

ABSTRACT

Title of Document: ANALOGUE STUDY OF PEER INFLUENCE
ON RISK-TAKING BEHAVIOR IN OLDER
ADOLESCENTS

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Psychology

An accumulation of research has demonstrated that peers play a considerable role in older adolescent risk behavior engagement with risk taking often occurring in the presence of peers. Yet, questions remain about how peer influence manifests in the immediate context of risk behavior engagement and consequently whether the influence of peers has been overestimated. It is uncertain whether a situational effect takes place whereby the presence of the peers and/or their influence in that moment is key. Additionally, it is unclear whether certain adolescents are more or less susceptible to peer influence. To better understand the proposed influence of peers during risk-taking behavior, the current experimental study aimed to examine whether peers do act in a riskier manner in the presence of peers and further whether peer presence alone influences risk behavior or if a direct influence process is necessary. Further, the study aimed to examine potential moderators of peer influence. Utilizing

a behavioral task assessing risk-taking behavior, 183 older adolescents (M age = 19.16, SD = .57, 63.9% female, 53.0% non-Hispanic White) came to the lab alone once and then were randomized to one of three conditions (alone, peers present, peers encouraging). If the target was randomized to peers present or peers encouraging conditions, the target brought in two, same-gender close friends for the second session. A repeated measures ANOVA with the within subject factor as the risk task score at each session and the between subjects factor as condition revealed a significant interaction of session by condition ($F(2, 180) = 11.38, p = .001$; partial $\eta^2 = .11$) such that at the baseline session there were nominal differences between the three conditions but at the experimental session there was a significant increase in risk task scores particularly for the encouraging condition. None of the proposed moderators had a significant effect, suggesting that the experimental conditions had an equal effect across participants. These findings support the idea that older adolescents take more risks when being encouraged by peers but that the presence of peers on its own does not lead to more risks than when completing the task alone.

**ANALOGUE STUDY OF PEER INFLUENCE ON RISK-TAKING BEHAVIOR IN
OLDER ADOLESCENTS**

By

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Chapter 1: Introduction

Proposal Overview

Older adolescence (ages 18-20) is a period of heightened risk-taking behavior. In particular, this period has been characterized by the propensity towards engagement in risky behaviors (e.g., substance use and abuse, risky sexual behavior, reckless driving) that have the potential for serious physical and psychological consequences. An accumulation of research has demonstrated that peers play a considerable role in older adolescent risk behavior engagement with risk taking often occurring in the presence of peers. Although extant literature has provided insight into the means by which peers may influence risk behavior engagement, there continue to be a number of limitations. As such, questions remain about how peer influence manifests in the immediate context of risk behavior engagement and consequently whether the influence of peers has been overestimated. It is uncertain whether a situational effect takes place whereby the presence of the peers and/or their influence in that moment is the key factor. Further, if a situational effect is the cause, whether it is the presence of peers alone (i.e., indirect influence) or a direct influence process (i.e., a peer encourages a behavior) that can lead to increased risk behavior. In addition, it is unclear whether certain adolescents are more or less susceptible to peer influence.

To better understand the proposed influence of peers during risk behavior engagement, the current experimental study aimed to examine whether peers do act in a riskier manner in the presence of peers and whether peer presence alone influences

risk behavior or whether a direct influence process (e.g., peer encouragement of risk behavior) is necessary. Furthermore, the study aimed to examine potential moderators of peer influence in order to identify factors that impact vulnerability to these peer effects. A behavioral task assessing risk-taking behavior (i.e., Balloon Analogue Risk Task: BART; Lejuez et al., 2002) was used as the outcome measure given it provides a well controlled paradigm with an easily quantifiable index of risk and as it has been shown to be related to real world risk behavior, indicating its validity for the goals of the current study. Older adolescents came to the lab alone once and then were randomized to one of three conditions (alone, peers present, peers encouraging). If the target was randomized to peers present or peers encouraging conditions, he/she was asked to bring in two same-gender, close friends for the second session (experimental session). In the alone condition, he/she came back without friends. This design allowed for the examination of differences in risk behavior when peers are a) not present; b) in the same room and able to see participant behavior on the risk task, but unable to provide any form of advice or encouragement in any way; and c) in the same room, able to see participant behavior on the risk task, and given the instruction to encourage risk behavior. In this way, it is possible to isolate peer presence and awareness of behavior from the additional influence of risk encouragement.

Older Adolescence as a Period of Heightened Risk-Taking Behavior

Older adolescence (ages 18-20; Clark & Moss, 2010) can be defined as a period of exploration of identity and one's place in the world (Zarrett & Eccles, 2006). Older adolescents achieve new levels of independence from their parents,

adopts considerably greater responsibilities, and often make important life decisions on their own for the first time. Although this age period is potentially an exciting time of positive change and growth, this period of transition also is marked by engagement in a variety of risk-taking behaviors, with the potential for very serious life-altering negative consequences. Research on risk taking has encompassed a variety of behaviors including alcohol consumption, tobacco use, risky sexual activity, dangerous driving, interpersonal aggression, and delinquent behaviors (Boyer, 2006). In their classic book on the topic, Jessor and Jessor (1977) defined risk taking as engagement in “behavior that is socially defined as a problem, a source of concern, or as undesirable by the norms of conventional society and the institutions of adult authority, and its occurrence usually elicits some kind of social control response” (p.33). Focusing more explicitly on the consequences of such behavior, definitions of risk taking also have taken into consideration the possibility of positive outcomes and thus have focused on the balancing of potential for harm or danger to the individual with potential achievement or reward (Byrnes, Miller, and Schafer, 1999; Leigh, 1999). This latter view is important because it leaves room for the influence of a variety of factors that affect an older adolescent’s willingness to take risks including the potential gain from risks in terms of positive reinforcement and the corresponding opportunity costs for an unwillingness to take risks.

Rates of participation with most drug use, alcohol use, and unprotected sexual activity have been found to peak during older adolescence and then to decline during adulthood (Johnston, O’Malley, Bachman, & Schulenberg, 2005). This decline has been linked to the assumption of new roles and responsibilities such as marriage,

parenthood, and employment (Schulenberg, O’Malley, Bachman, Wadsworth, & Johnston, 1996). College typically delays the assumption of many of these adult responsibilities and expands the period during which high levels of risk-taking behavior such as substance use can be sustained (Schulenberg et al., 1996). The following paragraphs provide an overview of the prevalence of a number of risk-taking behaviors (alcohol, illicit drugs, smoking, and risky sexual behavior—of note, the behaviors described are not all-inclusive, other important behaviors are dangerous driving, interpersonal aggression, and delinquent behaviors) among older adolescents in college settings, when possible comparing to non-college attending youth.

Alcohol

Individuals entering college show marked increases in alcohol use compared to those that live at home or obtain jobs following graduation from high school (Johnston, O’Malley, Bachman, & Schulenberg, 2009). For example, college students “binge drink” (i.e., having five or more drinks in a row at least once in the past two weeks) significantly more often than other young adults (40% vs. 30%; Johnston et al., 2009). However, in high school, college-bound seniors are less likely to report heavy drinking than non-college-bound youth. This suggests that emerging older adolescents in college “catch up to and pass” their non-college-attending peers (Johnston et al., 2009). Alcohol is considered to be a prominent part of the college culture, present at most social functions and part of many peer interactions (Thombs, 1999). Excessive drinking among college students is associated with a variety of negative consequences that include fatal and nonfatal injuries; alcohol poisoning; blackouts; academic failure; violence, including rape and assault; unintended

pregnancy; sexually transmitted diseases, including HIV/AIDS; property damage; and vocational and criminal consequences that could jeopardize future job prospects (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994; Wechsler, Lee, Kuo, & Lee, 2000; Wechsler et al., 2002).

