect in decision-making, very little research has explored the behavioral consequences of affect or identified salient intervention points (Andrade & Cohen, 2007). This dissertation aims to lay a foundation for expanded research into the role of emotion in adolescent sexual decision-making.

Guiding Principles

I began this work with the intention of generating new theory to inform the development of more effective sex education policies and practices. Frustrated with my personal experience working in the field of adolescent sex education and committed to finding new ways to improve the impact of policies and practices, I began to weave together knowledge from multiple disciplines to improve my understanding of adolescent sexual decision-making. Through this work I saw the importance of integrating the learning from existing cross-disciplinary research, controlled behavioral tasks, and more ecologically valid, qualitative accounts of adolescents' romantic and sexual experiences.

For the qualitative portion of this dissertation, I used grounded theory methods to allow the theory to grow from the data and for the analysis to facilitate the development of new constructs (Charmaz, 2006; Glaser & Strauss, 1967). The grounded theory process offered an opportunity to explore motivations for adolescent sexual behavior in new theoretical terms, reveal new theoretical categories, and describe the causes, conditions, and consequences adolescents associate with their own sexual decision making (Charmaz, 2006). In addition, interviewing provided me a unique opportunity to learn about adolescents' inner processes, experiences, perceptions and feelings related to sexual decision making as well as about the culture and context in which these events occur (Weiss, 1994). As I stepped into the mind of the adolescents I interviewed, I was able to better understand how adolescents engage emotion in sexual decision-making (McCracken & McCracken, 1988). Through their words and insights, adolescents described moments of emotional salience that lead to positive behavior change and explored their own gaps between emotion, intention, and behavior related to sexual decision-making. These interviews gave me to opportunity to understanding the personal and social contexts of adolescents' sexual decisions and the meanings they derived from them (Fortenberry, 2009). A dependence on quantitative methods, which reflect primarily cognitive mental processes, has resulted in the development of sexual health interventions that aim to change cognitive processes. In an effort to move beyond examination of cognitive processes, interviewing allowed me to glean critical information about emotions related to adolescent sexual decision-making. Peer influence was only one of many key themes that emerged from these interviews. Given the evidence that peer influence has been found as the main motivator of adolescent decision-making and that peers enhance the drive toward reward-seeking behaviors by simulating the reward circuitry in the brain, I felt it was appropriate to focus on this component to better understand the affective component of adolescent sexual decision-making (Forbes & Dahl, 2010; Sunstein, 2008).

I recognize that through this dissertation I have barely begun to answer the multitude of questions I have about how to best shape adolescent sex education policies and practices. My hope is that a better understanding of the role of affect and emotions in adolescent sexual decision-making will facilitate the development of improved policies, services and practice. The significance of this research lies in its efforts to bridge the divide between the fields of affective neuroscience and public health. Expanding beyond the rational decision-making framework for sexual decision making and the status quo of dedicating resources and funding towards adolescent sexual health interventions with little demonstrated efficacy, this research begins to lay the foundation for integrating emotional and affective weighting into the theoretical underpinnings of sex education, increasing their potential for success. My hope is that results of this study will allow practitioners to improve sex education curricula and provide policy makers with important information about adolescent sexual decision-making pushing them to make policy decisions related to funding of sex education, regulation of sexual content in the media, and support for programs and services based more on science rather than moral ideology (Brindis & Ott, 2002; Brindis, Geierstanger, & Faxio, 2009).

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II. Adolescent Sexual Decision Making and Sex Education: Using Developmental Neuroscience to Guide New Directions for Research, Policy and Practice

Introduction

Policy makers, public health professionals and parents have engaged in an unending quest to understand and explain adolescent risk-taking behavior. Parents and health professionals have strived to provide appropriate scaffolding to improve adolescent decision-making. And yet, despite valiant efforts, adolescents often appear to ignore or defy the structure around them designed to improve their health outcomes. One area of adolescent decision-making that has received extensive scholarly and familial attention is the realm of sexual health. Establishing policies and programs to improve health indicators related to adolescent sexual health presents some unique challenges. Policies to prohibit sexual behavior among adolescents are inappropriate, unrealistic and unenforceable. As a result, efforts have aimed at improving the health indictors, including sexually transmitted infections (STIs) and unwanted pregnancy, related to adolescent sexuality. Unfortunately, the current sexual health status of U.S. adolescents clearly provides compelling reasons why improved interventions are needed. Despite recent decreases, the U.S teen pregnancy rate continues to be one of the highest in the developed world (Guttmacher Institute, 2012a). While adolescents, aged 15–24 years, represent 25% of the sexually active population, they account for nearly 50% of the 18.9 million newly diagnosed STI cases each year (Guttmacher Institute, 2012a). Almost 17% of the new HIV/AIDS cases diagnosed in the U.S. in 2008 were among youth between the ages of 13–24 years old (Guttmacher Institute, 2012a), signaling that many were exposed to the virus earlier in their adolescence. These statistics persist despite the fact that the overwhelming majority of young people living in this country receive some type of sex education before leaving high school (Landry, Darroch, Singh, & Higgins, 2003).

Although school-based sex education remains an important tool to improve adolescent health outcomes, new efforts are needed to improve its impacts. A primary reason that school-based sex education falls short stems from the fact that the current theoretical foundation of most curricula asserts that sexual decision-making is primarily a rational, deliberative process. Far from being only a rational process, a number of affective (emotional and motivational) factors also influence adolescent sexual decision-making. The cognitive, hormonal, emotional, and physical changes that accompany the onset of puberty and occur throughout the teenage years play a significant role in aspects of adolescent sexual risk taking. Thus, one approach to advancing current understanding of these complex issues is to leverage rapidly emerging knowledge in developmental affective neuroscience over the past 15 years, which suggests some potentially promising innovations that may inform new educational, behavioral, social, and environment directions to address these adolescent health problems. Emerging brain development research and neuroscience suggest that changes in rational, affective, and social processing play a critical role in influencing adolescent behavior (Crone & Dahl, 2012; Steinberg, 2005). The goal of this article is to review the current state of sex education and explore ways to use emerging neuroscience research in adolescent decision making may help to inform sex

education policies and behavioral interventions. While the current understanding of the neuroscience may be too formative at this time to directly translate into policy and practice, conceptual and empirical advances in understanding adolescent brain development may provide new perspectives that encourage the testing of innovative approaches to sex education, which in turn may lead to more effective behavioral interventions.

The state of sex education: striving to make an impact

The State of the State

Since the1970's, one of the primary policy responses to address adolescent pregnancy and STI rates, including HIV, has been school-based sex education programs (Guttmacher Institute, 2012b). School-based sex education aims to provide young people with knowledge and skills and the opportunity to form attitudes and beliefs, with the end goal of improving adolescent sexual and reproductive health. Sex education has been divided into two primary domains: abstinence only and comprehensive sex education. While abstinence only education focuses on preventing all adolescent sexual behavior, comprehensive sex education aims to delay the initiation of sexual intercourse, improve sexual decision-making, and increase the use of condoms and other forms of contraception at the time of sexual debut subsequently helping young people avoid adverse health outcomes including unintended pregnancy and STIs, including HIV. When expanded to include the broader tenants of sexuality education, comprehensive sex education also focuses on positive sexual development including the experience of healthy, safe, pleasurable sexual experiences (World Health Organization). Comprehensive sexuality education expands beyond comprehensive sex education by covering topics related to sexual development, interpersonal relationships, body image, intimacy, and gender roles (Goldfarb & Constantine, 2011; SIECUS).

The implementation of sex education in schools varies widely across the country. Today, 33 states and the District of Columbia have policies mandating school-based HIV education, which include information about HIV infection and prevention (Guttmacher Institute, 2012b). Twenty-seven states and the District of Columbia have mandates that extend to general sex education, which vary widely, but address topics including abstinence, contraception, anatomy, healthy decision-making, sexual coercion, communication, sexual orientation, and consequences of teen pregnancy (Guttmacher Institute, 2012b). There has been strong support for use of best practice sex education curricula based firmly in health behavior theory (Brindis, Sattley, & Mamo, 2005; Kirby & Laris, 2009). Social learning theory (Rotter, 1954), social cognitive theory (Bandura, 1991), and self-efficacy theory (Bandura, 1977), provide the theoretical foundation for the majority of evidence-based adolescent sex education programs (Kirby, Laris, & Rolleri, 2007). Other significant theories that have informed effective current sex education efforts include the theory of reasoned action (Fishbein, 1979); the health belief model (Rosenstock, 1974); the theory of planned behavior (Ajzen, 1985); and the information-motivation-behavioral skills model (Fisher & Fisher, 1992; Kirby et al., 2007). These theories, while diverse, are all based in the assumption that adolescent sexual behavior results from an intentional, deliberative process in which the individual weighs the pros and cons of a decision,

considers external influences, develops a behavioral plan, and follows through on the selected action (Gibbons, Houlihan, & Gerrard, 2009). These theories predict that providing adolescents with information, skills, self-efficacy, and opportunities to plan ahead, will improve their capacity to make informed sexual decisions.

Funding resources, impacted by the political and social environment, shape both the quality and the content of school-based sex education programs. Support for both abstinence only and comprehensive school-based sex education comes from a variety of funding streams, including federal, state and local resources. While federal funding provides some support for sex education, in most cases, school districts and teachers work to provide sex education in the absence of dedicated funding. In the development of models and best practices, school based sex education has been intimately tied to the availability of federal funding which has been driven more by political and social will than demonstrated efficacy.

Introduced in 1996, Title V of the Social Security Act, Section 510(b) of Maternal and Child Health Block Services Grant has continued to provide the majority of federal funding and policy support for abstinence only sex education (Santelli et al., 2006; Social Security Administration). Extensive federal resources have been committed to support this Act ranging from annual budgets of $80 million to $204 million per year (Kohler, Manhart, & Lafferty, 2008). While funding for Title V had lapsed in 2009, it was reinstated as part of the Affordable Care Act in 2012 at the level of $50 million per year over five years (National Partnership for Women & Families, 2012). Reinforcing the social value of abstinence until marriage, this act requires that youth be taught to abstain from sex until marriage and that besides leading to disease and pregnancy out of wedlock, that "sexual activity outside of the context of marriage is likely to have harmful psychological and physical effects" (510(b)(2)(E)) (Social Security Administration). This directive persists despite no clear research demonstrating positive social or emotional outcomes of refraining from sex until marriage (Busby, Carroll, & Willoughby, 2010; Santelli et al., 2006) or clear demonstrated efficacy of abstinence only education on improving sexual health outcomes (Hauser, 2004; Kirby, 2008; Kohler et al., 2008).

Since the beginning of the Obama administration, there has been a renewed commitment to the federal funding of comprehensive sex education. In 2010, Congress established the Office of Adolescent Health (OAH) and approved $155 million over five years to support the Teen Pregnancy Prevention (TPP) Initiative with a focus on funding comprehensive sex education programs (US Department of Health and Human Services, 2011). The majority of funding has been allocated to the implementation and replication of existing previously well-studied curricula and programs (US Department of Health and Human Services, 2011). The best practices programs, 11 of which were evaluated in school settings, met clearly outlined evaluation criteria and affected the sexual health outcomes or behaviors of participants (Advocates for Youth, 2008). The remaining funding (approximately $25 million) was dedicated to the development of innovative strategies to address teen pregnancy, in recognition of the need for greater numbers of interventions. The work begun by TPP was expanded in 2012, when the Affordable Care Act included $75 million per year for 5 years to support the Personal

Responsibility and Education Program (PREP). PREP supports expanded comprehensive sex education and related programs, specifically for youth at highest risk of teen pregnancy, sexually transmitted infections, and other poor sexual health outcomes (Department of Health and Human Services, 2012). Building on the youth development model, in addition to providing sex education, these programs must also teach skills to prepare youth for adulthood including healthy relationships, financial literacy, communication, and educational and career success (US Department of Health and Human Services, 2012). While 13.3% of the funding ($10,000,000) is allocated for innovation grants for new programs, 73.7% ($55,250,000) of the funding is earmarked for replication of existing evidence-based programs (US Department of Health and Human Services, 2012).

Despite the fact that sustained funding to support the implementation of existing sex education programs suggests a belief in their efficacy, it has been very difficult to quantify the exact role that school-based sex education plays in improving adolescent sexual health outcomes. The implementation of sex education in schools has been bolstered by efforts to evaluate and measure the impact of many research-based curricula. Over the past 20 years, there has been an extensive effort and considerable scholarly and practice-focused literature dedicated to trying to determine how well sex education works (Devaney, Johnson, Maynard, Trenholm, 2002; DiCenso, Guyatt, Willan, & Griffith, 2002; Kirby, 2008; Kirby et al., 2007; The Administration for Children and Families Department of Health and Human Services, 2007). These evaluations have argued that if adolescents are exposed to the strongest evidence-based programs, they will have more knowledge about sexual health and prevention and improved skills to negotiate sexual situations; and, as a result, they will make better sexual decisions and improve sexual health outcomes (Kirby et al., 2007).

Given the theoretical underpinnings of current sex education, it is not surprising that the greatest documented impacts of sex education are changes in adolescents' sexual knowledge and intentions (Kirby et al., 2007; Kohler et al., 2008). Perhaps not surprising given the overall complexity of the dynamics impacting adolescent sexual and reproductive health behaviors, these changes in knowledge have not directly translated into changes in adolescent sexual behavior or sexual health outcomes. While some research has suggested that some effective, skills-based sex education may help delay the onset of sexual activity and increase use of contraception at first intercourse (Lindberg & Maddow-Zimet, 2012; Mueller, Gavin, & Kulkarni, 2008), other research has demonstrated that overall sex education has little or no effect on these behaviors (DiCenso et al., 2002; Kirby et al., 2007). Programs that have proven successful in positively impacting sexual health outcomes often have the exact same characteristics and components as programs found to have no effect (Gavin, Catalano, David-Ferdon, Gloppen, & Markham, 2010). Research also indicates that few existing interventions, even those deemed as best practices, significantly and sustainably improve adolescent sexual decision-making, behavior, or health outcomes (Kirby, 2008; Steinberg, 2008). A recent assessment classified school-based sex education efforts as "found not to work" for improving sexual and reproductive health outcomes among both male and female adolescents (Bell, Terzian, & Moore, 2012; Bandy 2012). Overall, current sex education efforts alone have not led to

profound reductions in adolescent pregnancy or STI rates or increases in age of first coitus (DiCenso et al., 2002; Hauser, 2004; Kirby et al., 2007; Kohler et al., 2008) and even for interventions that have had some impact, it is unclear what led to the behavior change (Kirby et al., 2007). In addition, efforts to establish a relationship between the historical decreases in reducing the country's unacceptable rates of teenage childbearing and school-based sex education practices have fallen short (Cavazos-Rehg et al., 2012). For example, studies examining teen pregnancy rates have yielded mixed results, with some studies showing no effect from health education (Cavazos-Rehg et al., 2012; DiCenso et al., 2002; Kirby et al., 2007) and others showing promising reductions (Kohler et al., 2008).

While these evaluations have used reputable methods to quantify the impact of the best practice sex education programs, they face many inherent challenges. One persistent challenge lies in the lack of consistency in curriculum content and delivery (Combellick & Brindis, 2011; Lindau, Tetteh, Kasza, & Gilliam, 2008; Ott, Rouse, Resseguie, Smith, & Woodcox, 2011). The content and quality of school-based sex education can be highly variable even replicating evidence-based curricula (Brindis, 2002; Woo, Soon, Thomas, & Kaneshiro, 2011). Given the social, economic and cultural diversity of school age youth in the U.S. and the variable resources to support school-based sex education, teachers and school districts often face the challenge of modifying sex education curricula to meet the needs of their specific setting. Research indicates that attempts at adaptation pose significant threats to the quality and integrity of the delivered sex education (Ott et al., 2011). Many of the proven and promising research-based curricula have only been tested in specific contexts or with specific populations. Of the 11 school-based best practice programs, 3 were evaluated in elementary schools, 5 in middle schools, and 7 in high schools (Advocates for Youth, 2008). While 10 were evaluated in urban settings, only half of the curricula were tested in rural and/or suburban settings (Advocates for Youth, 2008). There was also extensive variability in the demographics of youth who participated in the testing of the curricula with 91% of the curricula being tested among African American youth, 64% among Hispanic/Latino and White youth, and 36% among Asian youth (Advocates for Youth, 2008). While these curricula may be more easily replicated in settings similar to the environments in which they were demonstrated to have some impact, they may require significant adaptation to serve the diverse needs of U.S. school-based settings.

The challenge to measure the impact of sex education is compounded when schools and districts deviate from the research-based models. Little is known as to what level of sexuality education is being concretely implemented in schools throughout the country. Lacking clear policies for guidance, teachers may be faced with piecing together or developing home grown curricula. Many classroom teachers tasked with teaching sex education have limited training and experience with the content area (Eisenberg, Madsen, Oliphant, Sieving, & Resnick, 2010; Lindau et al., 2008). One small study of a sample of California schools documented that even in a state where evidence-based curriculum is to be taught in school settings, that there was wide variation in what was actually reported being taught (Combellick & Brindis, 2011). The California study highlighted that teachers received limited training on sex education and that, in many cases, districts and teachers significantly deviated from the designated research based

curricula (Combellick & Brindis, 2011). In light of the fact that California has fairly strong policies to guide the implementation of sex education, we can extrapolate that fidelity to research based curricula likely suffers throughout the country. As a result, the quality of sex education that young people receive in schools is highly variable.

A final challenge lies in the evaluation science. While these evaluations have done a formidable job of exploring the impact of sex education, some experts caution that these evaluations face major methodological challenges. Constantine and colleagues (2012) noted that sex education reviews have been limited by: 1) failure to distinguish between associated risk factors for sexual behavior and causal risk factors; 2) unclear inclusion criteria; and 3) numerous validity problems including unadjusted significance testing and failure to adjust for clustering (Constantine, 2012). While it is unclear whether improved evaluation methods would increase or decrease the evidence supporting sex education, it is clear that improving evaluation methodologies will be key to better understanding the true impact of sex education. In addition, even if improved evaluation methodologies were to be employed, it is clear that current sex education efforts fail to meet expectations for improving the sexual health status of youth (Constantine, 2012).

Given the current state of sex education, the desire to improve the sexual health status of American youth, and the need to prudently use limited public health funding, a key goal is to investigate ways to further improve sex education—in a way that leads to meaningful behavior change. Despite continued efforts to use the best science available to inform sex education, the meager results of current best-practice programs highlights the need to explore new ways to improve policy and practice. As a hot social and political topic, policy makers continue to allocate sex education funding in a way that seems to have little to do with evidence. In the current funding climate where social programs face increasing scrutiny, strengthening sex education programs and coupling them with rigorous evaluation will help policy makers and funders make more informed decisions and invest in truly effective sex education programs. One exciting source of innovative perspectives focuses on rapid advances in understanding adolescent brain development—particularly the insights regarding pubertal changes in affective and social influences on cognitive processes that may inform the theoretical underpinnings of school-based sex education. These approaches may also contribute to innovative neuroscience methods to evaluate and refine sex education in ways that improve and strengthen programs, increasing the likelihood of better short and longer-term outcomes.

Adolescent brain development and implications for sexual decision-making

Adolescence is a period of incredible transformation during which adolescents experience a number of cognitive, hormonal, and physical changes that influence their sexual decision-making. Adolescence begins with the hormonal and physiological changes associated with puberty and ends with a social transition to adulthood. The onset of puberty not only affects physical maturations, but also influences the brain--activating changes in drives, emotions, goals and motivations (Crone & Dahl, 2012). Recent developments in neuroscience have highlighted that the interactions between the maturation of cognitive, affective, and social

processing during adolescence appear to play a key role in understanding and addressing some aspects of adolescent risk-taking behavior (Crone & Dahl, 2012). The time of adolescence spotlights the importance of neural plasticity, a process through which thinking and learning transform the brain's physical structure and functional organization (Galván, 2010). Experiencing new attractions, motivations, and desires for experiences, sexual decision-making becomes incredibly complex for adolescents to navigate.