Illicit Drug Use

As with alcohol, the general trajectory for illicit drug use is an increase in adolescence, peak in older adolescence/young adulthood, and then decline through adulthood (Arnett, 2005; Bachman et al., 2002; Bachman, Wadsworth, O'Malley, & Schulenberg, 1997; Chen & Kandel, 1995). According to the 2004 National Survey on Drug Use and Health (SAMHSA, 2004), rates of past month illicit drug use climbed steadily for youth from 12 to 17, peaked among 18 to 20 year olds, and remained high for those between 21 and 25 before dropping for persons 26 through 29. In addition to continuing use, initiation of substances also occurs during this time period; for example, one third of new marijuana users start using after age 17 as do about 70% of cocaine users (Volkow, 2004). In terms of variation in use among college attendees and non-attendees, illicit drug use has been increasing on college campuses since the mid-1990s (Mohler-Kuo, Lee, & Wechsler, 2003). However, college students differ only modestly from their non-college peers in their rate of drug use and types of drugs used (Johnston et al., 2005). The annual prevalence (i.e., use of the drug in the past year) for the use of any illicit drug among college students is 36%, compared to 39% of counterparts not attending college (Johnston et al., 2005), and when considering only drugs other than marijuana, rates are 19% for college students and 24% for terminal high school graduates. Thus, illicit drug use among

college students does not appear to exceed rates of use in the general young adult population, and for certain drugs, rates appear to be somewhat lower in the college student population.

Cigarette Smoking

Research shows that smoking initiation typically occurs in the teenage or high school years (Johnston et al., 2005). Although the majority of smokers begin in these years, many become dependent on nicotine in the older adolescent/young adult years of ages 18–24 (Ellickson, Perlman, & Klein, 2003). Smoking in this developmental period is of concern as the rate of smoking in the 1990's declined in all age groups except ages 18–24 (Hebert, 2004). At present, those aged 18–24 years have the highest prevalence of smoking (24.4%) compared with all other age groups (American Cancer Society, 2007). Cigarette smoking occurs less frequently in the college student population than in the general young adult population (5.6% vs. 16%; Johnston et al., 2005).

Risky Sexual Behavior

Adolescents and young adults are more likely than older adults to have multiple sex partners, to engage in unprotected sexual intercourse, and to select higher risk partners (Bearinger, & Resnick, 2003; CDCP, 2003). Half of all new HIV infections occur among individuals aged 24 years and younger (Futterman, 2005). Adolescents and young adults aged 15–25 years have the highest rate of sexually transmitted diseases (STDs) of any age group in the United States (CDCP, 2005). Emerging evidence indicates a higher prevalence of sexual risk behavior among non-

college youth, thought to be due largely to a continuation of patterns of higher risk behavior and lower academic performance during high school (Bailey, Fleming, Henson, Catalano, & Haggerty, 2008). Yet, risky sexual behavior is also prevalent among college attendees. For example, many college students do not report using condoms consistently (Kiene & Barta, 2003, 2006; Kiene, Barta, Zelenski, & Cothran, 2005). Furthermore, college women are one of the two groups, the other being female STD clinic attendees, with the highest prevalence of human papillomavirus (HPV) in the United States (Revzina & Diclemente, 2005).

In sum, older adolescence, the transition period between high school and young adulthood, is marked by the formation of identity and transition to new adult-type roles. Yet, it is also a time of increased risk-taking behavior, which can have long-term effects. Attending college may represent a special risk to older adolescents for some risk-taking behavior such as drinking.

Factors Associated with Risk-Taking Behavior: Relevance of Peers

A number of factors have been found to be related to risk-taking behavior in older adolescents (Rolinson, & Scherman, 2003; White, & Jackson, 2004), including individual difference variables (e.g., impulsivity and sensation seeking), cognitive variables, (e.g., expectancies, perceived risk and benefits), coping strategies (e.g., relief from negative feelings), and environmental contexts (e.g., parental influences, availability of substances). Beyond these variables, an accumulation of research has demonstrated that peers play a considerable role in older adolescent risk behavior engagement (Borsari & Carey, 2001). As compared to adults, one of the hallmarks of adolescent risk taking is that it often occurs in the context of peers (Steinberg, 2009).

The degree to which an adolescent's peers use alcohol or illicit drugs has been identified as a strong predictor of that adolescent's own substance use behavior (Chassin et al., 2004). Freshmen whose social networks consist mainly or entirely of abstainers are less likely to initiate alcohol use or drink heavily (four/five or more drinks per occasion) than students whose social networks consist predominantly of drinkers (Reifman, & Watson, 2003; Baer, Kivlahan, & Marlatt, 1995). This also has been shown prospectively from high school: recent work suggests that having fewer friends who use substances protects against increases in the frequency of alcohol use, heavy episodic drinking, and marijuana use as one transitions out of high school and into college (White et al., 2006). Beyond the beginning of college, a longitudinal study of 294 young adults, ages 19 to 25, and both a same- and an opposite-gender best friend or romantic partner found similarity across time between both peers and the young adult in cigarette use, alcohol use, and binge drinking (Andrews, Tildesley, Hops, & Li, 2002). In prospective analyses, peer use predicted young adult cigarette use, binge drinking, and problem use. Other longitudinal work has demonstrated that one of the best predictors of young adults' smoking was whether they had smoking friends when they were adolescents (Brook, Whiteman, Czeisler, Shapiro, & Cohen, 1997). Examples of peer influence are available beyond substance use as well. Binge eating among female college students has been found to cluster within informal social groups (Crandall, 1988). Additionally, adolescents have been found to be more likely to be sexually active when their peers are sexually active (DiBlasio & Benda, 1992; Udry, 1987). In fact, this relation has held if there was a belief that friends were

sexually active, regardless of whether or not they actually were (Brooks-Gunn & Furstenberg, 1989; Prinstein, Meade, & Cohen, 2003).

Of particular relevance to the proposed study, research has shown that adolescent risk taking is likely to occur in the context of peers. For example, crash rates and fatalities rise dramatically when adolescent drivers are with peer passengers (Chen, Baker, Braver, & Li, 2000; Preusser, Ferguson, & Williams, 1998). Youths drive faster and take more risks when carrying peers than when carrying adults as passengers (Arnett, Offer, & Fine, 1997; Bingham, Shope, Parow, & Raghunathan, 2009; Simons-Morton, Lerner, & Singer, 2005), especially if the peers are young men (Baxter et al., 1990). Further, youth are usually accompanied by one or more persons when committing crimes that range in seriousness from vandalism and drug use (Erickson & Jensen, 1977) to rape and homicide (Zimring, 1998). Peer context influence has also been demonstrated with substance use (Chassin, Hussong, & Beltran, 2009). Clapp and colleagues have conducted research on environmental predictors and have found that social settings are related to heavy episodic drinking among college students (Clapp, Lange, & Shillington, 2003; Clapp, Reed, Holmes, Lange, & Voas, 2006). Furthermore, investigations of initial smoking experiences place the occurrence of first-time use in the context of peers (Friedman, Lichtenstein, & Biglan, 1985; Lucas & Lloyd, 1999).