While exciting neural development occurs during this time, it is far from a linear process to try to explain or understand adolescent sexual behavior based on brain development. Many social and environmental factors also play a significant role. The environment in which adolescents develop influences their decision-making processes and capacity. An increasing body of evidence from the field of population neuroscience has demonstrated that while genetics play an important role in brain development, experience and environment serve as critical moderators in the cognitive developmental process (Paus, 2009). In addition, efforts in adolescent neuroscience to untangle gender differences have highlighted structural and functional differences in development. However, far more research is needed to translate this knowledge into assumptions about cognitive or decision-making capacities (Lenroot & Giedd, 2010). Understanding the complexity of the interaction of the development of these systems provides a foundation for improving school-based sex education. While a comprehensive review of adolescent neuroscience is beyond the scope of this paper, the following section highlights some of the key developmental changes that influence sexual decision-making.

Cognitive Development

During adolescence, young people gain increasing cognitive capacity, which facilitates their ability to assume more adult-like roles and responsibilities. In recent years, neuroimaging has facilitated a much more comprehensive understanding of the development of complex neural circuits that accompanies the important cognitive changes (Steinberg, 2005). The maturation of the lateral prefrontal cortex and the parietal cortex, both integral to managing impulse control, play the primary roles in adolescent cognitive development (Casey, Jones, & Hare, 2008). Maturation of these areas affects basic cognitive control functions, including working memory, task switching, self-inhibition, and complex cognitive control functions, including performance monitoring, feedback learning, and relational reasoning (Crone & Dahl, 2012).

While it would appear that the increase in cognitive control functions would lead to decreased risk-taking and improved sexual decision-making throughout adolescence, other factors also interact with this process. By mid-adolescence, young people have similar cognitive capacities as do adults and understand risks associated with sexual activity, but they lack specific experience in affective evaluation and regulation related to sex, sexuality, and sexual behavior to employ when making decisions (Dahl, 2004; Steinberg, 2005). Even when adolescents do employ careful rational processing in sexual decision-making, they may not always derive the most health protective outcome. Due to their inexperience, when adolescents employ cognition during decision-making, they may put greater weight on the *benefits* of engaging in

sexual behavior, than on the *risks* associated with the behavior, resulting in adverse outcomes (Rivers, Reyna, & Mills, 2008a).

Upon encountering a new decision-making opportunity, an individual must rely on prior experience with related decisions and integrate new information from this novel experience. As people gain experience with making a decision, their dependence on verbatim memory of the decision's context, process, and consequences decrease and their dependence on generalized, rapid, "gist" based decision-making increases (Reyna & Farley, 2006; Rivers, Reyna, & Mills, 2008). In the context of adolescent sexual decision making, this means that adolescents who are engaging in a new sexual activity for the first time, or even a familiar activity with a new partner, will likely employ a slower decision making process that may lead to extensive weighing of the emotional and cognitive pros and cons of choosing to engage in a sexual activity. When engaging in this deliberative process, an adolescent may weight short term, immediate outcomes (i.e., physical pleasure, intimacy with a partner) more significantly than longer-term outcomes (i.e., avoiding an STI or pregnancy) resulting in increased risk taking. Even for an adolescent who firmly holds the goal of attending college and becoming a doctor, she may still choose to have sex without a condom in order to achieve the more immediately salient short-term goal of trust and intimacy with her partner. Rationally based sex education curricula fail to address that adolescents often have competing short-term goals in sexual decision-making.

Lack of experience with certain situations can also significantly interact with working memory capacity and subsequent sexual decision-making. Working memory capacity describes one's capacity to hold multiple pieces of information 'on-line' in one's immediate mental processes in order to perform a task (Cowan, 2005). New information and experiences burden working memory by occupying the brain with capturing details. This dedication of cognitive resources can create limitations in the amount of new information that an individual can retain, process, and integrate (Cowan, 2005). Working memory capacity has been found to develop in a linear fashion throughout adolescence (Blakemore & Choudhury, 2006; Luciana, Conklin, Hooper, & Yarger, 2005; Nagy, Westerberg, & Klingberg, 2004). Because the period of adolescence involves a vast number of novel experiences, adolescents may face challenges in attempting to retain and apply all of the new information and skills they have learned, especially in interactions that are particularly "charged" with emotions. In the context of sexual decision-making, adolescents strive to retain cues related to novel experiences in romantic and sexual interactions. Some examples of these cues may include what elicits a positive response from a potential partner; what words and actions enhance a romantic interaction; how to propose a sexual encounter; and how to put on a condom. Because sexual experience only represents a small portion of the burden on adolescents' working memory capacity, this information may be competing with memories related to navigating a new, larger school, more complicated academic demands, increasing personal responsibility, and countless other factors. While adolescent brain development contributes to increases in working memory capacity, this capacity may still not be sufficient for adolescents to retain and effectively employ information, especially in states of high arousal, in a way that results in improved sexual health outcomes.

As adolescents gain experience making sexual decisions, they are more likely to be able to better engage their enhanced cognitive capacity. This translates into decreased burdens on their working memory capacity and increased ability to use a gist representation, or generalized framing of a decision, to make their sexual choices, resulting in more balanced weighting of short and long term goals and pros and cons (Rivers et al., 2008). Increased experience making sexual decisions, including setting boundaries and refusing sex, not only helps adolescents make better sexual decisions in the short-term, but also lays the foundation for how they will make sexual decisions in the future. While enhanced cognitive capacity serves adolescents in states of non-arousal, traditional sex education, which focuses solely on giving information and building skills, fails to address the emerging developmental cognitive capacity of adolescents and the true mixed status of their sexual decision-making. Developing innovative ways to help adolescents best employ their developing rational capacity in the context of novel sexual decision-making may be key to improving the impact of sex education interventions.

Social-emotional Development

As adolescents prepare to separate from their family of origin and take on adult responsibilities, they undergo significant social and emotional transformation. Adolescent neuroimaging has uncovered two components of social development: social-cognitive and social-affective development (Crone & Dahl, 2012). Social-cognitive development, involving the knowledge and skills needed to understand and navigate social situations, has been linked to a network of brain regions that include the medial prefrontal cortex and the temporoparietal junction (Crone & Dahl, 2012). The interaction of the activation of these two parts of the brain contributes to the development of social skills and capacities, specifically related to one's ability to engage in pro-social behavior(Crone & Dahl, 2012; Eisenberg, Fabes, & Spinrad, 2007). Similarly, social-affective development, centered in the temporal pole and the insula, influences adolescents' capacity to experience empathy and experience social acceptance and rejection (Crone & Dahl, 2012). Pro-social behavior holds great importance as adolescents grapple with engaging in romantic relationships and negotiating sexual limits, while also developing their own sense of self.

The neural development linked to emotional processing also highly influences adolescent behavior. Adolescents, despite their increasing self-control, are highly motivated to find novel, exciting, and sensual experiences (Casey et al., 2008). Maturation of aspects of the limbic system involved in affective processing and regulation, leads to increased reward-seeking and sensation-seeking behavior in adolescents (Casey et al., 2008). Neuroscience has focused on this development and activation occurring in the ventral striatum (VS) – the reward center of the brain – and its connection to the prefrontal cortex (Crone & Dahl, 2012). Functional MRI data has illustrated that while adolescents have increased striatal activation compared to children when experiencing rewards, they have decreased striatal activation compared to adults when anticipating rewards (Crone & Dahl, 2012). While increased VS activation during adolescence has traditionally been associated with increased sensation seeking and risk-taking, some new research suggests that in the context of meaningful pro-social behavior, it may also

be associated with declines in risk-taking (Telzer, Fuligni, Lieberman, & Galván, 2012). Adolescents' challenged capacity to predict the emotional pleasure of rewards coupled with an enhanced capacity to experience rewards may help explain their risk-taking and sensation seeking behavior (Crone & Dahl, 2012). As a highly affective and sensual experience, sex creates both an opportunity for physical and psychological excitation and sensuality and a continued opportunity for novel experiences with new partners and/or new activities.

As a result of brain development, adolescent risk-taking is uniquely influenced by peer presence and peer pressure (Forbes & Dahl, 2010; Gardner & Steinberg, 2005; Pfeifer et al., 2011). Both sexual partners and platonic peers influence adolescent sexual encounters. Sexual partners are physically present during sexual encounters and have outcome expectations for the relationship that contribute to intimacy and fidelity. In addition, platonic peers often share values and expectations related to sexual behavior and have been found to influence one another's sexual behavior (Ali & Dwyer, 2011; Dishion & Tipsord, 2011; Prinstein, Meade, & Cohen, 2003). Behavioral research has highlighted that in the presence of peers, adolescents prioritize immediate rewards over long-term rewards (O'Brien, Albert, Chein, & Steinberg, 2011). In the context of a sexual encounter, this helps explain why the immediate physical pleasure of engaging in a sexual act or the emotional pleasure resulting from physical intimacy may outweigh the value of a longer-term goal associated with delaying sex. While behavioral research has demonstrated that influential peers can both promote and inhibit risk-taking behaviors, neuroscience has offered an explanation for why increased risk-taking occurs. Neuroscience has demonstrated that the presence of peers can enhance an adolescent's drive towards reward-seeking behaviors as peer presence simulates the reward circuitry in the brain (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Sunstein, 2008). During a sexual encounter, while the physical and emotional components of sexual intimacy are stimulating the reward circuitry in the brain, the presence of a peer further enhances this stimulation. This intense pleasure stimulation contributes to the challenge adolescents face in engaging rational, premeditated thought processes when pre-contemplating and engaging in sexual experiences.

One of the greatest challenges in addressing unplanned risk taking using a rational framework results from the fact that adolescents' willingness to engage in sexual behaviors is often implicit, while their plans and intentions are explicit. Implicit attitudes, linked to the reward center of the brain, have been found to differentially influence and predict adolescent behavior (van Goethem, Scholte, & Wiers, 2010). While an adolescent can clearly articulate an explicit behavioral intention or plan to engage in or abstain from a specific sexual behavior, he may simultaneously have a conflicting, implicit willingness or openness to engage in that behavior which is more readily influenced by affect and mood (Gibbons, Gerrard, Reimer, & Pomery, 2006).

When adolescents lack experience in making a decision related to a specific behavior, their behavioral willingness, rather than their behavioral intention, is more likely to predict their behavior, resulting in less forethought and contemplation prior to taking action (Gibbons et al., 2006). This may result because the context in which a young person makes a plan for sexual

behavior is often affectively neutral, in the absence of peers, and in a state of non-arousal. When the decision is made, the inverse is true and the context is most likely in a state of high arousal, in the presence of their partners and perceived peers, and affectively charged. When the context of the plan better matches the context of the decision, behavioral intention becomes a better predictor of behavior, but this rarely occurs in sexual decision-making (Gibbons et al., 2006).

The process of reflecting upon and weighing the emotional outcomes of engaging in a sexual behavior can significantly influence decision-making (Rivers et al., 2008a). This process can be viewed as though adolescents are weighing the promoting and inhibiting factors on a scale which, when tipped in one direction, leads to a behavioral outcome. For example, if the weight of the *negative* emotions associated with *engaging* in oral sex overwhelms the positive emotions, the behavior may be avoided. Similarly, if the weight of the *positive* emotions associated with *abstaining* from oral sex overwhelms the negative emotions, the behavior may also be avoided. While both these examples lead to avoiding engaging in oral sex, the opposite weighing in both examples could lead to promotion of and the decision to engage in the behavior. Far from being a linear process, the nuanced emotional weighting that occurs, complicates the decision-making process. While an adolescent may be able to more rationally explore emotions linked to explicit beliefs, he may not be able to adequately explore the emotional outcomes of implicit beliefs. Integrating activities into sex education that explore both implicit and explicit beliefs and associated emotional outcomes may better prepare adolescents when they are faced with the actual decision.

Different types of emotional responses have different impacts on decision-making, which can heavily influence subsequent rational responses (Slovic, Finucane, Peters, & MacGregor, 2007). The salience and perceived severity of an undesirable outcome can lead to various behavioral outcomes (Slovic et al., 2007). For example, an adolescent who does not feel he is very likely to contract chlamydia and has the perception that it is a mild consequence for unprotected sex may not be emotionally motivated to use condoms. In contrast, an adolescent who feels that she is very likely to become pregnant and that pregnancy would have significant negative effects on her life may be emotionally motivated to delay sexual debut. Emotions are also influenced by two factors associated with the perception of the decision and the behavior: probabilities and outcomes (Loewenstein, Weber, Hsee, & Welch, 2001). When making a decision, an individual emotionally evaluates the likelihood that an outcome will occur (i.e., how likely is it that I will get an STI if I have sex?) and what the outcome will mean in their current context (i.e., what will it mean and how will I feel if I get an STI?). Integrating activities into sex education that help adolescents explore both probabilities and impact of the emotional outcomes related to sexual behavior could be promising. An adolescent who understands that if she engages in vaginal intercourse without contraception, she has a 90% of becoming pregnant within a year (Guttmacher Institute, 2012a), *and* she understands the true emotional impact of what it would mean for her personally to become pregnant, may be more motivated to delay intercourse or seek out contraception than an adolescent with considering only one of these pieces.

While emotion can lead to direct behaviors, it also provides an important feedback system, which facilitates learning and cognitive integration after an experience has taken place (Baumeister, Vohs, DeWall, & Zhang, 2007). Some neuroimaging studies identify a decline in emotional processing beginning around early puberty and resolving around age 16 years (Blakemore, 2008). This may explain some of the disassociation that young people have described related to sexual intentions, sexual decision-making, and sexual behaviors (Tolman, 2005). Two different types of emotion, anticipatory and anticipated, are involved in the process of making a decision. Anticipatory emotions are immediate visceral reactions to risks and uncertainties, while anticipated emotions are those that are not experienced in the immediate present, but are expected to be experienced in the future (Leone, Perugini, & Bagozzi, 2005; Loewenstein et al., 2001). When anticipatory emotions diverge from cognitive evaluations, emotions often have more influence on behavior than cognition (Lowenstein et al., 2001). People engage these two types of affect in both evaluation (i.e., how will I feel in the moment if I do this?) and regulation (i.e., how will what I do now influence my mood?), which influences behavioral outcomes (Andrade & Cohen, 2007). During decision-making, affective states and emotions may confound the risk-benefit assessment process and lead to behavioral outcomes that do not align with rational factors (Loewenstein, 2007).

Emotions occurring in anticipation of, during, or when recalling an event can facilitate rational decision-making when an individual has the life experience to accurately predict the consequences of a decision (Slovic et al., 2007; Wirtz, Kruger, Napa Scollon, & Diener, 2003). However, these same emotional responses can be misleading when the decision-maker lacks the necessary life experience to make accurate predictions or the behaviors are new or unpracticed (Gibbons et al., 2006; Slovic et al., 2007). In addition, states of high emotional arousal can overwhelm self-regulation processes, resulting in increased risk-taking, even for young people who have clear intentions to avoid risks and cognitively understand the potential costs associated with risk-taking behaviors (Rivers et al., 2008a). As a result, appropriately addressing emotion and affect is key to influencing adolescent sexual behavior change. Despite the emerging body of evidence on the role of affect in decision-making, very little research has explored the behavioral consequences of affect or identified salient intervention points (Andrade & Cohen, 2007).

Neuroscience has highlighted that social and emotional factors, which extend beyond a rational decision-making framework, significantly influence adolescent sexual behavior in a number of ways. Perhaps because of the relatively recent research documenting the interaction between emotions, affect, and cognition in sexual decision-making, policy makers and practitioners have not always known how to best integrate these components into sex education. The path to integrating neuroscience into school-based sex education is far from straight forward and this effort is intended to support and expand research that has advocated for current adolescent sexual health rights. While advocates have worked extensively to demonstrate that adolescents have the cognitive capacity to make appropriate reproductive health care decisions, including accessing confidential STI treatment, birth control services, and abortion (English &

Ford, 2004; Steinberg, Cauffman, Woolard, Graham, & Banich, 2009), others argue that the results are controversial and that the adolescents are not cognitively mature to make such decision without parental engagement. Recent neuroscience continues to support the fact that adolescents make clinical sexual health decisions very similarly to adults (Ford, English, & Sigman, 2004; Steinberg et al., 2009). While neuroscience points to the fact that adolescents can make appropriate clinical decisions around sexual health, it also points to why adolescents struggle to make sexual decisions in the moment. For example, while adolescents demonstrate similar cognitive capacity to adults when making pregnancy and contraceptive decisions (Steinberg et al., 2009), they still have remarkably higher rates of unintended pregnancy and STI infection. While 49% of pregnancies to U.S. women are unintended, 82% of pregnancies among adolescents, ages 15-19 years old, are unintended (Finer & Zolna, 2011). Similarly, the rate of chlamydia infection among 15-19 year old females is 2.5 times that of females age 25-29 years old and 6 times that of females age 30-34 years old (Centers for Disease Control and Prevention, 2012). Adolescents do not lack the ability to make decisions related to preparing for sex or seek treatment following sex, but they do need better supports to make decisions in the heat of the moment. Due to the fact that sexual behavior in itself creates a state of high arousal and primarily occurs in the presence of peers, integrating learning from neuroscience into sex education interventions is key. This represents a challenging task, given the variability of students' experience of sex education in classrooms, but working towards new curricula, policies and standards that integrate these components old promise. We need to move towards bridging the gap between our understanding of adolescent emotions and implicit attitudes related to sex and sexuality and our policies and practices around sex education.

Using emerging neuroscience to inform policy and practice

While efforts have been made to integrate an understanding of neuroscience into policy and programs in other areas, including minor consent laws, graduated drivers' licenses, and substance use interventions, efforts to integrate this learning into sex education policies and interventions have been limited (Steinberg, 2009; Steinberg et al., 2009; Wiers et al., 2006; Wiers, Van De Luitgaarden, Van Den Wildenberg, & Smulders, 2005). Integrating knowledge about the role of emotions in adolescent sexual decision-making poses some unique challenges. Because sexual development and sexual socialization are both important parts of adolescence, restricting access to sex and sexual health information and services is not an appropriate or effective solution. In contrast, efforts to increase youth access to sexual health services, including contraception, have helped adolescents overcome barriers to making responsible sexual choices and have contributed to recent declines in teen pregnancy (Kearney & Levine, 2012). Rather than eliminating school-based sex education efforts, many opportunities exist to expand and modify existing policies and programs to embrace what we have learned. From inception through evaluation, integrate concepts from neuroscience could significantly improve the impact of school-based sex education.

Example of Innovations Using Neuroscience: Pretesting

Extensive investment is dedicated to the development, piloting and testing of research-based sex education curricula. Because evaluating the effectiveness of sex education on behavior change outcomes has proven challenging, neuroscience offers opportunities to help us better assess and predict the impact of health education messages. In an innovative use of neuroscience, Falk and colleagues (2012) found that using functional MRI (fMRI) in a small sample of individuals to detect activity in a region in the medial prefrontal cortex (MPFC) of the brain previously associated with behavior change, was more effective in predicting population behavior change response than using the same sample's self reports (Falk, Berkman, & Lieberman, 2012). In this study, participants were both asked to review and explicitly self-report the effectiveness of three stop-smoking advertisements (Falk et al, 2012). In addition, fMRI was used to measure activity in a specific region in the MPFC while participants viewed the ads (Falk et al, 2012). Interestingly, the ad participants explicitly ranked as least effective, stimulated the greatest MPFC activity and resulted in the most stop smoking calls to a smoking cessation hotline when aired nationally (Falk et al, 2012). Moving beyond a traditional pilot of sex education curricula, this strategy holds great promise for using neuroscience to better predict an activity's potential to move beyond giving information to motivating behavior change. Using fMRIs to test and pilot existing best practice curricula and to support the development of new curricula may enhance the potential for sex education to bridge the gap from providing information and affecting real change.