Peer Influence in the College Setting

In considering the role of peers on older adolescent risk-taking behavior, it is important to consider that peers may be an especially important influence among those in the college setting. Starting with matriculation and throughout college, there

is a marked shift in influence from parents to peers. Early on in adolescence, parents have a strong influence on the child's attitudes and behaviors (Kandel & Andrews, 1987). As adolescents get older, they spend less time with their parents and more time with friends (Csikszentmihalyi & Larson, 1984), resisting attempts by parents to control the selection and involvement of these friends (Smetana & Asquith, 1994). Peers become increasingly important and are fairly free of parental oversight and control (Brown, Dolcini, & Leventhal, 1997). This process appears to intensify in college where youths face multiple transitions, including changes in their living arrangements, academic environments, and friendship networks, while adapting to greater independence and responsibility in their personal and academic lives (Pittman, & Richmond, 2008). Matriculating students may be especially vulnerable to the influence of peers because of their need to make and maintain new friendships. Students entering college seek to establish a peer network that can be a source of support and closeness (Paul & Kelleher, 1995). To develop a peer network on campus, students immerse themselves in the social environment (Martin & Hoffman, 1993). Within the many social environments on campus, risk-taking behavior opportunities are prevalent; for example, alcohol is a prominent part of the college culture—it is present at most social functions and part of many peer interactions (Thombs, 1999).

The heightened attention to the views of others can be adaptive, given that those who are attuned to peers are more likely to successfully navigate complex social scenarios and to form mature relationships (Baumeister & Leary, 1995). Adolescents who lack a sense of acceptance experience a greater risk of depression,

anxiety, and future problem behaviors (Capaldi, Dishion, Stoolmiller, & Yoerger, 2001; Kawachi, & Berkman, 2001). Furthermore, meta-analyses in adulthood indicate that the risks to future mortality resulting from social isolation are high (House, Landis, & Umberson, 1988). As such, available evidence suggests that adolescents' preoccupation with their social status is neither needless nor irrational (Allen & Brown, 2008).

In sum, when considering factors associated with risk behavior engagement, peers may be a particularly important influence given the pronounced shift in influence from parents to peers during college and the prevalence of risk-taking-based social opportunities on campus.

Global Peer Influence Processes

As previously described, one of the strongest predictors of adolescent risk-taking behavior is the risk-taking behavior of close friends (Prinstein & Dodge, 2008). On a global level, it has been observed that this similarity in risk-taking behavior among peers may result from both socialization and selection effects (Kandel, 1996); that is, friends can influence one's risk behavior and, conversely, that one's risk behavior impacts the selection of friends (Dishion, & Owen, 2002). Both selection and socialization effects have been demonstrated for a wide variety of behaviors including delinquency, violence, risky sexual behavior, substance use, and weight-related behaviors (see Prinstein, & Dodge, 2008 for review). In the process of selection, individuals choose peers who exhibit similar attitudes and behaviors. For example, Leibsohn (1994) found that entering freshmen sought out new friends with whom to drink and use drugs—new friends whose use patterns were similar to those

of their old high school friends. Selection does not presume that individuals influence each other; rather, similar individuals are simply attracted to each other. Socialization effects, on the other hand, refer to the process by which youth's behavior may be affected by their affiliations with other peers. Initial dissimilarity among affiliates will grow into similarity over time through peer influence (Prinstein, & Dodge, 2008).

This past body of research on global peer influence processes has offered a tremendous contribution by advancing the understanding of why a youth and peers' behavior are related to each other. Yet, remarkably little is known regarding basic descriptive aspects of peer influence effects and more specifically, the means by which peer influence manifests in the immediate context of risk behavior engagement (Allen & Brown, 2008). As described above, one of the hallmarks of older adolescent risk-taking behavior is that it often takes place in a social context, specifically, within the presence of peers. Yet, it is unclear whether risk taking solely takes place in a peer context because adolescents spend a considerable amount of time with peers (Brown, 2004) or whether there is something inherent about the physical presence of peers that leads to increased risk behavior engagement. Surprisingly few studies have focused on the specific methods by which peers affect individual behavior (Brown, Bakken, Ameringer, & Mahon, 2008) and, as such, more information is needed on the means by which peers exert influence in order to assess the degree to which individuals' response to peer influence depends on the way it is manifested. Hence in order to better understand social-situational context of risk behavior, it is important to conduct more micro-level examinations of peer influence

by researching the role peers can have in the immediate context of risk behavior engagement.

Peer Influence in the Immediate Context of Risk Behavior Engagement

As previously described, a critical issue that is lacking understanding is what is happening in the immediate context of risk behavior engagement. Focusing on a specific risk behavior, Allen and Brown (2008) have identified a number of limitations to our current knowledge of why the presence of peers leads to negative outcomes when driving. They posed a number of questions including: is the driver simply distracted by the flow of conversation going on among passengers; do teen passengers engage in behaviors that interfere with driving more directly, such as grabbing the wheel or urging the driver to drive fast; does the sheer presence of teen passengers prompt an adolescent to drive differently? Thus, it has been observed that remarkably little is known regarding the nature and quality of peer influence that actually takes place, leading to questions about what mode(s) of peer influence can impact risk-taking behavior.

Hence, in order to better understand the proposed potent effects of peer influence in the immediate context of risk behavior engagement, it is necessary to 1) establish whether youth do inherently act in a more risky manner in the presence of peers (not just happenstance that risky behavior occurs in a social context due to considerable time spent in peer groups) and then 2) examine in what manner peers can exert their influence. In considering possible means of peer influence in the immediate context of risk taking behavior engagement, “peer pressure” is a commonly identified impression. Although operationalized in different ways, this

term carries the connotation of youth being cajoled or coerced into some behaviors by peers (Brown et al., 2008). Yet, in considering possible means of peer influence in the immediate context of risk-taking behavior engagement, it has been suggested that peers may influence behavior both directly and indirectly (Borsari & Carey, 2001; Graham, Marks, & Hansen, 1991; Oostveen, Knibbe, & De Vries, 1996; Simons-Morton et al., 2005). In contrast, to direct peer influence (i.e., explicit offers or pressure to engage in a certain behavior), indirect influence refers to passive, non-explicit, or unintended peer influence (e.g., an individual's perception and interpretation of the risk taking and reinforcement patterns of others; Borsari & Carey, 2001; Simons-Morton et al., 2005). The following sections provide an overview of the available literature on direct and indirect peer influence in the immediate context of risk behavior engagement.

Direct Influence

Direct peer influence refers to active effort on the part of the peer. Behaviors can range from civil gestures (e.g., offering a drink, cigarette, or marijuana) to overt encouragement and orders (e.g., forcing others to drink during drinking games). Allen and Brown (2008) have described direct influence in youth driving behavior which they refer to as incitement; that is, when a teen is navigating, one car zooms past another car with a threatening wave to the driver, and as a result the teen's passengers enthusiastically scream at their driver to catch up and pass him back.

Studies of direct influence are relatively limited among older adolescents (Borsari, & Carey, 2001). The existing research has shown that direct offers to drink are associated with alcohol use and problems (Wood, Read, Palfai, & Stevenson,

2001). Further, qualitative research has suggested that not drinking at college social functions is regarded as an unusual behavior that will elicit several offers to drink (Rabow & Duncan-Schill, 1995). Nondrinking students at parties are repeatedly offered drinks, exposed to teasing from friends, and report feelings of inferiority. In terms of other risk behavior, one Australian study indicates that drivers report often being incited by youthful passengers (aged 16–24 years) more frequently than by adults (Regan & Mistopoulos, 2003).