Revisiting the theoretical foundation of curricula

Reviewing and revising the theoretical underpinnings of existing school-based sex education also holds promise. Dual process models acknowledge the role of both cognition and emotion in health decision-making (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Reyna, 2004; Slovic, Peters, Finucane, & MacGregor, 2005; Wiers et al., 2007; Wiers, Houben, Roefs, Hofmann, & Stacy, 2010). Recognizing that decision-making is not a solely cognitive process, dual process theories built on teachings from neuroscience, have integrated affect and emotion, behavioral willingness, memories and mental representations of people or settings associated with risk, implicit processes, and risk-avoidant values that are stimulated by specific situational context into decision making frameworks (Gibbons et al., 2009; Reyna & Farley, 2006; Reyna, 2004; Rivers et al., 2008; Wiers et al., 2010). Early attempts to operationalize dual process theories in field-based interventions have led to promising results in changing health behaviors related to alcohol use (Wiers et al., 2006; Wiers, Rinck, Kordts, Houben, & Strack, 2010). Wiers et al. (2010) were able to successfully change heavy drinkers' action tendencies to drink alcohol by shifting implicit attitudes related to alcohol through use of the alcohol Approach Avoidance Test. Using a simple push-pull computer simulation, participants pushed away images related to alcohol and pulled towards them images of soft drinks (Wiers et al, 2010). Participants who had been "trained" to push alcohol images away were able to perform this task more quickly, had significant changes in implicit attitudes related to avoidance of alcohol, and consumed less alcohol during taste tests (Wiers et al, 2010).

This serves as one promising example that independent of explicit cognition, measuring and shifting implicit attitudes can lead to improved health behavior. Using a similar model for sex

education may prove to be an area for innovation. As discussed above, peers play an influential role in sexual decision-making that includes both implicit and explicit components. While best-practice traditional sex education curricula providing information and skills to help address peer pressure, this only addresses the explicit components associated with decision-making. Providing a training tool where adolescents pushed away images associated with prioritizing peers' expectations and pulled closer images associated with prioritizing their own expectations may help address the more implicit expectations and bolster the potential for a true behavioral impact.

Dual process theories have also been applied in some controlled research studies, which have analyzed how behavioral intention (van Empelen & Kok, 2006) and risk perception (Mills, Reyna, & Estrada, 2008) can be influenced to improve adolescent sexual health outcomes. Recognizing that intention to use condoms often does not lead to condom use behavior, van Empelen and Kok (2006) attempted to explore how behavioral intention and behavioral willingness influence adolescents' condom use behavior. As suggested by the neuroscience outlined above, while adolescents may be able to explicitly articulate their plans to use condoms, they may not be aware of the factors that influence their implicit willingness to engage in unprotected intercourse. The conclusions of this research highlighted the importance of experience and context on sexual decision-making. In steady sexual relationships where condom use had been explicitly discussed and had become a habit, behavioral willingness was less likely to influence condom use behavior (van Empelen & Kok, 2006). In contrast, in the context of casual sex occurring in a novel context with an unfamiliar partner, independent of preparatory behaviors (purchasing, carrying and negotiating about condoms), behavioral willingness played an important mediating role in condom use behavior (van Empelen & Kok, 2006).

Similarly, Mills et al. (2008) examined the confusing fact that high perceptions of risk related to sexual behavior can be both positively and negatively associated with sexual risk taking behavior. The results of this research indicate that endorsing simple values (gist representations) to avoid risk (e.g., "Better safe than sorry") led to a protective effect of reducing risk behavior, while verbatim representations (e.g., "I am likely to get pregnant in the next six months") engaged rational processes that led to increased risk taking (Mills et al., 2008). Revising existing curricula to avoid verbatim representations and focus on gist representations will increase their potential for success. This line of inquiry holds promise for significantly improving adolescent health outcomes.

The majority of existing best-practice curricula fail to address behavioral willingness, and specifically the implicit component of willingness, as a factor in sexual decision-making. In an effort to provide detailed information, classroom presentations also often get stuck in the weeds of verbatim representations rather than focusing on simpler gist representations. Traditional curricula do an excellent job of helping young people understand the prevalence of STI infections, the modes of transmission, and the best means of prevention. Most young people can clearly explain that they intend to avoid STIs and many can describe a clear plan of action. In a classroom setting where youth are discussing STIs, the overwhelming majority of

youth express explicit intentions to use condoms or abstinence to prevent transmission. Where existing sex education falls short is by failing to offer opportunities for youth to explore where their willingness may deviate from their intentions. While a plan to use condoms while having intercourse may explicitly sound like a good way to avoid STI infection, implicit willingness to have unprotected sex in the absence of condoms may be more predictive of future behavior. Expanding sex education to explore behavioral willingness and giving youth an opportunity to acknowledge contradictions with behavioral intentions serves may again help bridge the gap. A review of existing curricula and a reframing in a dual process model may prove effective.

While a rationally based sex education curriculum focuses primarily on building skills and knowledge related to the preparatory behaviors, a dual process based curriculum would integrate creative strategies that help youth identify and influence their behavioral willingness and shift implicit attitudes related to sexual behavior. Due to the limited efficacy of rationally-based sex education programs and the promising results from these neurological studies, we must renew efforts to apply and rigorously evaluate dual process theories in the field of sex education.

Enhancing emotional learning in the classroom

While shifting the theoretical underpinnings of sex education creates opportunities for development of new strategies to expand emotional learning in the classroom, it also requires the development of new strategies. Behavioral and experimental neuroscience suggests that young people improve their sexual decision making with increased experience, and specifically emotionally relevant experience. With experience, adolescents move from relying on slow, rational processes, to engaging heuristics that improve their sexual health outcomes. Yet, educators have struggled to provide integrate experiential learning into sex education.

The *Healthy Choices: Relationships, Sexuality, and Family Planning* Program designed for use with the RealCare Baby®, an abstinence only program marketed as "experiential learning technology", serves as an example of a failed attempt in this arena. Designed to give teens some parenting experience in hopes that it will reinforce intentions to delay parenting by delay their plans to engage in sexual behavior, the program has been shown to have little impact on teens' attitudes, beliefs or intentions related to parenting or their sexual and contraceptive behavior (Somers & Fahlman, 2001; Tingle, 2002). Part of the challenges this programs faces may be due to the fact that while adolescents may be able to explicitly state their desire to avoid parenting after experiencing the simulator, they may not understand the implicit beliefs they will have to address in order to prevent pregnancy from occurring. While this program provides adolescents with the negative affective experience of caring for a demanding infant simulator, it does not provide any experiential learning about the more implicit, affective desires to engage in sexual behaviors or negotiate sexual situations.

Similarly, role-plays, a component of many best practice curricula, attempt to simulate negotiating condom use or discussing healthy relationships. While helpful in highlighting important skills, role-plays often fail to capture the true emotional content of a real-time

experience. While reinforcing skills that can be applied in a social context that adolescents explicitly recognize, role-plays do not help adolescents gain experience in translating those skills in highly emotional, potentially implicit contexts. If an adolescent has not explicitly planned to engage in unprotected sex, he may not be able to translate the experience negotiating condom use in a role-play to an unexpected sexual encounter in which he did not have a condom available.

With the increasing use of technology in the classroom, computer-based strategies to simulate experience hold promise. Many efforts have been made to enhance traditional classroom learning environments with the use of virtual technology (Pan, Cheok, Yang, Zhu, & Shi, 2006). Recognizing that virtual realities are incredibly popular with 10-15 year olds and provide an opportunity to offer health information and model healthy behavior, the Centers for Disease Control and Prevention (CDC) has provided innovation and funding to expand the use of social media in health education and promotion (Centers For Disease Control and Prevention, 2010). One example of this is the CDC's support of Second Life® as a venue for distributing health information (Centers For Disease Control and Prevention, 2010). The Second Life® Sexual Health Public Education and Outreach simulator (SIM) has been used to distribute information about contraception, sexual health, STI transmission and other sexual health issues (Kamel Boulos & Toth-Cohen, 2009). The SIM has also hosted guest speakers and provides the "AIDS-related Kaposi Sarcoma Experience" where participants can experience the social reaction from others of having KS lesions (Kamel Boulos & Toth-Cohen, 2009, p. 281). While evaluating the impact of virtual experiences presents unique challenges, the majority of participants using the sexual health SIM found the experience useful and 39% said that they had learned something new (Kamel Boulos & Toth-Cohen, 2009). While this SIM was geared towards adult users and the primary focus of this SIM was to provide information, it holds promise for enhancing sex education. Building on this early experience with virtual experiences, virtual reality software could be integrated into traditional classroom sex education and allow young people to gain virtual experience related to relationships and sexual health. Emotional experiences in virtual environments correlate with emotional experiences in real life, offering opportunities to use this as a venue for emotional learning (Riva et al., 2007). As a result, in a controlled and monitored environment, adolescents could gain emotional experience related to a broad range of experiences including asking someone on a date, experiencing a break-up talking about sexual limits, making sexual choices, selecting contraception, and experiencing the outcomes of sexual decisions. In a lesson designed to talk about healthy relationships, the teacher/facilitator could teach the lesson, students could then participate in an activity in the classroom to practice the content in an affectively neutral setting, and then students could spend time in a SIM executing a specific assignment related to healthy relationships and communication. The teacher could also be present in the SIM providing feedback, coaching and guidance. In a multi-session sex education program, the virtual reality experience could offer an opportunity to gain continual experience and feedback on an ongoing basis and allow adolescents to gain experiences and build skills in a very low risk environment.

Integration with Youth Development

Classroom time dedicated to sex education is often very limited and in competition with a number of other educational requirements. As a result, viewing the classroom as the sole source of sex education inherently undermines the potential for success. As a result, integrating sex education with other programming that has been identified as supporting sexual health outcomes increases the potential for meaningful behavior change. Coupled with comprehensive sex education, positive youth development programs hold great promise for improving adolescent sexual health outcomes. Broad, developmentally-based interventions, and lengthier interventions, such as the Children's Aid Society (Philliber, Kaye, Herring, & West, 2002), the Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002)), and service learning interventions that include voluntary community service with a structured opportunity for reflection on the service experience (e.g., Teen Outreach Program (Allen & Philliber, 2001)) have yielded some more promising impacts on adolescent sexual health outcomes as compared to more traditional sex education (Gavin et al., 2010; Kirby, 2002). These multi-faceted, skill-building based approaches adopt a youth development framework providing both supports and services, building upon existing youth strengths and assets (Brindis, 2006).

Experts have proposed that the positive outcomes achieved are linked to long lasting programs that support building meaningful relationships with caring adults, increased self-efficacy, focus on helping others, increased future orientation, and increased time in supervised, engaging activities (Gavin et al., 2010; Kirby, 2002). While these experiences and skills are key to helping adolescents build a vision for their future, these programs also offer an experience that expands beyond the rational decision making framework and targets sexual behavior in a more comprehensive manner suggested by neuroscience research. Through these programs, adolescents gain experience in building, navigating and maintaining emotional relationships in a supportive and consistent context. When participants have a negative experience as the result of a decision, they have a supportive framework in which to reflect on the experience, revise their plans and intentions, gain new information, and try again. In addition, as participants build strong emotional ties with one another, they have the opportunity to learn from each other's experiences, in a context strongly supported by caring and familiar adults.

A primary challenge of these service learning and positive youth development programs lies in the fact that they require a great deal of financial and personnel resources to implement and consist of multiple, complex program components, which have been difficult to replicate and show reduced effectiveness if not implemented entirely as designed (Kriby, 2002). In contrast, a key factor that makes these programs potentially important investments is that they move beyond a rational decision-making framework and provide participants with an opportunity to influence social and emotional factors, which neuroscience has implicated in adolescent sexual decision-making. For example, afterschool activities, in addition to providing opportunities to build skills and engage in activities that may enhance decision-making and increase resilience, offer more structured, adult supervised time thereby decreasing opportunities for sexual encounters.

While components of positive youth development programs exist in many after-school and school-based enrichment programs, too few efforts have been made to link these to concurrent school-based sex education. This may reflect the finding that sexuality education is treated as controversial, as compared to the mainstream idea of providing effective school-based enrichment programs. Rather than eliminating existing support services and school-based sex education, efforts should be made to look at school interventions comprehensively and make appropriate programmatic links to maximize the potential for impact. This would require both building bridges between schools and other youth serving organizations to develop integrated intervention approaches, and systems to better track and monitor youth participation and outcomes. Policies that support and provide funding for this integration could maximize the potential for improved sexual health, among other types of outcomes.

Enhancing Evaluation

In addition to improving sex education curricula, evaluations of school-based sex education must also be updated to capture key components of dual process theories. Given the complexity of sexual decision making and the sophistication of existing curricula, we must expand our efforts to measure and document success. While many sex education evaluations ask about behavioral intentions (e.g., "How likely are you to have sex in the next 6 months?"), they often fail to explore behavioral willingness (e.g., "If the opportunity arises, how willing are you have sex in the next 6 months?"). Similarly, while current evaluations measure how much knowledge participants have gained, they often miss asking how likely participants are to use or how confident they feel about using the knowledge. Integrating these questions into evaluation tools may help identify program components that better target both willingness and intention and which participants explicitly identify as bridging the gap between information and action.

Improving strategies to evaluate sex education will be key to better understanding its true impact (Constantine, 2012). Traditional surveys and self-report methods capture only explicit attitudes related to sexual behavior and fail to capture important implicit information that significantly influences sexual decision-making. Employing creative evaluation strategies that look at how current behavioral interventions influence implicit attitudes will provide new insight into what programs really work to change behavior. Integrating implicit attitude testing and fMRI technology into sex education evaluation plans will improve the understanding we have of the true effects of these programs.

Conclusion

Even in the absence of neurological findings, experts have identified the key components of effective school-based sex education (Kirby & Laris, 2009). Rather than abandoning existing sex education efforts, lessons from neuroscience may provide an important set of innovations and insights for expanding existing sex education to include strategies that build on dual process theories and address adolescents' implicit and explicit attitudes related to sexual behavior, and in turn, improve adolescent sexual health outcomes. Policies to support research and

innovation to better understand the concepts of behavioral willingness and intention, implicit and explicit cognition, and rational and emotional decision-making, in relationship to adolescent sexual behavior, will facilitate the development of more effective behavioral interventions.

As neuroscience continues to provide a better understanding of adolescent decision-making, we can take steps now to improve sex education policies and practices. We must move towards developing sex education interventions, evaluation strategies, and supportive funding streams that push for dual-process approaches in sex education. In addition, continuing to support primary research to better understand adolescent brain development and activation specific to sexual decision-making, sexual arousal and sexual behavior will offer opportunities to improve and strengthen sex education. We need to encourage bridges between health educators, researchers, and policy makers to explore opportunities to integrate discoveries about brain development and neuroscience in the laboratory into practices and innovation in the field. The more we understand about the relationship between adolescent emotional and cognitive development and sexual decision-making, the more progress can be made in determining how these factors can be best targeted in a public health setting through classroom and community-based sex education. Since current sex education efforts continue to have limited success, using existing science to improve them seems prudent.

Building on the existing infrastructure of what we have learned works about school-based sex education and integrating lessons from neuroscience about social-emotional development and its role in adolescent sexual decision-making increases the potential for success. As Reyna and Farley state:

> *The limited effectiveness of these programs in the short term and their tendency to wane in effectiveness in the long term…suggest not that the intervention is futile, but that the incorporation of additional explanatory and predictive factors is needed to reduce adolescent risk taking.* (Reyna & Farley, 2006, p. 35)

The science we have offers an explanation for why current sex education efforts continue to have a limited impact on adolescent sexual health outcomes. Supporting the positive sexual development of U.S. youth requires that we improve the ways we prepare young people to face sexual and other types of important decision-making that impacts their lives. A better understanding of the role that brain development plays in adolescent sexual decision-making will facilitate the development of improved policies, services, and practice. Innovation is needed to address the gap between the country's current investments in school-based sex education and the outcomes we see in the sexual health status of our youth. In order to preserve funding and support of school-based sex education, we must move sex education forward from being adequate to being effective and utilize results from recent neuroscience research to inform our policies and best practices.

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III. Using a Computer-Based Risk Task to Explore the Role of Emotion in Adolescent Intentions and Behavior in Adolescent Sexual Decision-Making

Introduction

Assessment of many cognitive based behavior change theories (e.g. Theory of Planned Behavior (Ajzen, 1985)) have attempted to quantify how well intentions predict future health behavior. Understanding the link between intention and behavior is particularly challenging in the context of adolescent sexual behavior. When an adolescent states his intention to use condoms or remain abstinent, how do we really know how likely it is that his intention will result in action? A recent meta-analysis found that among adolescents, while behavioral intentions are more predictive of more affectively neutral health behaviors such as dietary choices and physical activity, intentions are weaker predictors of more affectively charged, safer-sex behaviors (McEachan, Conner, Taylor, & Lawton, 2011). Prior research has attempted to explore the link between intention and behavior in adolescent sexual decision making related to condom use (Abraham, Henderson, & Der, 2004) and other sexual risk behavior (Huebner, Neilands, Rebchook, & Kegeles, 2011). Abraham and colleagues found that while a school-based sex education program successfully improved participants' intentions to discuss condoms with sexual partners, there were no changes in intentions or behavior of consistent condom use (Abraham et al., 2004). Similarly, Huebner and colleagues found that among gay and bisexual men, beliefs and attitudes related to unprotected sexual intercourse did not predict subsequent risky behavior (Huebner et al., 2011). Evaluations of sex education programs have found a persistent gap between improved intentions related to adolescent sexual behavior including intentions to communicate about safer sex, abstain from sex, and consistently use condoms and improved sexual health outcomes (Kirby, Laris, & Rolleri, 2007). When adolescents plan and discuss future health decision-making, they often make strong declarations to engage in safe, health protective behavior. Unfortunately, these plans and predictions often fail to be realized in actual behavior. Better understanding the gap between adolescents' intentions and their actual behavior is key to developing better interventions to improve adolescent sexual health outcomes.

While it is difficult to accurately quantify young people's intentions around sexual behavior, some data gives helpful clues to better understand the gap between intentions and behavior. According to the 2009-2011 California Healthy Kids Survey, the majority of 7th graders reported (62%; n=3977) said that they were sure that they would not have sexual intercourse during the coming year and 16% said that it would probably not happen (*California Healthy Kids Survey, Student Well-being in California, 2009-2011: Statewide Results*). As the grade of the students increased, the intention to remain abstinent declined. While 66% of 9th graders (n=4952) said they felt sure or probably sure that they would not have intercourse, by 11th grade, the number had dropped to just over half (51%; n=4919). Prior to engaging in sex, young people report a range of reasons for abstaining from sex including following religious morals or values; waiting to find the "right" person; avoiding pregnancy; and avoiding a sexually transmitted infections (STIs) (Abma, Martinez, & Copen, 2010; Guttmacher Institute, 2013). Despite intentions to

remain abstinent, by the time young people in the U.S. reach 19 years of age, 70% of them have become sexually active (Guttmacher Institute, 2013). While the behavior of abstaining from sex is a good way to prevent unintended pregnancy and STIs, the intention to abstain from sex has not been found less so. In a national sample of adolescents who set a clear intention to remain abstinent through a virginity pledge, five years after setting the abstinence intention, pledgers did not differ in age of sexual debut, number of sexual partners, or rates of STIs from matched non-pledgers (Rosenbaum, 2009). In addition, the publicly declared intention to avoid intercourse seemed to have a detrimental effect on protective health behaviors, as pledgers were less likely to use birth control and condoms when they did engage in sexual activity (Rosenbaum, 2009).

Among adolescents who become sexually active, intentions to engage in safer, protected sexual behavior may not directly translate into action. The gap between intention and behavior was well illustrated in a study with female adolescents (14-17 years old) (Bartz, Shew, Ofner, & Fortenberry, 2007). Among participants who reported that did not intend to become pregnant during the course of the study (n=270), they only reported using contraception in 44.8% (n=1398) of coital encounters (Bartz, Shew, Ofner, & Fortenberry, 2007). Similarly, among a sample of young adults (18-21 years old) 54.9% (n=50) of people with casual partners and 49% (n=77) of people with steady partners who intended to use both a condom and other contraception during last intercourse failed to do so (Turchik & Gidycz, 2012). While employing dual methods presents additional challenges, among those who intended to use condoms only, 28.4% (n=33) of people with casual partner and 29.7% (n=54) of people with steady partners, failed to do so (Turchik & Gidycz, 2012). Meta-analyses exploring the relationship between adolescent condom use intention and actual condom use have demonstrated the limited predictive validity of intention on behavior (Turchik & Gidycz, 2012). Compared to adult and young adult populations, adolescents are less capable of translating intentions to use condoms into condom use behavior (Sheeran & Orbell, 2011).

The challenge adolescents face in translating sexual intention into behavior continues to impact their sexual health outcomes. While there have been marked improvements in the consistent use of condoms and other contraception both at first intercourse and during subsequent intercourse, U.S. adolescents bear a disproportionate burden of STIs and unintended pregnancy (Guttmacher Institute, 2013). Adolescents, aged 15–24 years, account for nearly half of the 18.9 million newly diagnosed STI cases each year and adolescents have the highest rates of chlamydia and gonorrhea infection across all age groups (Guttmacher Institute, 2012; Guttmacher Institute, 2013). Despite recent decreases, the U.S teen pregnancy rate continues to be one of the highest in the developed world and pregnant teens report that 82% of their pregnancies are unplanned (Guttmacher Institute, 2013). While teens may have clear intentions to abstain from sex and engage in safer sex behaviors, their sexual health outcomes suggest that the gap between intentions and behavior are vast. In alignment with effective health behavior theory, many interventions aiming to improve adolescent sexual health outcomes include objectives to shift behavioral intentions related to engaging sex as well as intentions around contraceptive use including condoms. A better understanding of the link

between adolescent intentions and behavior related to sexual decision-making hold great promise for improving the sexual health of adolescents.

The relationship between adolescent emotions, intentions and behavior

When all people, including adolescents, make decisions, they engage in a process of weighing risks and benefits (Alhakami & Slovic, 1994). This weighting process includes the evaluation of not only the facts and rational thoughts but also the weighting of emotional and affective factors linked to the positive and negative outcomes (Alhakami & Slovic, 1994). For example, when a young person is making a decision to have sexual intercourse for the first time, he may consider a number of rational factors. From things he learned in sex education he considers that condoms, his chosen method of contraception, are not 100% effective in preventing pregnancy and may break if not used correctly. He also considers that condoms are the only form of contraception that helps prevent the transmission of STIs. From discussions with his parents, he knows that they strongly disapprove of sex outside of marriage, and also reflects that they have repeatedly said how much they approve of his current girlfriend. In thinking about his friends, he knows that his best friend recently had sex for the first time and had a good experience, but also thinks about his friend who got his girlfriend pregnant, who says he wishes he had waited to have sex. While he considers these rational thoughts, he also weighs the emotional factors linked to the potential experience. He reflects on how happy and in love he will feel if he has sex with his girlfriend and everything goes well. He thinks about how horrified he will feel if the condom breaks or his girlfriend, who has more sexual experience, thinks that he is doing something wrong or awkward. He thinks about how proud he will feel to tell his friends that he lost his virginity and how ashamed he will feel if his parents find out that he went against their values. He feels nervous about his ability to put on a condom correctly and confident about going to the local clinic to pick some up. Some of these factors he may be able to easily articulate while others may be more implicit. His mood and all of the other decisions he is making in his life may also contribute to the weight of this balance. As a result, before he even goes into the moment of making the actual decision, he is already balancing a heavy load of rational and affective factors.

States of high emotional arousal have the potential to overwhelm self-regulation processes resulting in increased risk taking even for young people who have clear intentions to avoid risks and cognitively understand the potential costs associated with a specific behavior (Rivers, Reyna, & Mills, 2008). One of the key barriers individuals face in translating intention into behavior is an inability to anticipate the affective state they will experience when making the decision. Most cognitive based behavior change theories have failed to adequately account for the role that affect has in influencing decision-making (Gibbons, Houlihan, & Gerrard, 2009). Recent research has illustrated that while anticipated affect is not an independent predictor of future behavior, it does helps explain a more significant part of the variation between intention and behavior across a wide range of health behaviors (Rivis, Sheeran, & Armitage, 2009). Despite the emerging body of evidence on the role of affect in decision-making, very little research has explored the behavioral consequences of affect or identified salient intervention

points (Andrade & Cohen, 2007). Both behavioral and neuroscience research have begun to identify important factors that contribute to the intention-behavior gap.

Emotions have a profound effect on the link between intentions and behavior primarily because people do not accurately anticipate the power of their influence (Andrade & Iyer, 2009; Ariely & Loewenstein, 2006). Appraisal theory posits that emotions result from an individual's evaluation of an event or situation (Roseman & Smith, 2001). As individuals appraise external factors and determine how they will respond and integrate them into their personal identity, they experience emotions (Nussbaum, 2003). Adolescent sexual behavior is often driven by emotions commonly associated with risk (e.g. panic, fear, worry, pain, anxiety), as well as many positive emotions (e.g. pleasure, love, intimacy, satisfaction) that may lead to behavior that could lead to undesirable outcomes (e.g. sexually transmitted infections, pregnancy) or health protective behaviors (e.g. abstinence, consistent contraceptive use, etc.). Depending on the individual and the context, the same emotions may be at play during decision-making, but result in very different outcomes.

These emotions play a key role in determining behavior, but are difficult for people to anticipate when they are engaging in a novel behavior. When planning for a future decision in a state of non-emotional arousal, individuals do a poor job of predicting their actual future behavior. While there has been limited research in adolescents, this has been demonstrated in risk taking games (Andrade & Iyer, 2009), use of contraception during intercourse (Turchik & Gidycz, 2012), and in sexual interests and preferences (Ariely & Loewenstein, 2006) among young adult populations. Using a sequential gambling game, Andrade and Ayer (2009) demonstrated that following losing a gamble, participants experienced greater negative affect than they expected and, as a result, bet more following a loss than they had planned to bet when in a cold cognitive state. In alignment with prior literature, Turchik and Gidycz demonstrated that being in a negative mood at the time of a sexual encounter led to increased discord between intentions to use contraception and actions to do so (Turchik & Gidycz, 2012). Similarly, Ariely and Lowenstein (2006) demonstrated that when people became sexually aroused, they were more willing to engage in unsafe sexual behaviors than they had predicted in a state of non-arousal. While it remains unclear how magnitude and direction of affect and emotions translate into direct effects on decision-making, the reality of their impact is clear.

Two different types of emotion, anticipatory and anticipated, contribute to behaviors and intentions respectively. Anticipatory emotions are immediate visceral reactions to risks and uncertainties, while anticipated emotions are those that are not experienced in the immediate present but are expected to be experienced in the future (DiClemente, Salazar, Crosby, & Rosenthal, 2005). While people set intentions accounting for anticipated emotions, they engage in behavior in the context of anticipatory emotions. Anticipated emotions have been found to be helpful in predicting the strength of the link between adolescent sexual intentions and behaviors. Newby and colleagues found that adolescents who had stronger intentions to use condoms were more likely to endorse positive affective outcomes related to condom use while those with weaker intentions were more likely to endorse positive outcomes related to

unprotected sex (Newby, Brown, French, & Wallace, 2013). When adolescents engage in the process of weighing a future sexual decision, they account for their anticipated emotions but may not accurately predict their anticipatory emotions related to the behavior. For example, when planning to abstain from intercourse, an adolescent may anticipate feeling proud of abstaining, powerful for making a healthy choice, and confident about avoiding STIs. In contrast, when in the moment of kissing a partner, the same adolescent may feel sexual pleasure, love and intimacy with her partner, and frustration with parental expectations to remain abstinent. The flood of unpredicted anticipatory emotions may tip the decision making scale, motivating the adolescent to engage in unplanned intercourse. When anticipatory emotions diverge from cognitive evaluations and anticipated emotions, they can significantly influence behavior (DiClemente et al., 2005).

Adolescent emotional development adds a dimension to understanding how adolescents' limited capacity to predict anticipated emotions and process anticipatory emotions contribute to sexual risk taking. In exploring anticipation of rewards, studies have focused on the development and activation of the ventral striatum (VS) (Bjork, Smith, Danube, & Hommer, 2007; Crone & Dahl, 2012; Eshel, Nelson, Blair, Pine, & Ernst, 2007), the anterior insula (AI) (Van Leijenhorst et al., 2010; Volz & Von Cramon, 2006), and the orbitofrontal cortex (OFC) (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011). This research has showed that compared to adults, adolescents experience decreased striatal activation when anticipating rewards and increased striatal activation when experiencing rewards (Crone & Dahl, 2012; Spear, 2013; Van Leijenhorst et al., 2010). The limited capacity of adolescents to predict the emotional pleasure of rewards coupled with an augmented capacity to experience rewards may help explain the gap between adolescent sexual intention and behavior. While an adolescent may have clear health protective intentions when making plans in a cool emotional state, when emotionally aroused, those same plans may be abandoned in search of other, more immediate outcomes.

Researchers have also explored how the development of the behavior-monitoring Posterior Mesofrontal Cortex (PMC) contributes to adolescent risk taking (Bjork et al., 2007). Comparing the risk-taking of adolescents and adults in a monetary game of chicken, Bjork and colleagues found that while adolescents had similar PMC activation when the penalty or risk of the situation was clear, in trials that had a low penalty and required more risk-reward weighing, they observed a developmental increase in PMC activation (Bjork et al., 2007). This suggests that when faced with the complexity of sexual decision-making that may have multiple risks and benefits associated with both abstaining from and engaging in behaviors, adolescents may have less behavior monitoring capacity. As a highly affective and sensual experience that requires significant weighing of various risk and rewards, sex creates both an opportunity for physical and psychological excitation and sensuality and a continued opportunity for novel experiences with new partners and/or new activities.

The interaction of adolescent development and lack of experience with sexual decision-making poses particular challenges for adolescents in aligning their intentions with their behavior. Adolescents are at a dynamic interface where they are undergoing significant physiological and

social transformations. The development of various functional regions of the brain coupled with the development of the interconnectivity between these regions contributes to increased flexibility, sensation seeking, reward sensitivity, and risk taking during adolescence (Crone & Dahl, 2012). Despite increasing cognitive self-control, simultaneous maturation of aspects of the brain involved in emotional processing motivates adolescents to find novel, exciting, and sensual experiences (Casey, Jones, & Hare, 2008). While adolescents may be able to cognitively think about risks similarly to adults, simultaneous affective and social processing can tip the scales towards increased risk behavior. Socially, adolescents adopt a vast number of new roles during this life stage. Transitioning from childhood, adolescents often gain more independence and encounter many opportunities to engage in risker behavior. Adolescents' lack of experience in many new realms they encounter also tips the scales towards increased risk taking.

Dual process theories (e.g. Fuzzy Trace Theory (Reyna, 2004); Prototype Willingness Model (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008)) which attempt to integrate rational and emotional components into predicting health behaviors hold promise for better predicting and affecting adolescent intentions and behavior compared to traditional behavior change theories (Gibbons, Kingsbury, & Gerrard, 2012). Recognizing the limited capacity of intention to predict future behavior, these theories include additional constructs to predict future behavior including behavioral willingness, behavioral expectation, and prior experience with a specific experience (Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009). Each of these components expands on the cognitive model of decision-making to explore more affective components. When adolescents lack experience in making a decision related to a specific behavior, their willingness or openness to engage in a behavior, rather than their behavioral intention or plan to engage in a behavior, is more likely to predict their behavior (Gibbons, Gerrard, Reimer, & Pomery, 2006). Behavioral willingness has been found to be more effective than intention at predicting future behavior among younger adolescents and among older adolescents with less experience with a given behavior (Pomery et al., 2009). Behavioral expectation expands on the concept of intention to explore how context and circumstance may influence behavior (Pomery et al., 2009). For example, while an adolescent may express an intention to not to become physically intimate with a partner, she may more realistically recognize that in the presence of that partner that she expects to do so. While limited behavioral research has explored this concept of behavioral expectation, expanding the construct of intention to account for context appears to be important in accounting for the emotional context that influences the link between intention and behavior.

Lastly, experience with a given behavior significantly affects one's ability to predict and plan for the emotional outcome of a decision. While adolescents have adult-like cognitive capacities, they lack life experience to use during decision-making (Cauffman & Steinberg, 1995). Research has suggested that cognitive based theories are less effective at predicting behavior when behaviors are new or unpracticed (Gibbons et al., 2009). When employing cognition during decision-making, lack of life or situation experience may result in adolescents anticipating greater emotional benefits of engaging in a behavior than from abstaining (Rivers et al., 2008).

In the context of significant social, emotional and cognitive development, adolescence is a time when most young people are first experiencing sexual feelings, setting sexual intentions, and engaging in sexual behaviors. All of these factors add to the complexity of intention being a good predictor of adolescent sexual decision-making.

The fact that most sexual decision-making occurs in the context of peers makes it particularly challenging for adolescents. As a physically and emotionally pleasurable act, sex activates the reward circuitry in the brain similarly to any other pleasure (Georgiadis & Kringelbach, 2012). Among adolescents, the presence of peers enhances the drive towards reward-seeking behaviors by also stimulating the reward circuitry in the brain (Chein et al., 2011; Sunstein, 2008). Using a driving simulation task, Chein and colleagues demonstrated that among adolescents, the presence of peers led to significantly increased activation of the VS and OFC compared to both children and adults (Chein et al., 2011). During a sexual encounter, while the physical and emotional components of sexual intimacy are stimulating the reward circuitry in the brain, the presence of a peer further enhances this stimulation and has the potential to confound reward prediction and valuation. The intense emotional experience of pleasure coupled with the limited experience predicting the emotional outcomes of sexual decisions contributes to the challenge adolescents face in engaging rational, premeditated thought processes during sexual experiences.

While the presence of peers may potentially augment risk-taking by activating reward circuitry in the brain, taking the perspective of a peer when making a decision has been shown to have protective effect for adolescents. When compared to making decisions for oneself, when adolescents are motivated to take another's perspective, they can engage more rational rather than emotional decision-making mechanisms (Crone, Bullens, Van Der Plas, Kijkuit, & Zelazo, 2008). Neuroscientists have identified important development occurring in the medial prefrontal cortex (mPFC) and the temporoparietal junction (TPJ), regions of the brain that contribute to improved social processing (Crone & Dahl, 2012). The interaction of the activation of the mPFC and the TPJ contribute to the development of social skills and capacities, including the capacity to take the perspective of another person (Crone & Dahl, 2012; Eisenberg, Fabes, & Spinrad, 2007). The improved capacity for perspective taking may have some potential for improving adolescent decisions. In a self-other gambling task, adolescents were more likely to make riskier choices for themselves than for another person, and the choices for the other person were slower, indicating a greater likelihood of engaging more rational decision-making pathways (Crone et al., 2008). Neuroimaging studies also indicate that different areas of the brain are activated when processing information for oneself versus when taking the perspective of another person suggesting that adolescent development may interact with these pathways (D'Argembeau et al., 2007; Ruby & Decety, 2004).

Current Study

Exploring the link between adolescent intention and behavior related to sexual risk taking presents many challenges. Efforts have been made to unravel and better understand the

unique developmental state of adolescents and the influence on decision-making and behavior. Some efforts have been made to better understand adolescent decision-making using risk-taking games including the Iowa Gambling Task (Cauffman et al., 2010; Crone et al., 2008; Overman et al., 2004; Smith, Xiao, & Bechara, 2012), Cake Gambling Task (Van Leijenhorst, Westenberg, & Crone, 2008), and other experimental studies (Gardner & Steinberg, 2005). While adolescents perform overall similarly to adults, they display important differences that reflect their attraction towards high intensity, affective experiences. Recent research suggests that performance on these risk-taking tasks correlates with self-reported risk taking in real-world decisions (Rao et al., 2011). In an attempt to continue to explore effect of affect on the link between adolescents' intention and behavior, this study expanded on existing research by Andrade and Iyer looking at this link among young adults (Andrade & Iyer, 2009). As mentioned above, Andrade and Iyer (2009) illustrated the gap created by unanticipated emotions between intentions and future risk-taking behavior in young adults (Andrade & Iyer, 2009). Their work demonstrated that when individuals are asked to predict their own future behavior, they underestimate the role that their emotions will play compared to their actual behavior (Andrade & Iyer, 2009). To our knowledge, this same research has not been replicated with adolescents.

Adapting the protocol from Andrade and Iyer (2009), this research explored the gap between making risk decisions in a neutral affective state versus in positive or negative affective state following a win or loss with adolescents. Departing from the Andrade and Ayer protocol, because taking the perspective of another person has been demonstrated to be a slower, more conservative, and likely less emotionally charged process for adolescents, participants were also asked to advise a peer on how to behave at each decision-making point. This goal of this component was to explore the differential influence of emotion on prediction of future behavior, advice to others on future behavior, and actual behavior and advice in the midst of an affective experience.

Hypotheses

Integrating the concepts outlined above, this research explored 1) the effect of unanticipated emotions on adolescent decision-making; and 2) the difference between predicted behavior, actual behavior and advice to others. Based on prior research by Andrade and Iyers, we anticipated demonstrating the following hypotheses (Andrade & Iyer, 2009). First, similar to adults, we predicted that adolescents would underestimate the effect of negative affective experiences on future decisions. As a result, we anticipated that when adolescents experience negative emotions due to a loss in prior rounds, they would take greater risks than planned in subsequent rounds. Second, we predicted that while a positive gap would appear between planned behavior and actual behavior for adolescents experiencing negative emotions, we did not anticipate that this gap would be duplicated in their advice to others. Employing a more rational process, even in the presence of negative emotions, we predicted that adolescents would have more conservative advice for others than for themselves, even following the negative affective experience.

Methods

Participants

Ninety-five adolescents between the ages of 15-19 years old (mean age 16.7 years) from the greater San Francisco Bay Area participated in this experiment. The participants represented the racial and ethnic diversity of the community (37% Latino, 28% African American, 18% Asian/Pacific Islander, 10% Other and 7% White/Caucasian) and the majority was female (61%). Participants resided in 14 different zip codes from across the greater San Francisco Bay Area. Written parental permission and youth assent was obtained for all participants under 18 years old and 18-19 year olds provided written consent. The UC Berkeley Human Subjects Review Board approved all processes and procedures.

Procedure

Participants participated in the web-based game on laptops or desktops in community based settings (i.e. youth centers, private homes, schools, etc.). Each session took approximately 15 minutes. Participants received information that the goal of the research was to better understand how adolescents make decisions. Participants were told that they would receive $15 in gift cards for participating in the study and that they could use up to $6 of that money to play the game. To clarify that participants understood the impact of risking money, they were informed that they could receive a minimum of $9 for their participation if they played and lost all $6, and a maximum of $21 if they played $6 and doubled their money. Each participant played 3 rounds and could bet a minimum of $0 and a maximum of $2, in $.50 increments, in each round.

The procedure and game for this study followed that employed by Andrade and Iyer with college age youth with some modifications (Andrade & Iyer, 2009). During the game, a rectangle board consisting of 22 red and 18 blue squares appeared on the computer screen. Once the participant had pushed the appropriate button on the screen, a yellow "X" moved randomly around the board every ¼ second for 5 seconds. At the end of the 5-second period, the "X" landed in a square. If it landed in a blue square, the participant would win twice the amount wagered. If it landed in a red square, the participant would lose the amount of the wager. Prior to beginning the game, participants were told that this was a game of chance and that they could not control the outcome of the game.

The computer game involved four phases: instructions, practice, planning and playing. After completing a short demographic survey, clear printed instructions appeared on the screen explaining how the game works. If participants had questions or could not read the text, a researcher read the text aloud throughout the procedure. During the instructions phase, participants observed that if the flashing X landed on a blue square they would win that round and if it landed on a red square, they would lose that round. During the practice phase, participants had an opportunity to walk through making a wager and push the button to see the results for 3 rounds. At this time, they were reminded that they were not wagering any money. During the planning phase, participants were asked to plan their wagers on the

computer for the three rounds in anticipation of the results of the prior round. As a result, they had to make predictions for a total of 7 scenarios including: 1) wager for Round 1; 2) wager for Round 2 following a loss in Round 1; 3) wager in Round 2 following a win in Round 1; 4) wager in Round 3 following a win in both rounds 1 and 2; 5) wager in Round 3 following a loss in both Rounds 1 and 2; 6) wager in Round 3 following a loss in Round 1 and a win in Round 2; and 7) wager in Round 3 following a win in Round 1 and a loss in Round 2. In deviation from the Andrade and Iyer (2009) protocol, participants were next asked to think of a peer – someone who they liked who was similar in age – and to write their name on a piece of paper. They were then asked to provide advice to this peer on how to play the game. Similar to planning for self, participants had to advise their friend on what to wager in each of the 7 possible scenarios. After the planning for self and the planned advice were completed, the game began. Because of the memory challenge presented by the large number of planning scenarios, participants were reminded of what they had planned to wager and played Round 1. At the completion of Round 1, participants were reminded of their relevant plan for Round 2 given the results of Round 1 and given the unanticipated opportunity to revise this wager. They were similarly reminded of their relevant advice for their friend and given an opportunity to revise their advice. Round 3 repeated the steps of Round 2. At the completion of Round 3, participants were informed what they had won or lost in the game, responded to a few questions about the game, and were thanked for their participation.