In addition to these self-report descriptive studies, some experimental work tapping youth's susceptibility to direct peer influence has been conducted. In 2005, Gardner and Steinberg published an experimental study of peer influence on risk taking, risk preference, and risky decision-making. The study recruited 306 individuals in three age groups: 13–16, 18 –22, and 24 and older. The subjects completed two questionnaire measures assessing risk preference and risky decision-making, and a behavioral task measuring risk taking (called Chicken). Participants in each age group were randomly assigned to complete the measures either alone or with two same-gender and -aged peers. The peers were informed that they could call out advice during the behavioral task and questionnaires and that the player was instructed that he or she could choose whether to follow the advice of his or her peers. The results demonstrated that compared with those who completed the measures by themselves, participants who completed the same measures with peers giving advice took more risks during the risk-taking game, gave greater weight to the benefits rather than the costs of risky activities, and were more likely to select risky courses of action in the risky decision-making situations. Further, the magnitude of the group effect on

risk taking was greater among younger rather than older participants. The authors concluded that relative to adults, younger and older adolescents are more susceptible to the influence of their peers in risky situations.

Recently, Steinberg's group conducted a follow-up study with a sample of 18 and 19 year-old undergraduates using a within subject design and a similar behavioral task (Albert et al., 2009). Youth completed the behavioral risk task both alone and with peers being allowed to interact without any restrictions. The results indicated that participants were riskier on the task in the peer condition, but only when this condition occurred first. There was no difference in conditions when the task was first completed alone.

These studies have been influential and advanced the understanding of peer influence on risk-taking behavior; yet, some limitations are present which may temper conclusions. First, it is unclear what types of interactions took place in the peer present condition. All that is reported is that there was the possibility of communication between the peer group during the task and assessments but it is unclear whether there was explicit encouragement of risk behavior. A second factor is the payment. Both the target youth and peers received equivalent payment on the task based on the target's performance. As such, peers might have been collaborating with the target to determine the most optimal strategy. This appears counter to how risk taking is thought to take place in the "real world" where peers may gain the benefits from risky behaviors without necessarily experiencing the costs (e.g., peers urge on a driver to take some risky action, knowing that they will most likely not experience the consequences directly as they do not bear any legal responsibility;

Allen & Brown, 2008). In the second study, it is difficult to understand the ordering effect with particular reference to why the participants who completed the task first alone did not increase in risk taking on the second administration in the peer condition; replication is needed. Finally, the behavioral risk task (Chicken) may have impacted the results. While the Chicken task has the advantages of a behavioral task over self-report (risk taking that requires participants to make actual decisions about how much risk to take in a situation that closely mirrors one faced in everyday life), the task is a driving simulation. Participants may have varied experience with driving (particularly due to age differences since one group included participants under the legal driving age) thus impacting their behavior on the task. In sum, these studies raise important questions about the nature of the peer effect; specifically, whether direct influence of risky behavior (e.g., encouragement) took place. Thus, focusing on the immediate context of engagement in risk-taking behavior, what type of effect does/can direct peer influence have?

Indirect Influence

Within the immediate context of risk behavior engagement, it may be that peer influence does not solely occur through the overt behaviors described above. Rather, the simple presence of peers alone may act as a social influence. For example, in the literature on adolescent driving behaviors, young males have reported that they would drive in a risky manner when with peers even if their passengers did not encourage them to do so (Regan & Mitsopoulos, 2003).

The premise that the presence of others can provoke behavior change is central to Zajonc's (1965) theory of social facilitation (impact of social presence on

individual performance) and one of the oldest studied in social psychology (Aiello & Douthitt, 2001). Typically, studies on social facilitation investigate the impact of social presence (usually the presence of relative strangers) on individual performance, specifically focusing on changes in an individual's performance that occur when a person performs in the presence of others versus when alone. Social facilitation has been applied to risk-taking behavior. For example, research among adults has suggested that even just the implied presence of other players increases gambling intensity (Rockloff & Dyer, 2007). In addition, college-age youth have shown more aggression when in the presence of others than when alone (Jacquin, Harrison, & Alford, 2006). However, social presence leading to increased risk behavior was not supported in a recent fMRI study in which social influence on a monetary betting task was examined (Nawa, Nelson, Pine, & Ernst, 2008). Although there was differential neural activation, the behavioral pattern of decision-making and reaction time did not differ between the social and non-social conditions.

Though this collection of social facilitation studies highlights the impact social presence can have (or not have) on risk behavior engagement and lends support to studying this means of influence, it is important to emphasize that each of these studies used relative strangers. It is expected that the impact of social presence (and the process by which influence is exerted) is substantially different depending on who the other person might be and how familiar the individual is with the other person (Aiello & Douthitt, 2001). For example, social norms have been found to be most relevant for influencing behavior if they are created or evaluated by a salient reference group (Brown et al., 2008). Thus, these social facilitation and risk-taking

studies speak to the impact of social presence in general but may provide little insight into if the presence of peers, specifically, influences risk behavior engagement.

Speaking specifically to *peer* presence, emerging theory and empirical studies have suggested that the simple presence of peers may act as an influence on risk-taking behavior (Miller & Byrnes, 1997; Morrongiello & Sedore, 2005). It has been proposed that if one's risk-taking behavior functions as a method for maintaining or obtaining reputation and social status, than it would be more likely to occur when a peer is present to observe the risk behavior (Jacquin et al., 2006). Peers are thought to provide information regarding which behaviors are accepted, admired, and appropriate in a given social context, and therefore what behaviors are likely to lead to social acceptance (Borsari & Carey, 2001). As such, the presence of a peer may lead an individual to assess his/her own behavior more closely, in terms of adherence to what is considered acceptable behavior (Deaux & Major, 1987). A second hypothesis regarding the impact the presence of peers can have on risk behavior engagement has been set forth by Steinberg and colleagues. They have proposed that the presence of peers sensitizes the incentive processing system to respond to cues signaling the potential rewards for risky behavior (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Steinberg, 2007; 2008; 2009). Accordingly, the presence of peers are thought to bias decision making in favor of rewarding, social-processing outcomes, rather than rational outcomes. Although these ideas are interesting, the empirical support is somewhat limited.

A recent fMRI study did model the impact of peer observation on risk taking (Chein et al., 2011). Participants falling into three age groups (14-18, 19-22, and 24-

29), completed a driving stimulation task in which the participants were given the goal of reaching the end of a track as quickly as possible to maximize monetary rewards (risk taking was defined as not stopping for a yellow light) both alone and while being observed by peers. All participants brought in two same-age, same-gender peers, who in the peer condition observed the target participant conduct the driving stimulation task. In order to let the target participant know s/he was being observed by the peers while in the scanner in the peer condition, the peers communicated with the target via an intercom. The authors described the allowed communication as “the peers were permitted to speak authentically while informing the scanned participant of their presence, demonstrating their ability to observe task performance on the monitor, and communicating that they had made predictions about the scanned participant’s pending performance. The peers were carefully instructed to make these specific points during the interaction and to avoid comments that might explicitly or intentionally bias behavior” (p. F3, Chein et al., 2011). Results of the study indicated that in the alone condition the three age groups performed similarly. Yet, participants in the 14-18 year old age group took significantly more risks when observed by peers than when alone. This was not the case for the other two age groups.