Results

Analysis of the data exploring variation related to gender and ethnicity did not produce significant results and will not be discussed below. In addition, while results for all three rounds of the gambles were analyzed, due to the decreasing cell sizes in Round 3, no significant effects were detected. For this reason, while the data for all three rounds are presented below, the discussion of the results will be limited to the first two rounds.

Planning Phase

Results from the planning phase are summarized in Figure 1. While at least 50% of participants differed their planned bets from their planned advice ($p<.05$), for the most part there were no significant differences between the gambles participants planned for themselves and how they advised their friend to gamble. An exception to this occurred in Round 3 following a win in Round 1 and a loss in Round 2 where predictions for self ($M_{plannedbet} = 1.05$) were significantly higher than the predicted advice for a peer ($M_{plannedadvice} = .93$, $p=.01$). There were no other significant differences between planned bets for oneself and the advised bet for the peers in any other conditions.

As predicted, participants did anticipate they would bet more in Round 2 following a win in Round 1 ($M_{plannedbet} = 1.15$), than following a loss ($M_{plannedbet} = .96$; $p=.005$). They similarly advised their peers to bet more in Round 2 following a win in Round 1 ($M_{plannedadvice} = 1.05$) than following a loss ($M_{plannedadvice} = .94$; $p=.05$). Similarly, in Round 3, participants planned that they would bet more and advised their peers to bet more following a win in both Rounds 1 and 2

($M_{plannedbet}$ = 1.11; $M_{plannedadvice}$ = 1.12), than they would following a loss in Round 1 and a win in Round 2 ($M_{plannedbet}$ = .96; p=.04; $M_{plannedadvice}$ = .94; p=.01). While plans for themselves did not differ in Round 3 when comparing a wins in the two prior rounds with a win in Round 1 and a loss in Round 2, they did have significantly differing advice for peers ($M_{wwplannedadvice}$ = 1.12; $M_{wlplannedadvice}$ = .93, p=.005).

Actual Phase – Round 1

After making predictions for all seven scenarios, participants did not revise their bets for Round 1. As a result, Round 1 was interpreted as the baseline level of assumed risk that participants were willing to take prior to any affective experience of winning or losing. Based on the program algorithm, 48% of participants experienced the negative affective experience of a loss and 52% experienced the positive affective experience of a gain.

Actual Phase – Round 2

Two-way ANOVA was used to test for an interaction between the relevant predicted bet for Round 2 based on the outcome of Round 1 and the actual outcome of Round 1 on the actual bet in Round 2. As expected based on the results of prior research, the full model was highly significant (F(3,91)=38.33, p<.001) and the interaction was marginally significant (F(1,91)=2.93, p=.09). With the interaction in the model, the outcome of Round 1 significantly affected actual bets in Round 2 (F(1, 91)=3.81, p=.05). When the interaction was removed from the model, the affect of outcome of Round 1 was no longer significant (F(1,92)=.87, p=.35). In contrast, when the two-way ANOVA was used to explore the effect of the outcome in Round 1 on actual advice to a peer in Round 2, as predicted, no significant affect was observed. Planned t-tests indicated there was no significant difference between the mean planned and actual bets ($M_{plannedbet}$=1.08 vs. $M_{actualbet}$=1.10, df=48, p=.72.) or the planned and actual advice ($M_{plannedadvice}$=1.05 vs. $M_{actualadvice}$=1.11, df=45, p=.45) following a win in Round 1. In contrast, after a loss in Round 1, the mean actual bet was significantly higher than the mean planned bet ($M_{actualbet}$=1.05 vs. $M_{plannedbet}$=0.91, df=45, p=.04). In alignment with predictions that the negative affective experience of the loss would not affect advice to a peer, the mean planned advice in Round 2 following a loss in Round 1 was not significantly different than the actual advice ($M_{plannedadvice}$=1.00 vs. $M_{actualadvice}$=1.13, df=42, p=.13). Among those who deviated from their plan in Round 2 (n=25, 26.3%), the outcome of Round 1 did not significantly influence the direction of deviation from the plan. This was likely due to the very small cell sizes for this analysis. Results of differences between planned and actual bets and advice for Round 2 based on outcome of Round 1 are summarized in Figure 2.

When we further explored the gap, the observed results disappeared. Using multilevel modeling, we were able to observe that in Round 2, the planned bets and planned advice were good predictors of the actual bets and actual advice. In addition, we used the actual bet and actual advice in Round 1 as a baseline predictor for an individual's assumed level of risk. When controlling for planned bets and planned advice and actual bet and advice in Round 1, the difference in bets after losses dropped out in Round 2. This can be explained due to the fact that the overwhelming majority of players who both won (n_{Bet}=36; 73.5%; n_{lost}=35; 76.1%;) and

lost (n_{bet}=34; 73.9%; n_{lost}=35; 67.4%) Round 1 decided not to change their bet or their advice from their original plans for Round 2. Among those who did deviate from either their planned bets or planned advice, the number of people who increased versus decreased their decision was not significantly different from chance. This expanded model also indicated that there was no significant effect from round or planned bets on actual bet and that there was no interaction between round and planned bet.

Actual Phase – Round 3

Counter to expectations, results from Round 3 did not demonstrate that a negative affective experience from losing in prior rounds led to significantly deviating from planned bets or planned advice. During Round 3, 53.68% (n=51) of participants deviated from their planned bet. Across all four conditions, for those who did change their bet, the number who increased versus decreased their bet did not significantly differ from chance. As predicted, using paired t-tests, planned bets did not differ from actual bets in the Win-Win ($M_{plannedbet}$=1.19 vs. $M_{actualbet}$=1.15, df=23, p=.75) , Win-Loss ($M_{plannedbet}$=.92 vs. $M_{actualbet}$=.94, df=24, p=.88), or the Loss-Win ($M_{plannedbet}$=.90 vs. $M_{actualbet}$=1.00, df=23, p=.38) conditions. Counter to predictions, planned bets also did not differ significantly from actual bets in the Loss-Loss condition ($M_{plannedbet}$=1.18 vs. $M_{actualbet}$=1.22, df=41, p=.69). In addition, while there was a trend in the expected direction, actual bets did not significantly differ from actual advice to peers suggesting that participants did not offer more conservative recommendations to peers. In the Win-Win ($M_{actualbet}$=1.15 vs. $M_{actualadvice}$=.98, df=22, p=.12), Loss-Win ($M_{actualbet}$=1.00 vs. $M_{actualadvice}$=.94, df=23, p=.33), and Loss-Loss ($M_{actualbet}$=1.20 vs. $M_{actualadvice}$=1.20, df=19, p=.19) conditions, actual bets did not significantly differ from actual advice. In the Win-Loss condition, a paired t-test did illustrate that the actual decision for oneself in Round 3 was significantly higher than the actual advice ($M_{actualbet}$=1.0 vs. $M_{actualadvice}$=.80, df=22, p=.05.). Figure 3 summarizes the difference between planned versus actual bets and advice in Round 3 as a function of condition.

Similar to Round 2, to analyze the results of Round 3 we used multilevel modeling, now including all 3 rounds, to further explore the results. Planned bets and planned advice and actual bets and advice in Round 1 were good predictors of the actual bets and actual advice. This expanded model reaffirmed that there was no significant effect from round or planned bets on actual bet and that there was no interaction between round and planned bet. Mirroring the results of Round 2, when controlling for these other variables, actual bets in Round 3 following a win in Round 1 and a win in Round 2 were significantly higher than planned bets ($\chi^2(6) = 17.05$ p=.009). No other conditions resulted in significant differences.

Results Discussion

This experiment highlighted several important findings. In alignment with prior research, in the cold, cognitive state of planning, participants planned to bet less after losses in prior rounds compared to gains (Andrade & Iyer, 2009). In anticipation that they would want to conserve resources following the experience of the loss and adopt more conservative behavior, adolescents predicted more rational behavior. The results of Round 2 highlighted that while the planned bets were good predictors of actual behavior following a win in Round 1, that they

were less predictive following a loss. As predicted, among those who deviated from their planned bet, after experiencing the negative affective experience of the loss in Round 1, participants were more likely to bet more than they had planned. This aligned with prior research indicating that people do a poor job of predicting how the negative affective experience of a loss will influence their decision-making (Andrade & Iyer, 2009). As a result, when adolescents experience the negative emotions, they are more likely to increase their risk-taking. While not measured directly in this study, this supports the idea that behavioral expectation, which accounts for the context of decision-making, may be a better predictor of behavior than behavioral intention. Unlike in prior research, due to small cell sizes we were not able to demonstrate a significant difference in the preference for positive deviations in Round 2 following a loss in Round 1 but the data did trend in this general direction suggesting that additional research in this area would be fruitful.

Two factors affected the relationship between the planned and actual bets. First, overall, the majority of participants did not deviate from their planned bets or their planned advice. This reinforces health behavior theories that highlight the importance of intention in predicting future behavior. Because planned bets did not account for all variation in behavior, in alignment with dual-process models and prior research, it is not sufficient to say that intention can independently predict all future behavior. Second, because the insertion of actual bet and advice in Round 1 into the model as a baseline predictor of level of risk eliminated the results suggests that additional research is needed to better explore individual differences in sensation seeking, impulsivity, emotional processing, and other factors contributing to risk-taking behavior.

While this research showed that adolescents performed similarly on this task to young adults, this project also added some interesting insight with regard to perspective taking. In contrast to decisions made for oneself, among those who experienced the negative affective state accompanying the loss in Round 1, participants did not change their advice for a peer from the planned advice. This aligns with the developmental research that adolescents are building their capacity for perspective taking and that the process of perspective taking may engage different decision-making pathways compared to when one is making a decision for oneself and prior experimental research (Crone et al., 2008). While peer presence has been found to increase risk taking, this research suggests that facilitating adolescents to take the perspective of their peers may support decreased risk-taking. While this is often attempted in sex education through scenarios and role-plays, exploring ways to better integrate perspective taking into both intention setting and real time decision-making may hold promise for decreasing the size of the intention-behavior gap. In attempt to better understand the difference in pathways between self versus other decision-making, the task was designed to measure decision times for both planned and actual bets and advice. Due to the fact that the data were collected in a variety of settings, these decision-making times were deemed of little validity. Participants were often distracted during the task resulting in wildly fluctuating and theoretically meaningless measurements. As a result, no analysis of these data was performed. Additional exploration

using behavioral and imaging data could expand our understanding of the difference of these pathways.

Limitations

This study faced a number of challenges. First, the study was conducted in the field resulting in variable environments in which participants were playing the game. While some participants had the opportunity to play the game in a quiet, private setting, others played the game in a computer lab or classroom surrounded by peers. The variability of environments likely contributed variability to the results. Second, due to resource constraints, this study had limited power. While some of the outcomes trended in the anticipated direction, significant effects were not realized and the behaviors in Round 3 could not be interpreted. Seeing that the results trended in the expected direction, conducting the study on a larger sample may yield more significant outcomes. Third, unlike the Andrade and Iyer study, this study did not ask participants to provide any measure of their emotional experience while completing the task (Andrade & Iyer, 2009). As a result, we can only speculate that in line with prior research that participants experienced a negative affective state following and loss that contributed to increased risk taking. Expanding this research to measure affective experience during the course of the task would reinforce our interpretation of the results. Lastly, in order to better understand the unique effect of adolescent development on risk taking behavior, it would have also been helpful to have an adult and child comparison group in this study. It also would have been helpful to have had additional information that has been found to interact with individual differences in adolescent risk-taking including measures of sensation seeking, impulsivity, pubertal stage, vulnerability to peer influence, and IQ. Future research will be needed to explore these differential effects.

General Discussion

Understanding the gap between intention and behavior related to adolescent risk-taking is key to improving adolescent health outcomes. This research highlights some important pathways to help improve interventions aiming to improve adolescent decision-making. First, this study demonstrates that when experiencing unanticipated negative emotions, adolescents deviated from planned rational intentions and engaged in increased risk-taking. This reinforces the need to better explore the role that affect and emotion have on adolescent sexual intentions and behavior. If adolescents are unable to accurately predict affective outcomes associated with their decisions, their rational intentions may not serve as accurate predictors of future behavior. Second, this study highlighted adolescents' capacity to make more rational decisions for peers than themselves, even in the face of increased emotional arousal. Building adolescents' capacity to take the perspective of another person when faced with a decision in a highly affective state may facilitate improved decision outcomes and decreased risk taking. Better integrating these components into sex education efforts may help increase their potential to improve adolescent health outcomes.

One of the challenges in helping young people establish intentions around sexual behavior is that the intentions are very fluid. Sex and sexuality is a basic human right, a natural part of adolescent development, and a component of adulthood that contributes to health mental and physical health (Goldfarb & Constantine, 2011). While abstaining from intercourse or consistently using contraception is critical when attempting to avoid pregnancy, later in life, when someone is intending to become pregnant, they must have the ability to shift their intentions and their behavior. This complexity makes developing sexual intentions and values challenging. While delaying the onset of sexual debut, reducing the number of sexual partners and learning to engage in health protective sexual behavior may improve adolescent health outcomes, sexual behavior alone is not inherently a harmful or deviant behavior. Healthy emotional development related to sexual decision-making is key for healthy sexual development. As a result, exploring the experience of emotions related to intentions and behaviors will help inform improved interventions.

Following the lead of most health behavior-change theory, the current theoretical foundation of most sex education curricula asserts that improvements in intentions will lead to improved behavior (Kirby et al., 2007). Far from being only a rational process, a number of affective factors also influence adolescent sexual decision-making. In alignment with their theoretical underpinnings, some of the greatest documented impacts of sex education are changes in adolescents' sexual intentions (Kirby et al., 2007; Kohler, Manhart, & Lafferty, 2008). While changes can be seen in intentions, this has not translated into changes in sexual behaviors. Overall, current sex education efforts alone have not led to profound reductions in adolescent pregnancy, STI rates, or increases in age of first coitus (Cavazos-Rehg et al., 2012; DiCenso, Guyatt, Willan, & Griffith, 2002; Hauser, 2004; Kirby et al., 2007; Kohler et al., 2008). As highlighted above, addressing the gap between intention and behavior is key to ensuring the translation of health protective intentions into action. Better understanding the role of affect in intention setting and decision-making will help expand our ability to develop interventions that have a greater potential for success in improving adolescent sexual behavior. These results point to the need for additional research to better understand the link between emotion, intention and behavior. Continuing to pursue understanding of the behavior-intention gap through both behavioral and neuroscience research holds promise for better understanding the interaction between function and behavior.

Figures

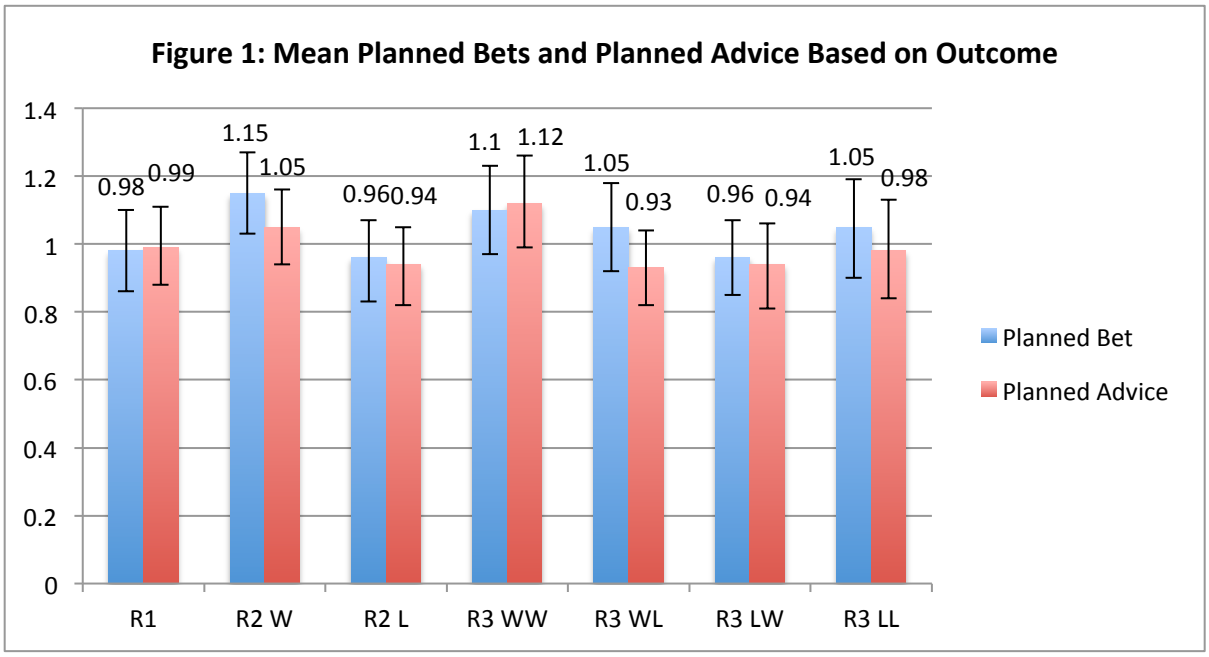


Figure 1: Mean Planned Bets and Planned Advice Based on Outcome
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.98
0.99
1.15
1.05
0.96
0.94
1.1
1.12
1.05
0.93
0.96
0.94
1.05
0.98
R1
R2 W
R2 L
R3 WW
R3 WL
R3 LW
R3 LL
Planned Bet
Planned Advice

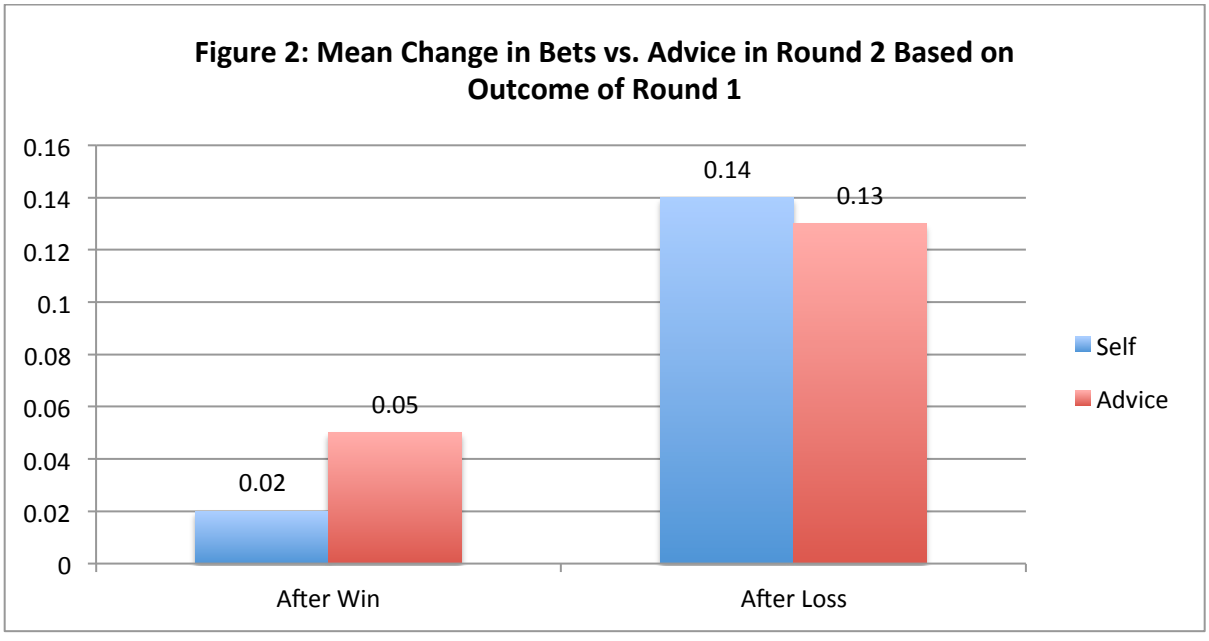
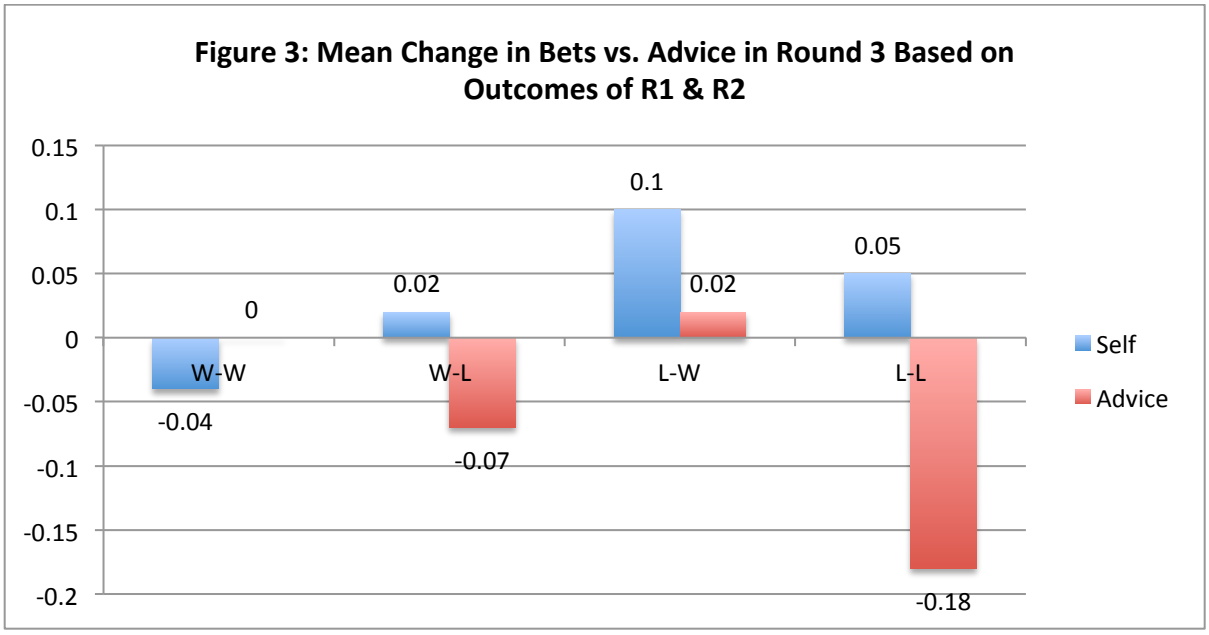


Figure 2: Mean Change in Bets vs. Advice in Round 2 Based on Outcome of Round 1
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0.02
0.05
0.14
0.13
After Win
After Loss
Self
Advice



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IV. The Complexity of Peer Influence in Adolescent Romantic Relationships: A Qualitative Perspective

Introduction

> *"I just thought that being in a relationship was cool like, ok, all the kids or everybody was in a relationship. It was like the thing to do and be, have a girlfriend, be in a relationship." - 15 year-old Latino male*

Public health practitioners and researchers recognize the significant role that peers play in influencing adolescent health behaviors (Crosnoe & McNeely, 2008; Gardner & Steinberg, 2005). Peers have been found to influence both positive and negative adolescent sexual behavior and adolescents' decisions to engage in romantic relationships (Ali & Dwyer, 2011; Baumgartner, Valkenburg, & Peter, 2011; Crockett, Raffaelli, & Shen, 2006; Kennett, Humphreys, & Schultz, 2012). Prior research has explored the importance of early romantic relationships in adolescent development (Furman & Shaffer, 2003; Furman & Simon, 2008). One of the reasons that romantic relationships become important during adolescence results from the increasing importance of all peer relationships during this period. During adolescence, young people increase the amount of time that they spend with their peers. The maturation that adolescents experience during this time also greatly influences adolescent sexual intentions and behaviors. Given that romantic and sexual behaviors are inherently social, peer involved activities, it is important to understand the role of peer influence in early romantic and sexual relationships. Despite some research in this area, additional research is needed to fully understand the impact of peers on adolescent romantic and sexual behaviors (Crosnoe & McNeely, 2008; Fortenberry, 2003). This paper offers a qualitative perspective on how the social, emotional, and cognitive changes that occur during adolescence interact with the increased value of peer influence on adolescent behavior to influence decision-making in early romantic and sexual relationships.

Research exploring the role of adolescent romantic relationships has highlighted their importance and value in adolescent development and in sexual socialization (Goldfarb & Constantine, 2011). Romantic relationships serve as the primary context for young people to explore their sexual identity and gain sexual experience and the majority of adolescent sexual activity takes place in the context of a romantic relationship (Furman & Shaffer, 2003; Furman, Ho, & Low, 2007). The majority of both male (56%) and female (70%) adolescents report that their first sexual experience occurred within the context of a romantic relationship (Guttmacher Institute, 2013). Early romantic relationships offer adolescents an opportunity to experience engage in and reflect on the outcomes of sexual behavior as well as a space for clarifying personal sexual desires and values (Furman & Shaffer, 2003). Through sexual socialization, young people establish both rational and affective components of personal beliefs, values, attitudes and behaviors related to sex and sexuality (Goldfarb & Constantine, 2011). As young people navigate early romantic and sexual relationships, they gain experience, knowledge and skills that will shape their relationships throughout their life course.

Peers often share values and expectations and have been found to influence one another's sexual and relationship behavior (Ali & Dwyer, 2011; Dishion & Tipsord, 2011; Fortenberry, 2003; Furman & Simon, 2008; Prinstein, Meade, & Cohen, 2003). Platonic and romantic peers have been found to have both a positive and negative influence on adolescent attitudes and behaviors related to romantic relationships and sexual behavior. On one hand, having sexually active peers has been found to lead to earlier sexual debut, more positive attitudes towards sexual activity, and an increased number of sexual partners (Ali & Dwyer, 2011; Santor, Messervey, & Kusumakar, 2000). On the other hand, sexually active peers often serve as good sources of information about contraceptives and sexual health clinical services (Fortenberry, 2003) and have been found to be associated with increased condom use (Stanton et al., 2002). In addition, while individuals who engage in early romantic relationships are more likely to engage in genital and non-genital sexual activity, they are also likely to have greater social acceptance and greater competence in friendship and romantic relationships (Furman et al., 2007). Engaging in early sexual activity can have some negative health trajectories including sexually transmitted infections (STIs), unintended pregnancy, or unwanted sexual behavior, but it can also create a strong foundation for life-long healthy sexual engagement (Furman & Shaffer, 2003).

Understanding the importance of peer influence is critical to improve our understanding of adolescent romantic and sexual behavior. Peers and social context have been found to be more influential on adolescent decision-making than hormone levels or other pubertal changes (Forbes & Dahl, 2010). Some of the vulnerability to peer influence that adolescents experience is a result of their social, emotional and cognitive development (Forbes & Dahl, 2010; Gardner & Steinberg, 2005; Pfeifer et al., 2011). Adolescents are undergoing critical social transformation to become more independent and more socially engaged with their peers (Crone & Dahl, 2012). Two interrelated processes likely contribute to the increased influence of peers during adolescence (Steinberg & Monahan, 2007). First, peers become a more salient reference group and adolescents become motivated to adopt values and behaviors that facilitate membership into peer groups. As adolescents work to shape a cohesive self-image, they engage in frequent social comparisons with the peers around them (Gerrard, Gibbons, Stock, Houlihan, & Dykstra, 2006). As youth move into late adolescence and have increased their social competence and social interaction skills, they are less likely to be heavily influenced by peer presence (Eisenberg, Morris, McDaniel, & Spinrad, 2004; Gerrard et al., 2006). Simultaneously, young people undergo changes in their neural processing that affects their interactions with influential peers. Brain imaging has helped identify that a network comprised of the medial prefrontal cortex (mPFC) and the temporoparietal junction (TPJ) play a key role in social processing (Crone & Dahl, 2012). The interaction of the activation of the mPFC and the TPJ contribute to the development of social skills and capacities, including the capacity to take the perspective of another person (Crone & Dahl, 2012; Eisenberg, Fabes, & Spinrad, 2007). Being able to take the perspective of another person has been shown to increase throughout adolescence accompanied by a gradual increase in activity in the TPJ and a gradual decrease in activity the mPFC (Crone & Dahl, 2012). While this increased ability to take another person's perspective serves a number of pro-social functions, if not accompanied by simultaneous

increased cognitive control, it may leave adolescents temporarily more vulnerable to peer influence as they attempt to accommodate the perspectives of their peers. Similarly, neuroscience suggests that increased activation of the anterior cingulate cortex (ACC) and the striatum accompanies adolescents' capacity to experience empathy and experience social acceptance and rejection (Crone & Dahl, 2012). Young adolescents, 10-12 years old, have been found to have greater ACC activation when experiencing rejection than adults and that increased activation in this area was associated with greater feelings of rejection-related pain (Crone & Dahl, 2012). A longitudinal study of peer influence and neural behavior found that increases in ventral striatum activity throughout adolescence positively correlated with increased self-reported resistance to peer influence (Pfeifer et al., 2011). While it remains unclear whether neural development results from or shapes social experience in adolescence, the u-shaped developmental trajectory of the power of peer influence throughout adolescence and the accompanying neural development raises important issues (Crone & Dahl, 2012).

While adolescents can demonstrate their increased cognitive development when performing tasks in a cold, cognitive state, their performance on these same tasks does not remain rational in the presence of peers. Developmental neuroscience has demonstrated that the presence of peers can enhance an adolescent's drive towards reward-seeking behaviors as peer presence simulates the reward circuitry in the brain (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Sunstein, 2008). During a sexual encounter, while the physical and emotional components of sexual intimacy are stimulating the reward circuitry in the brain, the presence of a peer further enhances this stimulation. This intense pleasure stimulation contributes to the challenge adolescents face in engaging rational, premeditated thought processes when contemplating and engaging in sexual behavior.

Existing research on the role of peer influence on adolescent romantic and sexual behavior has primarily relied on quantitative measures. Experimental methods, hypothetical vignettes, comparisons of individual and peer behavior, and self-report questionnaires have been the primary research strategies used to understand the role of peer influence in adolescent relationships (Mayeux & Cillessen, 2007). While helpful, these measures fail to fully capture the subtleties of peer influence. In reflecting on the quality of data that has been gathered on adolescent sexual behavior, Dennis Fortenberry, an expert in the field, argues that researchers should turn their focus away from trying to quantify adolescent sexual events and instead put "much more emphasis to understanding the personal and social contexts of their occurrence and the meanings derived from them" (Fortenberry, 2009, p. 199). Limited research has used qualitative methods to better understand peer influence in early romantic relationships (Hand & Furman, 2009; Selikow, Ahmed, Flisher, Mathews, & Mukoma, 2009). Additional research is needed to better understand the social and cognitive processes underlying peer influence and to inform the measurement and conceptualization of the role of peer influence in romantic relationships and on sexual behavior (Mayeux & Cillessen, 2007). In an effort to move beyond examination of cognitive processes, interviewing offers an optimal strategy to glean critical information about emotions related to adolescent sexual decision-making. As a result, this

qualitative study explores the role of peer influence in adolescents' early romantic and sexual relationships.

Methods

The effect of peer influence in romantic relationships emerged as a key theme in a qualitative, modified grounded theory, open-ended interview project exploring the role of emotions in adolescent romantic behaviors and sexual decision-making. The goal of this project was to inform the development of a stronger multi-dimensional theoretical approach to ultimately guide the development of more effective policies and interventions to improve the outcomes of adolescent sexual decision-making. Rather than approaching data collection and analysis with a hypothesis in mind, grounded theory methods allow the theory to grow from the data and the analysis to facilitate the development of new constructs (Charmaz, 2006; Glaser & Strauss, 1967). The grounded theory process offered an opportunity to explore motivations for adolescent sexual behavior in new theoretical terms, reveal new theoretical categories, and describe the causes, conditions, and consequences adolescents associated with their own sexual decision making (Charmaz, 2006). Interviewing also offered a unique opportunity to learn about adolescents' inner processes, experiences, perceptions and feelings related to sexual decision making as well as about the culture and context in which these events occur (Weiss, 1994).

I collected this data during the spring and summer of 2012, in the greater San Francisco Bay Area. During this project, I conducted purposive and snowball sampling to ensure that I spoke with a wide range of youth. The goal of the sampling was to speak with a wide range of youth between the ages of 15-19 years old, in an attempt to identify themes that transcended a breadth of individual factors including sexual and relationship experience, gender, socio-economic status, and sexual orientation. For this study, age and oral English-language skills were the sole selection criteria. While I was primarily interested young people's experience of their early relationship and sexual experiences which often occur before the age of 15 years old, I chose to interview this older age group because I was interested how their experiences and perceptions changed over the developmental course of adolescence and felt that the perspective that older youth had about their younger experiences would be key to understanding the changes that occurred across the developmental period of adolescence.

I recruited youth primarily through community based youth centers, youth-serving non-profit organizations, youth-serving clinics, and charter schools in Alameda, Contra Costa, and Mendocino Counties. In partnership with the adult staff in these settings, I posted fliers, presented the research project to groups of youth, and spent a lot of time hanging out in these locations to chat with potential participants. Past participants also referred friends to participate in future interviews. The youth serving agencies and adult allies were key to the success of this project as they were incredibly generous in allowing me to connect with the youth and often provided private space for the interviews. In some cases, adult allies also helped youth with scheduling interviews and remembering to show up.

I conducted interviews with a total of 40 youth (See Appendix A), who resided in 16 different zip codes throughout the greater San Francisco Bay Area. Sixty-two percent of participants were female (n=25) and the mean age was 16.7 years old. Reflecting the racial and ethnic diversity of the Bay Area, 25% of participants identified as white, 15% identified as African American, 27.5% identified as Latino/Latina, and 42.5% identified as Asian/Pacific Islander.[2] Fifteen percent of participants identified as gay, lesbian, bisexual, transgender, or queer (LGBTQ). Ninety percent of participants reported having been in some type of romantic relationship and 45% reported having had sexual intercourse. Although it was not an original focus of the interview guide, 100% of participants mentioned the influence that romantic and/or platonic peers had on their relationship and sexual behavior.

Interview Protocol

Before conducting the interview all participants under the age of 18 years old had to have written parental/guardian consent and had to read and sign written assents to participate. Participants over age 18 read and signed consent forms for themselves. The study protocol and interview guide (See Appendix B) were reviewed and approved by the University of California, Berkeley Committee for Protection of Human Subjects.

I allowed participants to identify the interview location in any location the adolescent identified as private, accessible and safe. As a result, interviews occurred in youth centers, clinics, private homes, and public libraries. Each interview lasted approximately 1 hour and every interview was digitally recorded and transcribed. Each participant received a $25 gift card for completing the hour-long interview.

At the beginning of each interview, all participants completed a short demographic survey that asked about age, gender, grade in school, ethnicity, education level of parents and zip code. The semi-structured interview guide (see Appendix A) included questions asking about early perceptions of romantic relationships, emotions related to romantic relationships and sexual behavior, beliefs and perceptions about sexual behavior, intentions related to safer-sex, and emotions related to safer-sex and boundary setting. While the guide did not explicitly ask about sexual or relationship experience, through the course of the interviews, all participants used specific examples from previous relationships or sexual experience in responding to questions. Similarly, while the demographic survey and interview guide did not explicitly ask about sexual orientation or gender identity, in the description of their own experiences with relationships, all participants discussed the gender of their partners or romantic interests. Because this was not explicitly asked, it is possible that the number of youth identifying as LGBTQ could be under-reported here.

Analysis

[2] Total is greater than 100% as participants could identify multiple racial/ethnic categories.

After the audio from each interview was transcribed, I verified the transcript and interview notes, and then entered it into HyperResearch, version 3.0.3, a qualitative data management software. Because the goal of this project was to better understand adolescents' emotions related to romantic and sexual behavior, I modified the grounded theory method and used reflective comparison to analyze the content of the data (Charmaz, 2006). After I had coded all of the interviews, I revisited a number of key themes that arose from the data that aligned with existing theory on adolescent sexual development. As the theme of peer influence emerged from the data, I extracted excerpts on peer influence from the transcripts and recoded these components using the classifications that had emerged from the original coding of the interviews. In addition, I reviewed all of the original transcripts to see if there were any additional places to code for peer influence. Five key themes related to peer influence in romantic relationships from a developmental perspective emerged from the data: motivations for early relationships, the role of platonic friends in romantic relationships, showing the world, pleasing partners emotionally and physically, and gaining perspective.

Results

As intended through the study design, it was very valuable to interview the 15-19 year old age group. While they could all clearly recall and describe their first relationship experiences, they also had important perspective and reflections on how their intentions, motivations and behaviors related to relationships had changed over time. When asked when they first became interested in having some type of romantic relationship, 30% reported interest prior to middle school and 55% reported interest at some point during middle school. This analysis focuses on the descriptions of their experiences in the early relationships that took place before early high school. At first look, it would be easy to dismiss these early relationships as insignificant given their quality and duration. The adolescents often reported relationships lasting no more than a few hours or days although some had relationships beginning in middle school that lasted multiple years. They also reported not always knowing whether or not they were really in a relationships or even talking to their partner while they were in it. When I asked if one 16-year-old Asian male had ever been in a romantic relationship he replied, *"Um, I don't think so because, they never last long"* but when I pressed further he admitted having had had physically intimate relationships with people he referred to as is his girlfriend. A 17 year-old Latino female also dismissed these early relationships describing, *"Like I had a whole bunch of boyfriends but like I didn't pay attention to them. They were just there. Like-like I wouldn't even hang out with them, like I just had them there."*

In alignment with prior research, other youth reported more connection with early partners and described that early romantic relationships provided essential emotional support they were not receiving from other relationships in their lives (Furman & Simon, 2008; Furman et al., 2007). A 18 year-old White female talked about how her romantic partners were more consistent than her other friends and described, *"He's really always there. Like, it's not like some of my friends, we can be close for a little bit and then like we'll have a little while where we don't see each other, don't speak to each other. And I feel like he's [her boyfriend] more, like*

of a constant friend, like always there." One 15 year-old Latino male further described the importance of romantic relationships he had in middle school as he stated, *" ...around that age, I um, with my family and stuff, I started to experience a lot of like difficulties with my family and a lot of obstacles. So when I had a girlfriend, the only mainly thing I looked for was just love. So, I wouldn't, if I was in a relationship with a girl, um, I wanted to feel love, because I mean, that's something I was missing…"* A 16 year-old Latino female recounted the importance of having the security of a romantic relationship, *"It was just nice having someone there for you…just being there for you when you're sad or when something's happened and you need someone to talk to. And just like the comfort feeling."* The most common emotions that young people reported experiencing in connection with early relationships were security and happiness. In describing a relationship in 5th grade, a 19 year-old Asian male recalled, *"I just knew that that [sic] girl was like really cute and we'd like talk on the phone and stuff and I was like ok, you know, she makes me happy and all that."* A 15 year-old White/African American female echoed similar experiences in her first relationship, *"I felt accomplished and I felt really happy and I was just happy for the both of us…"*

Overall, participants described that their lack of experience made it difficult to meaningfully participate in early relationships and affected their experiences. As one 19-year-old Latino female describes*, "I had my first boyfriend when I was in sixth grade. And you can, I guess you can say that was my first relationship. But back then, I didn't really know exactly what was a relationship, you know. I just thought you get to be with the guy you like."* As she looks back now, she has the perspective that *"…now I see it, that it was like, like a little crush, you know. I didn't know exactly what a relationship was."* Cautioning against dismissing the importance of these early relationships, the adolescents reported that these early relationships were very significant in shaping their future attitudes, beliefs and experiences in future relationships. As an 18-year-old white female asserted*, "I think going through the whole experiences of mostly being disillusioned with relationships right at the beginning of middle school, um, was very important. Because then I, I sort of learned from that I didn't want the superficial relationships that are just like the status and now we're dating and just sort of that…"*

Motivations for Early Relationships

Peer influence clearly arose when participants described what motivated them to engage in early relationships. Rather than thinking about what they would personally gain or get out of these relationships, the reason that young people often reported being interested in relationships was that their peers were interested in them. As a 17-year-old Asian female reports, *"I think that what was interesting was that everybody wanted one."* This was echoed throughout the interviews as a 15-year-old Latino male also articulated, *"I just thought that being in a relationship was cool like, ok, all the kids or everybody was in a relationship. It was like the thing to do and be, have a girlfriend, be in a relationship."* Many participants talked about how having a romantic relationship was particularly important for social status in middle school as highlighted by an 18-year-old Asian female, *"'Cause in middle school is, it was a lot about, like who was desired and who wasn't…like more people wanted to be your friend or yeah, more people wanted to talk to you."* Many participants described feeling left out or having

lower social status if they did not have an early relationship. Even young people who were comfortable with the decision not to have an early relationship acknowledged the social pressure to do so. As one 15 year-old Asian female shared, *"I think I'm pretty cool because I didn't, I haven't been in a relationship. And it's really hard for uh, people in high school or middle school because they are often so, they're surrounded by people who are in relationships."* This feeling of being left out was echoed by a 17-year-old African American female who had clear intentions not to engage in a romantic relationship prior to marriage in alignment with her religious beliefs. Despite being very clear and confident about her decision she shared, *"Like all my friends talk about these guys and their boyfriends, you know. I want to have like a little bit of that."* She went on to talk about how sometimes she would push her own limits and flirt with guys and described, *"I mainly do it just like to have more similarity with like my peers. Like you know, when they talk about their boyfriends and all, relationships, I'm just like the only one like quiet, pretending to do my work. And then like just, like having that experience will actually make me like, you know, be able to engage in those conversations."*

Beyond being motivated to have relationships based on the fact that everyone around them was having one, participants also clearly articulated that they were motivated to be in early relationships because they wanted to avoid hurting the feelings of the people with whom they were in relationship. More than attempting to appear cool in front of one's friends, young people were also very concerned that they would offend someone if they declined to go out with or date them. As a 16-year-old Latino male summarizes, *"They were interested in me, and that's kind of like also kind of the reason that I decided to. I just kind of didn't want to say, 'No, I don't like you back.'…'cause I didn't want to hurt any feelings and, you know."* A 15-year-old White female echoed this sentiment of not wanting to hurt someone's feelings by saying, *"I don't really think, um, I really wanted to be in relationships when I was um, like in them. But like, um, people, like ask me out so I like would feel bad, um, about saying like, no."*. Both male and female participants shared this concern about hurting or offending potential partners and often prioritized a partner's feelings over their own comfort or happiness.