This is one of the first studies to model the influence of familiar peer presence on risk behavior engagement; thus it is unique from prior social facilitation work that focused on the presence of unknown individuals. For younger adolescents, this familiar peer observation increased risk-taking behavior; however, the presence of peers did not have an effect for older adolescents or young adults. Considering the

novelty of this study, replication of the findings is necessary. In addition, it is unclear what effect the “communicating that they had made predictions about the scanned participant’s pending performance” by peers had on the target’s performance. Although the researchers describe this set-up as mere peer presence, this verbal communication about predictions may have a different impact than the presence of peers alone without any verbal commentary. Thus, follow-up work is needed to better understand the role of peer presence in the immediate context of risk behavior engagement, particularly in the older adolescent developmental period during which a large influence of peers on an individual’s risk-taking behavior has been observed (e.g., Borsari & Carey, 2001).

Factors that May Impact the Salience of Peer Influence

In addition to understanding the type of influence peers can have in the immediate context of risk behavior engagement (i.e., means by which peers exert influence), it is also necessary to take into account potential moderating factors that may buffer or exacerbate the effect of such influence. That is, it may be that some adolescents are more susceptible or alternatively more resilient to the influence of peers or the type of peer influence. Knowledge of these differences is particularly important for targeted prevention efforts. Basic research examining moderators of peer influence remains relatively rare, yet extant work has suggested several possible variables, including demographic factors, characteristics of the target individual, and nature of the peer relationship (Prinstein & Dodge, 2008).

In terms of demographic factors, prior research has suggested a differential impact of peer influence for male and female adolescents. For example, in a recent

study, Prinstein and colleagues (2010) found that gender served as a moderator of friend socialization effects such that female adolescents were uniquely susceptible to the influence of their best friends' engagement in a health risk behavior. The researchers speculated that this may be due to the fact that female adolescents have increased reliance on friendship support as a source of esteem and greater intimacy within dyadic friendships as compared to males, making them especially susceptible to the influence of peers. In addition to gender, another demographic variable that may moderate peer influence is race/ethnicity. Research is somewhat sparse and equivocal in this area; specifically, race/ethnicity has been found to moderate the influence of peers but in different directions. Some emerging work suggests that among entering college students, Caucasians' perceptions of peer behavior exerts a stronger influence on drinking behavior than among Latinos (Corbin, Vaughan, & Fromme, 2008). This finding was attributed to cultural differences and the importance of family versus peers in the creation of personal values (i.e., Latinos maintain strong ties with family and, thus, the influence of family drinking behavior outweighs the influence of peers). Other experimental work has found peer effects on risk taking to be greater among non-White than among White adolescents, which was ascribed to differential levels of risk behavior engagement (Gardner & Steinberg, 2005). These equivocal findings could certainly be due to the different groups being compared and as such additional work is needed.

Individual difference factors may also moderate the influence of peers. One such factor is engagement in “real world” risk behaviors. Adolescents with greater involvement in real world risk-taking behaviors may be more susceptible to pro-risk-

taking sources of peer influence (Dishion, Capaldi, Spracklen, & Li, 1995; Dishion, Patterson, Stoolmiller, & Skinner, 1991). Another factor to consider is the trait of resistance to peer influence, defined as the degree to which one acts autonomously in interactions with his/her peer group (Steinberg & Monahan, 2007). Adolescents' susceptibility to peer influence appears as a major risk factor linked to negative outcomes ranging from delinquency and substance abuse to risky sexual behavior (Allen, Porter, McFarland, 2006; DiIorio et al., 2001; Hops, Andrews, Duncan, Duncan, & Tildesley, 2000; Prinstein, Boergers, & Spirito, 2001). An individual's ability to resist peer influence may decrease his or her susceptibility to the presence and direct encouragement of peers.

The final category of moderators to consider based on prior empirical and conceptual work is the nature of peer relationship, specifically friendship quality and popularity. The quality of peer relationships has been found to affect the strength and nature of social influence such that stable, intimate, and supportive peer relationships make social influence more potent (Borsari & Carey 2006; Stevens & Prinstein, 2005; Urberg, Luo, Pilgrim, & Degirmencioglu, 2003). Relationships characterized by closeness may be especially likely to promote conformity due to individuals' high opportunities for discussion regarding behaviors and attitudes (Rose, 2002) as well as due to the fact that these intimate relationships are considered to be more important than those that are less so (Kobus, 2003). Another such factor is the status or popularity of the peer. Social psychology theories suggest that individuals tend to conform to perceived norms associated with "role models" of high status (this idea dates back to the Asch studies which demonstrated that targets were more likely to

conform to a group of high-status peers than lower-status peers; Bond & Smith, 1996). Substantial research suggests that adolescents place a high value on reputations and status among peers (Brown, 1990). Thus, adolescents are thought to be especially invested in adopting attitudes and behaviors that may earn them greater status among peers (i.e., perceived social rewards). Cohen and Prinstein (2006) demonstrated in an experimental study that adolescents of moderate peer social status were likely to comply with the opinions of peers whom they thought were high in social status and distance themselves from peers who appeared to be low in status. In sum, a number of potential moderators warrant consideration including demographic factors, characteristics of the target individual, and nature of peer relationship (Prinstein & Dodge, 2008).

Summary of the Literature

There are a number of limitations of the current understanding of peer influence that particularly impact the ability to understand the role of peers in the immediate context of risk behavior engagement. First, the peer influence literature has been plagued with studies that use cross-sectional, zero-order correlations between the behavior of adolescents and the behavior of their peers. This type of design and level of analysis may reflect measurement artifacts and friendship selection (Jaccard, Blanton, & Dodge, 2005) and, of key relevance to the proposed study, provides little insight into understanding how peer influence manifests in the immediate context of risk behavior engagement. Thus, the association between one's own behavior and reports of the behavior of friends cannot be taken as unambiguous evidence for peer influence and, further, it provides little information in terms of

influence in the immediate context of risk behavior engagement, if indeed it is occurring.

Also contributing to the lack of understanding on what can take place in the immediate context of risk behavior engagement is the extant research on direct peer influence. First, there are a limited number of studies, making it difficult to determine which findings are replicable. In terms of methodology, a number of studies have relied on retrospective report of the occurrence and nature of direct influence. Retrospective surveys are subject to self-report bias and social desirability factors that could possibly result in a youth denying the influence of peers. Youth may inaccurately represent the nature of their responses to active peer influences. In addition, assessing the frequency of being encouraged to engage in a risk behavior does not reveal whether the risk behavior actually takes place. Although experimental studies have begun to address the limitation of understanding how a peer may react to direct peer influence, this work has had a number of limitations present, including the nature of the task and the way in which the peer influence is manipulated.

Another notable limitation is the fact that peer presence, as indirect influence, is a poorly understood phenomenon; the majority of work on peer presence biasing youth toward risk behavior engagement has been more theoretical than actually supported by empirical findings. There is a paucity of studies modeling peer presence; thus, at a fundamental level it is unclear whether youth do, in fact, inherently act in a more risky manner in the presence of peers. Basic empirical

support of peer presence leading to increased risk behavior needs to be established in order to move toward understanding the mechanisms underlying this relationship.