Participants often realized that engaging in early relationships due to the peer influence led to a range of negative outcomes. Adolescents reported that they often felt awkward or uncomfortable in relationships that resulted from succumbing to peer influence. One 18-year-old Asian female reported, *"I felt really uncomfortable and it was kind of like, and it was, I didn't really start because I wanted to be [in a relationship]. It was kind of peer pressure and that kind of thing. And it's like really bad. And then, then, so I just broke it off after one week because I couldn't deal with it."* A number of participants described finding it difficult to resist partner's challenges to engage in a range of risk behaviors including alcohol use, ditching school or avoiding homework, sneaking out at night, and shoplifting. The topic of partners encouraging or asking youth to participate in shoplifting came up in a number of different interviews. A 15-old-Asian female felt that the pressure from romantic partners to steal was so significant in her peer community that it should be included as part of sex and relationship education in school. While she acknowledged the importance of learning the basics around STI and pregnancy

prevention and healthy relationships, she also felt that, *"…it [sex education] has to be more specific when it comes to like teaching us and stuff like that. About what's going on here."*

Following the developmental course of adolescence, young people reported that while peer influence was very significant in motivating early romantic relationships, that as they got older and gained experience, they were much more internally motivated when making relationship decisions. While romantic partners were significant in shaping relationship and sexual decisions, platonic friends also played a key role in motivating early relationships.

The role of platonic friends

> *"I've heard like rumors like, 'Oh my friend really likes you' and like 'Well your friend should probably just talk to me then, or something.'" – 17-year-old White Male*

Platonic peers have been found to be very important in the development of adolescent romantic relationships (Furman & Collins, 2009). Friendships serve as an important model for positive social interaction and provide important social support to young people engaging in romantic relationships (Furman & Collins, 2009). While adolescents reported that their friends did provide them with support before and during romantic relationships, they often also played a very active role in brokering relationships, especially early relationships. Many young people felt that their friends meddled in their relationships, often before they were even established. As a 15-year-old white female described, *"When I am interested [in someone], they're [my friends] all up in it and it's just not fun for me, 'cause they'll just make it way too obvious and it sort of just ruins our friendship."* Similarly, participants reported that their friends often tried to facilitate relationships with their partner's friends, family members, or other people. This often resulted in influence from both the platonic peer and the potential romantic interest. As one 18-year-old Asian female described, "*It's just kind of like a lot of pressure on me, 'Just like go with it, you know. He's a good guy.' I'm just like, you know, I feel really uncomfortable."* Although she felt very uncomfortable, this young woman decided to move forward and engage in the relationship. Rather than being a positive experience, this young woman recognized the challenge of pleasing her friends yet being stuck in a difficult situation. She summarizes this as she states, *"it's my friends and I don't want to disappoint them, and it's kind of like, and I just went with it. And then, just awful. Yeah, it was awful."* Similarly, a 15-year-old Asian male described how he felt badly upon finding out that his partner's sister had motivated her to date him, *" I didn't feel that good. She said um yes, cause her sister said so…[I felt] that she didn't really want to go out with me."* Some young people described specifically resisting when a friend tried to set them up because they didn't want to be motivated by their peers' desires. As one 18-year-old Latino male shared, *"And I didn't really know if she liked me or not until her, my neighbor told me. But then she told me, 'Oh, you should ask her out.' I didn't like that, that she told me I should ask her out. If I wanted to ask her out, I had to, you know, it had to come from me. I didn't, I didn't want to do it because somebody else told me to."*

In addition to friends creating challenges in romantic relationships, participants also described how having platonic friends involved in their relationships also had positive benefits. Having friends who were dating other friends often facilitated group dates and created more social cohesion. In describing the benefit of how she and two of her friends were dating 3 male friends, one 17-year-old African American female stated, *"So it was kind of like a group thing. And it seemed like when one person had a problem, we all had a problem. And we could understand each other. And I guess they [the male partners] can understand each other too.*" While this young woman described the benefit of this social cohesion, she also recognized that when two of the boys cheated on her and her friend, both of them continued to date their partners despite the infidelity. This situation created some tension in the friendships between the girls as she describes, *"One [friend] was like, um, you're stupid and stuff like that. You should see by now that it ain't worth it. And the other [friend] was like, I honestly can't tell you because I find myself doing the same thing."* While the participant decided to break up with her partner who had cheated, her friend decided to stay which continued to strain their friendship and contribute to feelings of social exclusion.

Beyond suggesting whom to do date, some of the participants described romantic relationships becoming somewhat of a game or a competition among their friends. One 16-year-old Asian male laughed as he described the challenge he and his friends have around dating*, "And then we bet against each other. I was like, 'Alright, I think yours is going to last six weeks and then you're going to lose feelings and then you're going to move on.' And he's like, and then he always asks me, 'Alright, alright, six weeks, ok, I could do that.' And he's like, "Alright, you're going to last three to four weeks, and then you're going to lose feelings, and then you're going to find someone new.' And then, like I want to, that's, that's what my friends and I do."* The participant went on to talk about how this type of challenge often resulted in a synchronized cycle of he and his friends looking for a new partner, dating, and breaking up. This coordination seemed to increase social cohesion with his friends and increase the opportunities for the friends to be cruising for new partners or dating people together. This same participant also talked about how having relationships outside of his school helped protect his relationships with his non-romantic peers. In reflecting on this he described, *"I always aim for people like to have a distance from me. So if I talk to them and it goes bad, then I won't run into them. So then like I keep myself safe. And then, I keep that good reputation where I'm a nice person."*

Showing the World

> *"Going places, and letting everybody know you guys are together, and pictures, and just love." – 16-year-old African American female*

Echoing prior research, once young people were in relationships, they talked about many of the benefits including having unconditional love, someone who was always there for them, increased social status, and an opportunity for engaging in coital and non-coital sexual activity (Laursen & Mooney, 2007). Another key benefit that young people reported gaining from being in a relationship was an opportunity to show the world the importance of their relationship. This resulted to increased social status as well as increased self-esteem. As one 18-year-old

Latino male stated, *"That way, once you already have that person, you can already like, you know, show the world."* An 18-year-old White female recognized the importance of even the little signs of affection in signaling the strength of her partner's commitment, *"Like, I felt just like good, him wanting to hold my hand and stuff when we were walking, so that I don't know, people would know we were together, and I just, it was just, it's just sweet."* Participants recognized that having someone engage in physical affection had a positive emotional impact. In describing what public displays of affection (PDA) added to a relationship, a 15-year-old Latino male shared, *"I guess, like, when somebody comes up to you and hugs you or gives you a kiss, something like that, you can like actually see it, like, they show you. So, it makes you feel special, makes you feel better."* Being willing to engage in romantic behavior in public was frequently described as a indicator that a relationship was going well. One 18-year-old Latino male described, *"If you're going to be with somebody, you shouldn't be embarrassed of letting the world know or just people see that you guys are together. So like in public, ok, maybe not kissing is the best things to do, but you know, just holding hands, like little minor things, doing, just doing little things like that…"*

Beyond engaging in relationships, the effect of having an audience was a very important motivator to engage in non-coital sexual behavior as well. Some participants valued PDA as a way to show people the commitment in one's relationship while others frowned on the idea and felt that the physical part of a relationship should be more private. Many participants recognized the double standard that PDA was more accepted for males and more frowned upon for females but this feeling was not unanimous. On the positive side, one 17-year-old Asian-Latino female described, *"I think the public displays of affection was the most interesting thing to me. For some reason that was really, almost like a trophy that you would carry around with you. Even if you were the girl. Um, yeah, just for other people to know that you were in a relationship felt, it, it looked like it was a good thing."* Despite valuing the opportunity to show the world about her relationships, this same participant later acknowledged the downside to PDA, *"I think it's all about um, just being mindful of the people around you. A lot of people um like, heterosexual relationships or homosexual, um it's still really uncomfortable a lot of the times to be around people who are like kissing each other, stuff like that. And also I started to think about like what difference does it make if people are around or if people can see you while you're displaying affection to your partner."* Interestingly, in reflecting on her experience with same gender relationships, this participant talked about how if one of the partners was not out to her friends and therefore unwilling to engage in PDA, it may also foster an opportunity for cheating as no one around them is aware of their commitment to one another. As a result, she felt strongly that PDA could have a protective affect in many relationships.

Not engaging in PDA or not being willing to show the world your relationship often was the source of problems and conflict. One 17-year-old Asian female recounted the experience of a close friend who's partner refused to hold her hand in public, *"And she was really upset about it, like, 'cause she said that like, they were a couple, but they never behaved like one in front of other people but he would do it like, in private…It was like kind of confusing for her because, like, she, um, like the relationship wasn't being expressed publicly."* An 18-year-old White female

described a friend sharing a similar experience, *"She was having a really hard time because like the guy she was going out with didn't really want to be around her. Like didn't want to like, let other people know about their relationship."* Being willing to show physical affection to one another in public was often described as a distinguishing factor between committed relationships and more casual encounters. In highlighting this distinction, one 18-year-old Latino male advised against public affection in less serious relationship by saying*, "So maybe the friends with benefits you might want to keep it on the DL [down low], cause it's not good to like let people know your business."*

Some youth reported looking down on others who flaunted the physical side of their relationships. As one 15-year-old White female reflected*, "It's just something that, like bragging about you got a new toy or something, kind of thing to them. Like it's just something they want to tell everybody about."* Another 15 year-old White female echoed a similar sentiment describing her experience at school*: "It's just like you walk down the hall, and on both sides you're surrounded by couples that are just like making out with each other. And it's like, I don't know, overwhelming."* A 16-year-old Asian male also shared his criticism of couples that always felt the need to show others their relationship, *"But then, there's always those relationships where, oh, we need to show everyone we're the cutest couple and how we've got to do this and do that and show like, throw themselves out there, so everyone knows they're together."*

Pleasing Partners Emotionally and Physically

> *"It can lead you to do something that you don't want to do, something that you're not ready for, something that you're not comfortable with. But you're still doing it because your partner is encouraging you." – 15-year-old Asian Female*

The idea of peer influence became very clear once young people were engaged in romantic relationships and making decisions about what types of relationship and sexual behavior they wanted to engage in. While explicit peer pressure often played a role in these decisions, most often, young people described the influence as much more subtle and implicit. The motivation for behavior often stemmed from youth speculating on what would please their partner emotionally or physically without ever assessing the true effect of their actions. Often, participants would not even begin their description of a decision they had made as stemming from peer influence and only through the course of their description would they realize for themselves what had motivated their behavior. Many participants surprised themselves during the course of the interview as they gained a better understanding of their own decisions. Participants widely perceived that perspective on past relationships was critical in order to gain perspective on motivations in earlier relationships and limit the potential for peer influence in future encounters. In contrast to most other themes in these interviews, this theme had a stronger gender divide which is reflected in the summary below.

When describing motivations to emotionally please partners, female participants frequently described that pleasing a partner led to increased emotional intimacy and security. A 19-year-

old Latino female summarized, *"I think it brings security pleasing, pleasing, because it's like this is what they're asking for and this is what I'll give. And if I give, they won't go away. Or…they'll keep on, you know, being there."* While recognizing the benefit of emotionally pleasing her partner, this young woman later realized that this desire to please her partner did not always serve her well. She later reflected, *"…at first I felt, it felt good because I was like ok, he cares. He likes me a lot you know. Um, I'm , I feel loved…So at the beginning it was cool. At the end it was like now, I can't do this no more you know."* Another 17-year-old Latino female highlighted the implicit motivation that led to her always trying to please her partner. In speculating what would happen if she did something to upset her partner she speculated*, "I think I was just scared he would get mad. And I don't know why but I'm always trying to please somebody."* Many of the young women talked about their co-dependent tendencies and how it led to suboptimal decisions in relationships.

Similarly, many young women talked about how efforts to please their partners led to unwanted sexual activity or engaging in unprotected sexual activity. In an attempt to understand her own motivation for engaging in a prior sexual encounter that was physically uncomfortable, one 15-year-old Asian-Latino female speculated that she was thinking about, "*Maybe what the other person is thinking or that I wouldn't want to ruin the mood. Or that maybe it will get better."* Although this young woman had a very sophisticated understanding of reproductive justice concepts and the importance of advocating for herself in relationships, she went on to describe a feeling of comfort in attempting to please her partners. She reflected, *"I like to hear what the other person wants or shares. Even if it's them leading something, um, I just feel comfortable. That it's about where they want to go and they're happy with it. I mean like they want to go there so if we get there, they'll be happy. So that all that is left for me to be happy to for us to both be happy."* Her motivation to be happy with her partner's happiness often led to her making sexual decisions that later felt uncomfortable and disempowering.

A 17-year-old Latina female reflected on the challenges she faced in advocating for herself in the context of sexual relationships. In describing her motivations for engaging in her first sexual relationship, despite not wanting to have sex she said, *"I guess I was scared that he would like leave me because I didn't want to do that [have sex]. And I was scared that was going to either look for some other girl to do it with even though he's still with me, and I didn't want, I didn't want that to happen."* She went on to describe her sexual encounters with that partner she could see, *"I don't feel like I'm enjoying this. Like I feel like I'm just doing this to make him happy and I felt like I shouldn't do that because it's me...It finally got to me and I was like, oh, I can't do this any more."* In reflecting on this experience this young woman described both sorrow and fatigue related to the burden of trying to please other people in her relationships, *"I can't please everyone you know. Even if I try to make people happy, like you can't be happy all the time. I can't make you happy all the time. It's just like, and I'm just tired. I feel, I feel sad…But I'm just tired of having to like, you know, do what you want, you know, just to make you happy."*

A 16-year-old Asian female was also described sacrificing her personal wants and needs in a relationship in order to keep the interest of her partner, *"I think a really common fear is having your partner loose interest in you. Like a lot of people tell me that if you wait too long they're going to loose interest in you so you want to keep it interesting. And that's probably why it's hard to speak up and that's not going to make your partner happy so you want to stretch it out."* She spoke of this very matter-of-factly as though this were common understanding and practice among her peer group. When I asked what her motivation was for prolonging a relationship, which she felt like she was making personal sacrifices to maintain without much other benefit, she sat thoughtfully and could not come up with any answer that satisfied her.

Even in relationships where there was clear communication about boundaries and limits, young women reported that they were often motivated to please their partners. One 18-year-old white female described a very positive relationship with her partner. While she was interested in becoming sexually active, she was still struggling with her familial values around pre-marital sex. In talking about this experience she described, *"It was really difficult. Because I--he obviously wanted to--have sex. But I was, like, still fighting through all these things in my mind. Like, "Should I wait?" Like all these different voices. I had no idea what I wanted to do. And we even got in, like, a fight. I know--he--I don't know. He was…asking me if I wanted to do it, and then, um, he--just some things he said. He said, like, "You know, you don't have to worry about birth control. Like, condoms are fine." And I'm like, "I want to be"--that really made me upset. I'm like, "I want to be 100 percent sure that nothing's going to happen" and stuff. Um, so that started it off… And I felt kind of, like, pressured, and just--awful. So we got in a fight over that."* Following the argument, her boyfriend brought her flowers, apologized and told her he was happy to wait until she was ready. This young woman felt that her boyfriend's willingness to apologize and maintain communication about sex was very loving and supportive and she soon after agreed to engage in intercourse.

Female participants commonly described maintaining sexual relationships in the hope that uncomfortable physical encounters would eventually get better. One of the female participants had developed such significant anxiety about pleasing their partners that she described having panic attacks while engaging in sexual intercourse. In an attempt to continue to please her partner and push through the anxiety, this young woman continued to engage in sexual intercourse in the hopes that she would feel better. The 19-year-old Latino female shared that she did it *"because I felt really bad"* because her partner wanted sex and she wasn't feeling comfortable. In a display of explicit peer pressure, she described her partner saying, "*Come on, come one, come on. It'll be ok. Like, I'll be, like come on, it'll be ok."* When I inquired as to how it felt to engage in intercourse again she responded*, "I did, I made the choice to start again, but once it kind of started, I just felt, I was beginning to feel horrible."* Recognizing her own co-dependency and extreme motivation to please her partner, this young woman finally decided to terminate the relationship and stated, *"It felt really good…just the fact that I'm kind of standing up for myself like that, it felt really good. Like really good. Because usually I'm like a big people pleaser."*

Beyond focusing on the negative effects of pleasing a partner, many of the female participants recognized the importance of balancing the needs and wants of their romantic partners with their own desires. Romantic relationships were an important place for young people to learn to balance their own needs with someone else's. In describing the challenge of obtaining this balance when setting sexual boundaries, an 18-year-old Asian female stated*, "I don't want to be the things that I want you know…I also want it to be like, things that he's comfortable with, he's ok with, you know. It's not just on me. It's kind of like, when you're in a relationship, you've got to learn how to balance, not just you, your life. It's also their life too."* An 18-year-old White female described having to make a difficult decision with a romantic partner and reflected, *"We did end up decided something that was sort of against what she might have wanted on her own."* She felt that this process of making a collaborative decision with a partner had a very positive outcome even though it required compromise but valued that her partner had been wiling to accept the less personally favorable outcome in favor of something that served both of them best.