In sum, despite some increasing methodological and analytical sophistication of investigations, the ability to make causal conclusions about the influence of peers in the immediate context of risk behavior engagement is often limited by designs dependent on self-report or clouded by confounds. It is unclear whether the magnitude of peer effects reported in previous research is overestimated. At a fundamental level it is unclear whether youth do, in fact, inherently act in a more risky manner in the presence of peers and for whom the influence of peers is most salient. As such, experimental designs in which peer influence can be modeled and manipulated in the laboratory are needed to test causal models of peer influence more stringently and to eventually examine mechanisms.

Current Study

In light of limitations in current questionnaire and experimental work and apparent lack of understanding on the effect of peers in the immediate context of risk behavior engagement, the current study aimed to understand whether peers do act in a riskier manner in the presence of peers and further whether peer presence alone influences risk behavior or whether a direct influence process (e.g., peer encouragement of risk behavior) is necessary. Furthermore, the study aimed to examine potential moderators of peer influence. Using a behavioral task of risk-taking behavior (the Balloon Analogue Risk Task – BART; Lejuez et al., 2002) as the outcome measure, older adolescents were tested alone once and then were randomized to one of three conditions (alone, peers present, peers encouraging). If

the target was randomized to peers present or peers encouraging conditions, he/she was asked to bring in two, same-gender close friends for the experimental session. In the alone condition, he/she came back without friends. This design allowed for the examination of differences in risk behavior when peers are a) not present; b) in the same room and able to see participant behavior on the risk task, but unable to provide any form of advice or encouragement; and c) in the same room, able to see participant behavior on the risk task, and given the instruction to encourage risk behavior. In this way, it is possible to isolate peer presence and awareness of behavior from the additional influence of risk encouragement.

Primary Aim

Using three conditions: alone, peers present, and peers encouraging, the current study aimed to examine the influence of peers on older adolescent risky behavior as indexed on a behavioral risk task. Specifically, analyses examined whether older adolescent risk-taking behavior is influenced by the presence of peers and the encouragement of risk-taking behavior by peers. Further, analyses examined the differences in risk-taking behavior when peers are present versus directly encouraging risk behavior.

Exploratory Aim

To examine gender, ethnicity, real world risk-taking behavior, resistance to peer influence, friendship quality, and peer popularity as potential moderators in the primary aim due to their basis in the literature as factors that are likely to affect the relationship between peer influence and risk taking.

Chapter 2: Method

Overall Design

The study used a repeated measures design (two sessions spaced 1-3 weeks apart). The sample included 183 target 18-20 year olds, and 244 peers (2 for each participant in the peer conditions and 0 in the alone condition; total participants = 427). All target participants ($n = 183$) completed an initial session alone and then were randomly assigned to one of three experimental conditions: alone ($n = 61$), peers present ($n = 61$), peers encouraging ($n = 61$). Subjects were recruited using local advertisements and an online study enrollment system operated by the University of Maryland Psychology Department. The two assessment sessions occurred at the Center for Addiction, Personality, and Emotion Research (CAPER) on the University of Maryland campus. Each assessment session lasted approximately 40-60 minutes and included the completion of questionnaires and the Balloon Analogue Risk Task (BART). All study procedures were approved by the University of Maryland Institutional Review Board.

Participants

Participants were recruited primarily through flyers and the online Sona System. Flyers were posted in a variety of locations across the University of Maryland, College Park campus (e.g., dorms, library, academic buildings, student union, and cafeterias). Subjects also were recruited using the online Sona System, a web-based human subject pool management software for universities run by the University of Maryland Psychology Department. The study was advertised on the

paid part of the Sona System and subjects were informed that paid studies did not count toward class credit.

To be eligible for the study, the target participant had to be between 18 and 20 years of age, a sophomore at the University of Maryland, proficient in English, and able to bring in two same-gender, close friends for the experimental session. The peers were selected by the targets who were instructed to bring two close friends of the same gender. Once a participant had been in the study as either a target or a peer s/he was not eligible to participate again (thus the sample consists of 427 unique participants).

Of the 188 targets who completed the initial session (baseline), 5 target participants were excluded from the present analyses for the following reasons: did not come in for the experimental session (denoted by no response to phone or email inquiries; $n = 2$), and did not bring in the required type of peers for the second assessment (brought a different-gender instead of same-gender peer ($n = 1$) and brought a peer with whom the participant was not friends - indicated on the Network of Relationship Inventory as having just met ($n = 2$)). Thus, the attrition rate was 2.66%.

The resultant sample of 183 targets included participants who were on average 19.16 years of age ($SD = .57$), 63.9% female, 53.0% non-Hispanic White, 23.0% Black/African-American, 15.3% Asian, 4.4% Hispanic or Latino, 1.1 % American Indian or Alaska Native, and 3.3% of more than one race/ethnicity. The 2 peers of each target ($n = 244$) were randomly assigned as Friend 1 ($n = 122$) or Friend 2 ($n = 122$). Friend 1 was on average 19.25 years of age ($SD = .81$), 63.9% female, 55.7%

non-Hispanic White, 20.0% Black/African-American, 13.1% Asian, 7.4% Hispanic or Latino, 3.3% of more than one race/ethnicity, 16.4% freshman, 66.4% sophomores, 15.6% juniors, and 1.6% seniors. Friend 2 was on average 19.37 years of age ($SD = 1.23$), 63.9% female, 59.0% non-Hispanic White, 18.9% Black/African-American, 11.5% Asian, 7.4% Hispanic or Latino, 0.8% Native Hawaiian or Other Pacific Islander, 2.5% of more than one race/ethnicity, 15.7% freshman, 67.8% sophomores, 14.9% juniors, and 1.7% seniors. The target had known Friend 1 on average 30.64 months ($SD = 45.29$) and Friends 2 on average 22.74 months ($SD = 30.60$). There were no significant demographic differences between Friend 1 and Friend 2. The racial distribution of the study sample is largely consistent with the university undergraduate student body; however, the sample has a greater proportion of females compared to student body (College Portrait, 2009).

Procedure

After a brief screen for the previously described inclusion/exclusion criteria, target participants came to CAPER for the baseline session. This baseline session began with a thorough explanation of the protocol and required consent. Once consent was obtained, the target participant completed the BART. The target was read the computer task instructions using a visual of the task (see Figure 1) accompanied by the directions provided below:

Throughout the task, you will be presented with 30 balloons, one at a time. For each balloon, you can click on the button labeled “Click Here to Pump up the Balloon” to increase the size of the balloon. You will accumulate 2 cents in a temporary bank for each pump. At any

point, you can stop pumping up the balloon and click on the button labeled “Collect \$\$\$.” Clicking this button will start you on the next balloon and will transfer the accumulated money from your temporary bank to your permanent bank labeled “Total \$\$.” It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode. The explosion point varies across balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen. If your balloon explodes before you click on “Collect \$\$\$,” then you move onto the next balloon and all money in your temporary bank is lost. Exploded balloons do not affect the money accumulated in your permanent bank. At the end of the experiment, you will be paid the amount of money earned on the game.

Following completion of the BART, the questionnaires were administered (see measures section below). At the end of the baseline session, the target was told the outcome of randomization (i.e., whether s/he needed to bring in two friends for the experimental session, although not the specific condition), the second session was scheduled (one week apart with a maximum of three weeks), and compensation was given (between \$10-25 based on BART performance).