While the males I spoke with described many fewer challenges with being motivated to please a partner emotionally and physically leading to undesirable sexual behavior, some did echo the females' concerns. One 15-year-old White/African American/Asian male reported that pleasing his partner significantly influenced his decisions about how much time to spend with his partner and what they did together. Feeling more confident in his own ability to protect his own feelings, than his partner's capacity to protect hers he stated*, "So it's more about if she's happy, then I'm happy because I feel that if I'm not very happy, I actually have kind of an escape goat [sic]."* Many young men described being very open to sexual experiences and setting their sexual boundaries based on what their partners were willing to do. In contrast, one 16-year-old Asian male reported that the expectation that males were supposed to be sexually assertive had led him to engage in sexual behavior that felt personally uncomfortable. This perceived expectation led to him describing his boundaries as*, "...to me, for my significant other, whatever she's willing to do, I'm willing to do."* Rather than engaging in a dialogue to negotiate safer sex, this young man prioritized physically pleasing his partner over pleasing himself emotionally,

This social role of men as sexual aggressors also created challenges for other young men. One 19-year-old Asian male was concerned that this perception may result in his partners feeling that they could not communicate their own wants and needs in the context of the relationship. He described his inner dialogue during sex as*, "Like when we're about to do certain things you know, it just in the back of my mind like…but I'm just like dam, does she even really like want this or is she just doing this just because like I'm doing this, you know."* Currently in a very intimate, important relationship, this young man is striving to ensure the communication in his relationship allows for his partner to clearly communicate her desire and preferences in attempt to avoid behavior motivated by the desire to please. Another 16 year-old Asian male reported being pleasantly surprised by a young woman who was more sexually aggressive, but despite her initiating the encounter he expressed concern about her motivations: *"I think a lot*

of things were going through my head…I was scared if she was ok with it. I was thinking about whether or not we would do it again."

A number of young men said that they were motivated to stay in relationships they had attempted to end because they saw the pain and discomfort the break-up was causing their partner. A 19-year-old Asian male reported that observing the emotional impact of breaking up had repeatedly kept him from ending relationships. Attempting to break up with one partner after two months of dating he described, *"She was crying and stuff like that so I had to like, I felt really bad, so I like, took her back in."* While this relationship only lasted another 4 months, a later experience resulted in him dating a romantic partner for over a year and a half that he had attempted to leave after only 2 weeks. In this instance, while he was feeling little interest in the relationship, his partner inquired 2 weeks into the relationship whether or not they were officially dating. Instead of expressing his lack of interest, he instead agreed that they were dating. He described a feeling of powerlessness stating, *"I mean, like she basically trapped me. And then we didn't like, we didn't really have sex yet, and like, like that was a trap. Like you can't really do that to someone I feel."* While he admitted that part of his motivation was to have sexual intercourse with this young woman, he also reflected that the cost of trying to please her with the title of the relationship led to a very destructive relationship for both partners.

Other young men shared this motivation to stay in relationships because they didn't want to hurt someone's feelings. When describing his own attempt to terminate a relationship, another 19-year-old Asian male declared, *"I also, like, felt bad about it, letting her go and stuff. I was like, felt like ratting someone out or something, I don't know."* While there were times that the males perceived their partners to be vulnerable due to very real family or other external circumstances, many times the partners were not in difficult situations. A 17-year-old Asian male described being motivated to stay in a relationship based on his partner's potential reaction. When I asked what prevented him from getting out of a relationship he perceived as negative and personally destructive, he responded, *"Her yelling at me. Yes, yes, that was it. I was scared of her."* His fear of her anger and her disappointment resulted in him staying in the relationship where this young woman continued to yell at him, break his cell phone, and often derail his personal plans with her emotional outbursts. Despite this conflict in the relationship, he was afraid that things would be worse if he broke up with her and felt that she might even do something destructive to his house or target his family members.

Gaining Perspective

> *"I finally realized that like I don't have to like date a guy just because he's interested in me. Like if I don't want, if I would like feel embarrassed, like having him like walk down the hall with me and like everyone knowing that we're like dating, then it's obviously just not going to be a good relationship." – 15-year-old White female*

In alignment with the developmental perspective that romantic relationship increase in importance and intensity through out adolescence (Mayeux & Cillessen, 2007), and the

accompanying neural development which leads to increased social, emotional and cognitive control, participants reported that their motivations and expectations for romantic relationships shifted throughout the course of adolescence. While valuing the importance of early relationships, youth often reflected on early relationships as foolish or immature. Looking back on earlier experiences, a 15-year-old White female speculated*, "I think it was just peer pressure kind of thing, 'cause everybody was getting into dating. And I just wanted to be part of it. But then I realized that I realized that it wasn't it, it didn't actually, it wasn't that fun. It was just peer pressure."* Recognizing that peer influence motivated her behavior to engage in earlier relationships, this new perspective motivated this young woman to take a break from dating and focus more on herself in early high school. A 16-year-old Latino male looked back on his earlier relationships in which he made a number of sacrifices to please his partners and reflected, *"See the thing is, when it was during the relationship, I didn't see it as wrong at all. And it looks completely different now. It just looks weird."* From his position now in a much more balanced relationship from which he was getting a great deal of personal satisfaction and described good balance with his partner, he struggled to understand his earlier willingness to succumb to peer influence.

Many of the young people described how peer influence in their early relationships sometimes had very positive outcomes. In alignment with prior research, participants felt that one of the greatest benefits of early relationships was having someone in their life to care for and support them (Furman et al., 2007). A number of participants reported that romantic partners had motivated them to hang out with more positive platonic peers, improve their academic performance, or get along better with their parents. The youth often talked about the challenge of balancing the positive and negative peer influence from romantic partners in early adolescence. A 19-year-old Asian male looked back on some of his past relationship choices and struggled to resolve the issue of peer influence, *"I mean I don't know…you know, there's good peer pressure and whatnot. And then, like sometimes it's good peer pressure, some bad peer pressure."* Like this young man, many participants struggled to resolve how to accept more positive peer influence and resist the negative.

Discussion

Adolescence serves as a critical time for important social, emotional and cognitive changes. Simultaneously, it also serves as a time for individuals to first experience romantic relationships and accompanying coital and non-coital sexual behavior. Throughout the developmental arc of adolescence, young people increase their capacity to resist peer influence (Steinberg & Monahan, 2007; Sumter, Bokhorst, Steinberg, & Westenberg, 2009). The intersection of development, relationship experience, and vulnerability to peer influence results in a number of challenges as adolescents navigate early romantic and sexual relationships. A range of studies have demonstrated that peer presence and peer influence leads to sub-optimal decision making and increased risk-taking across a range of behaviors (Gardner & Steinberg, 2005; O'Brien, Albert, Chein, & Steinberg, 2011; Sullivan et al., 2012), while other research has argued that peer influence may have a more limited role in adolescent risk behavior (Jaccard, Blanton,

& Dodge, 2005). The adolescents in the current study revealed that the true role of peer influence is very nuanced and complex. In these interviews, adolescents described multiple ways in which peers influenced their behavior in early romantic and sexual relationships, and the effect these experiences had on their on future decisions. These interviews highlighted that peers play a very influential role in how, why and when adolescents initiate, maintain and terminate early relationships. The majority of the peer influence that occurred in these relationships was not explicit peer pressure to engage in specific activities, but instead, much more subtle, implicit influence that may not have even been intended by the involved peers.

Chan and colleagues recently conducted research attempting to explore how implicit suggestions by peers contribute to adolescent risk taking (Chan, Tong, & Moh, 2012). Through a series of experiments, they were able to demonstrate that priming adolescents with a friends name led to increased risk-taking on computer tasks (Chan, Tong, & Moh, 2012). This suggests that even when adolescents are not explicitly aware of peer influence, it still affects behavior. This results of this study coupled with the results of these interviews suggests that efforts to improve adolescent relationship and sex education programs need to come up with new and innovative ways to address the idea of peer influence. While traditional sex education curricula often include sessions on healthy relationships and sometimes address avoiding peer pressure, they do not adequately tackle the subtlety of the issue. Exploring creative ways to conduct more ecologically valid research exploring the implicit role of peer influence on adolescent romantic and sexual behavior holds promise for increasing the impact of interventions designed to improve these decisions. Interventions to support positive decision-making in the context of early romantic and sexual relationships must become more effective at addressing this concept of risk.

In this study, the perceived outcome of succumbing to peer influence also resulted in important gender contrasts. Some prior research has described males as being more vulnerable to peer influence, especially in early adolescence, while other studies have shown females as being more likely to conform to influential peers (Sumter et al., 2009). The narratives youth provided in these interviews suggest that rather than one gender being more or less influence by peers, that the context of peer influence is highly significant. While males and females described responding to peer influence very similarly regarding choosing to initiate early relationships, showing the world about their early commitments, and coping with influence of their platonic peers, a significant divide arose when adolescents talked about their motivations to please their romantic partners. Many of the young women described attempts to keep their partners emotionally and physically happy so that they would remain loyal. In contrast, many of the young men described staying in relationships because they did not want to hurt their partners or did not want to become the target of their partner's anger. While the motivations for these behaviors were very different, the result was often the same. In both cases, males and females reported compromising their own wants and needs to in some capacity please their partners. In some instances, young people reported experiencing explicit peer pressure to engage in behavior in order to maintain relationships but in most cases, adolescents were speculating about what would please their partner. This current research suggests that measuring

resistance to peer influence across adolescence on quantified scales may miss some important contextual factors that contribute to variations in vulnerability. Coupling quantitative scales with context specific narratives will expand our understanding of peer influence on adolescent sexual behavior.

One limitation of this study is that it asked people to engage in a very cognitive process to describe their feelings associated with early sexual experiences. Some research has argued that self-report of peer influence during adolescence is not reliable and may not allow young people to describe the subtle ways in which they are being influenced (Jaccard et al., 2005). These interviews represent only the information that participants were able and willing to explicitly describe. While asking people to cognitively describe prior emotional states is not an ideal measure of a very subtle and nuanced process, the capacity for adolescents to explicitly articulate their experiences and emotions related to peer influence and romantic and sexual behavior suggests that this line of inquiry deserves additional attention. A second limitation of this research is that by definition, implicit processes cannot be described through conscious introspection (Wiers, Teachman, & De Houwer, 2007). As a result, these cognitive self-report provide very limited insight into implicit attitudes. While this may be true, the complex ways in which adolescents described peer influence in these interviews suggests that it deserves closer attention. Given that these adolescents were able to explicitly articulate a great deal about peer influence as they reflected on earlier romantic experiences suggests that the true effect of peer influence is likely much greater than they describe. A better understanding of the implicit processes of peer influence may shed important light on how it motivates early romantic and sexual behavior.

Neuroscience, behavioral sciences, and social sciences all have important lines of inquiry that contribute to our improved understanding of adolescent's early decision-making (Boyer, 2006). Additional interdisciplinary research to explore the role that peer influence has on early romantic and sexual behavior holds promise for better understanding the reciprocal effect of neural development and behavior. Helping young people anticipate and respond to the peer influence they experience when navigating early romantic and sexual relationships holds promise for improving young people's experiences. Many of the participants in this study acknowledged the importance of their early relationship experiences in shaping their current attitudes and beliefs about relationships. For the young people engaging in undesired sexual activity or maintaining emotionally harmful relationships in response to peer influence, developing interventions to improve their capacity to more effectively resist peer influence is critical. Interventions that improve the quality of early romantic relationships by addressing the impact of peer influence holds promise for shaping healthier relationship trajectories.

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V. Conclusion

The research components I present in this dissertation contribute to an exploration of the role of affective weighting in adolescent romantic and sexual decision-making. I recognize that this dissertation is a small contribution to a long line of interdisciplinary inquiry needed to fully understand this complex issue. As an inherently affectively charged, peer-involved activity, adolescents face unique challenges when making sexual decisions. Each of the papers in this dissertation represents an important component that will improve our understanding of the role of affect and emotions in adolescent romantic and sexual decision-making. The significance of this dissertation lies in its efforts to bridge the divide between the fields of affective neuroscience and public health. My hope is that this work will contribute to innovation in sex education policies and practices by expanding the discussion beyond the rational decision-making framework. By presenting the opportunity to integrate emotional and affective weighting into the theoretical underpinnings of sex education interventions and increasing their potential for success, this project challenges the status quo of dedicating resources and funding towards adolescent sexual health interventions with little demonstrated efficacy.

In the first paper, I discussed how existing research from developmental neuroscience could be used to better inform school-based sex education policies and practices. While it is true that additional research is needed to improve the impact of sex education, steps can be taken now to integrate existing knowledge into the development of sex education theory, policy, practice, and evaluation. The impact of existing sex education programs has been stagnant for much too long. Over the last twenty years we have not seen any significant innovation that has led to profound improvements in the sexual health status of U.S. youth as a result of school-based sex education. Efforts need to be made to engage public health practitioners and policy makers in a dialogue to explore new and innovative ways, to improve sex education efforts. Engaging interdisciplinary experts in neuroscience, social sciences, behavioral economics, and public health holds great promise for informing improved school-based sex education.

The results of the second paper showed that emotions have a significant effect on the gap between intention and behavior. While adolescents did a poor job of anticipating the emotional outcome of a risk and the effect it would have on their own behavior, they were able to ignore the emotional influence when giving more rational advice to a peer. This research did not allow for a more ecologically valid exploration of role of affect in the intention-behavior gap in sexual decision-making, but the results invite further inquiry. Given that adolescents have a significant gap between their sexual intentions and behaviors and that sexual encounters are highly affective experiences, a better understanding the role of affect in these decisions is crucial. In addition, developing creative intervention strategies that maximize adolescents' capacities to mediate affect when giving advice holds great promise. Role-plays and other advice giving simulations in existing curricula do not seem to generate the necessary affective response. As we develop a better understanding of the role of affect on the sexual intention-behavior gap, creative solutions that involve computer simulation or provide an opportunity for

young people to implicitly engage advice-giving perspective when making sexual decisions may prove fruitful.

In the last paper, I provided a qualitative analysis highlighting that peer influence plays a significant role in adolescents' early romantic relationships and sexual behavior. Rather than presenting in the form of explicit peer pressure, most of the peer influence that motivates adolescent romantic and sexual behavior is very subtle and implicit. While the 15-19 year-olds who participated in these interviews were able to reflect back and describe how their decisions were driven by peer influence, they often recognized that they did not have that perspective while they were making the decisions. In addition, they described how these early experiences with the affective outcomes of their decisions were important in shaping their current capacities to make better choices. As a result, future research should explore ways to provide appropriate scaffolding so that adolescents can benefit from early romantic and sexual experiences but avoid the negative outcomes motivated by peer influence of engaging in unwanted sexual behavior, contracting an STI, or experiencing an unintended pregnancy. Future research should also continue to explore the subtlety of peer influence in order to better inform interventions to improve the quality of adolescents' early romantic and sexual relationships.

The goal of this dissertation is not to encourage abandoning existing sex education strategies, but instead an attempt to expand the discussion beyond the traditional framework shaping these interventions. Enhancing our understanding of how developmental and contextual factors influence the role of affect in adolescent sexual decision-making increases the potential for sex education to improve adolescent sexual health outcomes. Given the importance of early romantic and sexual relationships in adolescent development and sexual socialization, young people deserve to have a framework that allows them to safely explore these choices. One of the young women who I spoke to for this research summed up the importance of sexual intimacy in her relationships:

> *"I feel like it's important in a relationship because, I mean, I feel like we're humans. And we need it, you know, in a way. So I mean, if you guys -- if-if the -- if the two persons love each other, why not, you know? That's how I feel….I don't know if it's for most people. But to me, it makes me feel like it's a-a lot better. Um, I feel like -- like the more people are open about it, it's like, you -- I feel like it makes you really think about it, you know. Like -- mmm. How can I explain? Like-like I feel like people need it because, like I said, that's just part of life." – 19 year-old Latino female*

It is a young person's job to engage in sexual experimentation and exploration to contribute to their healthy sexual development. As this young woman claims, she feels like she needs it as a part of her life. In response, as a public health practitioner, I feel the need to explore ways to enhance the positive and diminish the negative outcomes of adolescent sexual experiences. I view this dissertation as an initial attempt to better understand and address the role that affect

plays in adolescent sexual decision-making and to propose ways to use the information to improve sex education policies and practice.

VI. Appendix A – Interview Participant Demographics

Age	Gender	Ethnicity	Relationship	Sexually Active	LGBTQ	Age first interested in relationships
16	F	API	Y	Y	N	unknown
17	F	API/L	Y	Y	Y	6th grade
16	M	L	Y	Y	Y	Middle School
15	F	W	Y	N	N	6th grade
15	F	W	Y	N	N	3rd grade
18	F	W	Y	Y	Y	12 years old
16	F	L	Y	N	N	10 years old
15	F	W/AA	Y	N	Y	6th grade "little kid"
18	F	L	N	N	N	6th grade
15	F	W	N	N	N	11 years old
16	M	L	Y	N	Y	7th or 8th grade
17	F	L	Y	N	N	15 years old
15	F	W	Y	N	Y	7th grade
17	F	API	Y	N	N	9th grade
18	F	W	Y	Y	N	10 or 11 years old
18	F	API	Y	N	N	Middle School
19	F	L	Y	Y	N	Middle School
19	F	L	Y	Y	N	5th grade
16	M	API	Y	N	N	13 or 14 years old
15	F	API	N	N	N	9 years old
17	F	AA	Y	Y	N	13 years old
17	F	AA	N	N	N	12 yo/ 7th grade
17	F	L	Y	Y	N	15 years old
16	F	API	Y	N	N	"little kid"
19	M	API	Y	Y	N	10 - 4th grade
15	M	L	Y	Y	N	9 or 10
18	M	L	Y	Y	N	8th grade
16	F	AA	Y	N	N	13 years old
18	F	API	Y	Y	N	Middle School
18	M	API	Y	N	N	High school
16	F	AA	Y	N	N	9 or 10 years old
17	M	W	Y	Y	N	8th grade
19	M	API	Y	Y	N	5th grade
19	M	API	Y	Y	N	6th grade "little kid"
17	M	API	Y	Y	N	15 years old
15	M	API	Y	N	N	15 years old
15	M	API	Y	N	N	10 years old
15	M	W/AA/API	Y	Y	N	7th grade
15	M	W	Y	N	N	6th grade/ 12 yo
18	M	API	Y	N	N	7th grade

VII. Appendix B – Youth Interview Guide

Based on the Grounded Theory model, not all questions will be asked of all participants. In addition, some questions that do not appear on this list may be included if relevant to the course of the interview.

1. How would you define a healthy relationship?
2. How old were you when you started thinking about relationships? What made you start thinking about wanting to be in a relationship?
3. Tell me about some of the relationships you have been in. Who have you dated? How long were your relationships?
4. What is the best part about dating someone?
5. What is the worst part about dating someone?
6. When you are in a relationship, what makes you feel the best? Tell me about a time when you felt really good about a relationship.
7. When you are in a relationship, what makes you feel really bad (angry, sad, etc)? Tell me about a time when you felt really bad (angry, sad, etc).
8. Tell me about a time in a relationship when you expected to feel one way and ended up feeling another way. How were your expectations different from the reality? How did that change how you felt about the relationship?
9. When you talk with your friends or think about getting together with someone or having sex, what do you think you will feel?
10. When you use the word "sex" what does that mean to you? What things does it include? What things doesn't it include?
11. After you have gotten together with someone or had sex with them, when you talk with your friends or think about it, how do you feel?
12. When you remember getting together with someone or having sex, how do you think you will feel? (Probe: You said you felt _____, tell me more about that. What led to you feeling that way?)
13. When you thinking about being physically intimate with someone, how do you hope it will make you feel?
14. When you remember being physically intimate with someone, how do you remember it making you feel?
15. Thinking about the difference between how you hoped to feel and how you remember feeling, what you do think you will feel about being physically intimate with someone in the future?
16. When you think about having sex in the future, what plans do you have to protect yourself

from pregnancy (getting someone pregnant) or STIs (sexually transmitted infections)? On a scale of 1-10 (1 being not at all and 10 being all the time) how often do you (think you will take actions to) protect yourself when having sex?

17. When you think about any gap between the plans you make to protect yourself and what actually happens, what do you think happens that makes it difficult to protect yourself?
18. How do (would) you feel when/if you plan(ned) to use protection during sex and don't?
19. How do (would) you feel when/if you plan(ned) to use protection during sex and you do?
20. When you think about your current or future relationships, what would you hope the physical part of your relationship to look like? How do you hope you will feel about it?