The experimental session had three possible scenarios: alone, peers present, or peers encouraging to which the targets were randomly assigned. For the alone condition, the target returned for the experimental session alone. In the peers present and peers encouraging conditions, the target returned with two, same-gender, close

friends. For these two conditions, upon arrival the friends were separated from the target, consented, and provided a thorough explanation of the protocol. Next, the BART was completed (see description of conditions below), followed by the questionnaires, compensation, and debriefing. In terms of compensation, for the experimental session, the target received between \$10-25 based on BART performance and an additional \$10 as an incentive for completion of the experimental session. The peers were paid between \$10-25 based on the target's riskiness on the BART. The target in both the peers present and peers encouraging conditions were given no specific information about peer payment (informed in the debriefing). For the peers in the present condition, they were given no specific information about payment beyond the possible range of payment. Only in the encouraging condition, peers were told they would be paid based on how risky the target was on the task (more risk by target, more peer payment regardless of the monetary gain of the target). This was done to ensure the peers would be motivated to encourage risk behavior and to simulate the real world where peers are not likely to experience the consequences of the risk behavior they may encourage in others. We did not provide this information to peers in the present condition because we did not want them to be motivated to use subtle nonverbal strategies to influence the target (e.g., laughing or nodding affirmatively; Dishion, Spracklen, Andrews, & Patterson, 1996; Piehler & Dishion, 2007). During debriefing the target was informed that the peer payment was based on their performance on the task and in the encouraging condition that the peers had been instructed to encourage maximal pumps.

Experimental Conditions

Alone. In the alone condition, the target completed the BART alone.

Peers Present. In the peers present condition, the peers were in the room with the target when the target performed the BART (the peers sat behind the target such that they were able to view the computer screen throughout the task; see room setup section below). Prior to joining the target in the experimental room, the peers were given a description of the task and instructed to not give any verbal or non-verbal feedback. The peers were instructed:

Your friend is going to complete a computer task and you are going to be asked to observe them playing the task. We ask that you not give any verbal or non-verbal feedback to your friend. Please remain silent. During the computer task, on the screen, your friend will see 30 balloons, one after another. For each balloon he/she will click on the button labeled “Click Here to Pump up the Balloon” to increase the size of the balloon. He/she will earn 2 cents for each click. At any point, he/she can stop pumping up the balloon and click on the button labeled “Collect \$\$\$.” Clicking this button will start him/her on the next balloon. At some point the balloon will explode. The explosion point varies across balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen. Remember, we ask that you not give any verbal or nonverbal feedback. Please don’t talk.

The target was told that their friends would be present while they completed the task. They were instructed to not talk to them.

Today you are going to complete the same computer task but this time your friends will be present. <BAR-T instructions> Please don't start until I bring your friends in. They are going to observe you playing the game. We ask that you not talk to them during the task.

Peers Encouraging. In the encouraging condition, the peers received the same description of the task yet were told that they want to encourage their friend to make as many pumps on each balloon as possible. They were told that their compensation was based on how many pumps their friend makes on the task regardless of the monetary gain of the target. The target was not privy to this information. The peers sat behind the target such that they are able to view the computer screen throughout the task (see room setup section below). The peers were instructed following the above outlined description of task:

Your friend is completing a computer task and you are going to be asked to encourage him/her while he/she plays the task. We want you to verbally encourage your friend to make as many pumps on the balloons as possible. Importantly, your compensation will be dependent on the number of pumps your friend makes on each balloon, even if a balloon pops. The more pumps your friend makes, the more you will get paid. We ask that you not share these instructions with your friend.

If peers asked about whether encouragement would impact their friend's performance they were told that they did not know the best strategy for their friend. The target was told that their friends would be present while they completed the task.

Today you are going to complete the same computer task but this time your friends will be present. < BART instructions > Please don't start until I bring your friends in.

Room Setup

Each of the conditions took place in a 6 feet by 10 feet experimental room (See Figure 2). The room contained the desk and chair that the target used as well as two chairs in which the peers sat in the peer conditions. The task was completed on Dell Optiplex 760. The room was equipped with two 17 inch monitors. In the peer conditions, one monitor was angled in such a way that the peers had a full view.

Measures

Balloon Analogue Risk Task

Lejuez and colleagues (2002) developed the Balloon Analogue Risk Task (BART) to model risk taking in the laboratory. In a number of studies, BART responding has been significantly related to composites of self-reported "real world" risk behaviors (e.g., substance use, delinquency, and safety behaviors; Lejuez et al., 2002; Lejuez, Aklin, Daughters, Zvolensky, & Kahler, 2007). This measure is well validated in older adolescent and young adult samples. An independent review by Harrison, Young, Butow, Salkeld, and Solomon (2005) of state of the art risk measurement strategies identified the BART has having excellent reliability and

validity. Before starting the BART, the task was thoroughly explained using a visual of the task accompanied by task directions. Once the subject pressed a button agreeing that he/she understood the task, the computer screen showed a small simulated balloon accompanied by a balloon pump, a reset button labeled “Collect”, and a permanent bank (See Figure 1). Each click on the pump inflated the balloon one degree (about .125” in all directions). With each pump, 2 cents were accrued in a temporary reserve (the number of points in this reserve is never indicated to the subject). When a balloon was pumped past its individual explosion point, a “pop” sound effect emanated from the computer. When a balloon exploded, all cents in the temporary bank were lost and the next un-inflated balloon was shown. At any point during each balloon, the subject could stop pumping the balloon and click the “Collect” button. Clicking this button transferred all cents from the temporary bank to the permanent bank (displayed in Total \$\$\$) incrementally cent by cent with a “bells” sound-effect playing. After each balloon explosion or collection, the subject’s exposure to that particular balloon ended and a new balloon appeared until 30 balloons (i.e., trials) had been completed. The primary dependent measure on the BART was the adjusted number of pumps across trials. This adjusted value, defined as the average number of pumps on balloons that did not explode, is preferable to the unadjusted average because the number of pumps is necessarily constrained on balloons that exploded, thereby limiting between participant variability in the unadjusted averages (cf. Lejuez et al., 2002).

Demographics

The participants completed a basic demographic form regarding personal information. The form included age, gender, race/ethnicity, and education level. Race/ethnicity was examined in the analyses as four groups: Non-Hispanic White, Black/African American, Asian, and Other (Hispanic or Latino, American Indian or Alaska Native, and of more than one race/ethnicity).

Resistance to Peer Influence

As described above, there is research suggesting that individuals may vary on their susceptibility/resistance to peer influence, which may have implications for behavior outcomes (Allen et al., 2006). As such, the Resistance to Peer influence Scale (RPI; Steinberg & Monahan, 2007) was included. The measure presents respondents with a series of 10 pairs of statements and asks them to choose the statement that is the best descriptor; that is, which sort of person he/she is most like (sample item: “Some people go along with their friends just to keep their friends happy” BUT “Other people refuse to go along with what their friends want to do, even though they know it will make their friends unhappy”). After indicating the best descriptor, the respondent is then asked whether the description is “Really True for me” or “Sort of True for me.” Responses are coded on a 4-point scale, ranging from “Really True for me” for one descriptor to “Really True for me” for the other descriptor, and averaged. Higher scores indicate greater resistance to peer influence. Examination of the scale’s internal consistency has been conducted in four samples (Steinberg & Monahan, 2007). These analyses indicate that the measure

demonstrates adequate internal consistency ($\alpha = .70 - .76$), which was replicated in this sample ($\alpha = .72$).

Risk-Taking Behavior

Because adolescents with greater risk-taking behaviors might prove more susceptible to pro-risk-taking sources of peer influence (Dishion et al., 1995; Dishion et al., 1991), self-reported levels of risk-taking behavior were included. Consistent with previous work examining risk behaviors in youth (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Lejuez et al., 2007), a modified version of the Youth Risk Behavior Surveillance System (YRBSS; Centers for Disease and Control Prevention, 2001) was used in order to create a risk behavior composite score for the target. Previous research by Cooper, Wood, Orcutt, & Albino (2003) has demonstrated that covariation among diverse behaviors can be adequately modeled by a single higher order factor. The YRBSS assessed engagement in the following behaviors: a) drunk driving (defined as either riding with someone who had been drinking alcohol or driving oneself following drinking), b) carrying a weapon (e.g., gun, knife, or club), c) been in a physical fight d) smoking cigarettes, e) use of other tobacco products (chewing tobacco, snuff, or dip), f) binge drinking (defined as having 5 or more alcoholic drinks in a row), g) marijuana use, h) other illicit drug use (cocaine, huffing, heroin, methamphetamine, ecstasy), i) sexual intercourse without prevention, and j) vomit/laxative use to control weight. Participants reported on their frequency of engagement for these risk behaviors on a Likert-type scale during the past 30 days. Four risk behaviors (carrying a weapon, use of other tobacco product, sexual intercourse without prevention, and vomit/laxative use) were highly truncated with

over 92.3% of the targets reporting they had not engaged in this behavior. Consequently, carrying a weapon, other tobacco product, sexual intercourse without prevention and vomit/laxative use were excluded from further analysis as they contributed no variability.

Because of the non-normality of the risk behaviors' distributions, each behavior was dichotomized to keep all variables on a relatively equal metric in order to combine these items into a single factor (cf. Aklin et al., 2005; Lejuez et al., 2007). Five risk behavior variables were truncated with greater than 50% of responses being zero (drunk driving, physical fight, smoking cigarettes, marijuana use, and illicit drug use) and were subsequently dichotomized as yes/no engaged in the behavior. For the other variable with a less truncated distribution (binge drinking with under 40% reporting no engagement in that risk behavior in each case), a median split was used to classify each participant as either high or low on the risk-related behavior.

In the six risk behaviors, results of an iterated principal factor analysis of tetrachoric correlations with weighted least squares estimation indicated a dominant first factor with an eigenvalue of 3.48, and accounting for 58% of the common variance among the items. Item loadings ranged from .38 (drunk driving) to .90 (marijuana use), suggesting that all items loaded adequately on this factor. Items were then summed into a risk behavior composite with a scale mean of 1.60 ($SD = 1.63$) with a range of 0 to 6. Internal consistency was adequate (Cronbach's $\alpha = .70$) with no item detracting from alpha.

Friendship Quality

The quality of peer relationships has been found to affect the strength and nature of social influence such that stable, intimate, and supportive peer relationships make social influence more potent (Borsari & Carey 2006). Relationships that are more intimate are considered to be more important than those that are less so (Kobus, 2003). In order to control for this notion that adolescents are more influenced by the actions of a quality friend, the Network of Relationships Inventory (Furman & Buhrmester, 1985) was used to assess friendship quality. Each target subject completed the questionnaire about each of his/her peers. The scale has established validity and reliability (Furman, 1996; Furman & Buhrmester, 2009). The instrument consists of 30 items designed to assess 10 relationship qualities: reliable alliance, intimacy, affection, relative power, conflict, enhancement of worth, instrumental help, satisfaction of relationship, companionship, and importance of relationship. Two broad factor scores of social support (closeness) and negative interactions (discord) for each relationship were created based on the averaging the items on the relevant positive and negative scales (Furman & Buhrmester, 1985); higher scores indicate greater closeness and discord accordingly. The target's impression of the two peers was used in analyses (an average of the two reports). Internal consistency for the closeness subscale was $\alpha = .96$ and discord was $\alpha = .92$.

Popularity

Based on the findings that the perceived status of a peer impacts a youth's susceptibility (Cohen & Prinstein, 2006) popularity was included as a measure. Popularity was determined by asking the target to rate their friend's popularity at the

University of Maryland (How popular do you think this friend is at UMD?) on a 4-point Likert scale (Diego, Field, & Sanders, 2003) with higher scores indicating greater popularity. The target's impression of the two peers was used in analyses (an average of the two reports).

Data Analysis Plan

Data was entered and analyzed using the statistical package PASW version 18. First, the distributional properties of all non-categorical variables were assessed to determine whether they met the statistical assumptions for the analyses and to check for outliers. Second, the means and standard deviations of the study variables were examined and then ANOVA and Chi-Square were used to compare the three conditions on all variables to ensure equivalence of groups at the baseline session.

To address the primary aim (compare the three conditions in which the BART was administered across the two sessions), a repeated measures analysis of variance (ANOVA) was conducted, with BART scores for baseline and experimental sessions entered as the within-subjects variable and experimental condition (alone, present, encouraging) entered as the between-subjects factor. Following an overall significant *F* test for the interaction of session and condition, the interaction was probed by 1) using individual repeated measures ANOVAs to test the impact of the session (baseline and experimental) on each of the three condition levels (alone, present, encouraging) and 2) testing the conditions (alone, present, encouraging) at each session level (baseline and experimental) with individual ANOVAs (IV: condition, DVs: baseline session BART score and experimental session BART score respectively). Together these two approaches allow for a comparison within each

condition of the change across time points and a comparison of the conditions against each other at both time points.

To address the exploratory aim examining the potential moderators, a repeated measures ANOVA was conducted with the within subject factor as the BART score at each session (baseline and experimental) and condition (alone, present, encouraging) and each of the proposed moderators as independent variables. To control for Type I error due to multiple comparisons, an error rate of .01 was used. Gender, ethnicity, and risk-taking behavior were examined separately as moderators with all three conditions. Resistance to peer influence, friendship closeness, friendship discord, and peer popularity were examined separately with the present and encouraging conditions (excluding the alone group).

Chapter 3: Results¹

Preliminary Analyses

As a preliminary analysis, descriptives of the study variables were examined for the whole sample as shown in Table 1. All variables met the statistical assumptions for the analyses (absolute values of less than 2 for skewness and less than 4 for kurtosis; Tabachnick & Fidell, 2007) and no outliers were identified. Next, to check for equivalence of groups, the means and standard deviations of the study variables at the first assessment were examined with ANOVA and Chi-Square; results

¹ An alternative outcome measure on the BART is the number of explosions that take place across the 30 balloons. When the current data analyses were conducted with explosions as the outcome, the same results were observed as reported for pumps adjusted average.

are shown in Table 1. The three conditions (alone, present, encouraging) did not significantly differ on any study variable ($p > .07$) at the baseline session.

Primary Aim

To investigate the impact of each condition (alone, present, encouraging) on BART performance across the two sessions, a repeated measures ANOVA was conducted with the within subject factor as the BART score at each session (baseline and experimental) and the between subjects factor as condition (alone, present, encouraging). The repeated measures ANOVA revealed a significant main effect of session on BART performance ($F(1, 180) = 67.37, p = .001$; partial $\eta^2 = .27$). This main effect of session suggests that the session influences BART performance. However, to qualify this main effect, as hypothesized, there was a significant interaction of session by condition ($F(2, 180) = 11.38, p = .001$; partial $\eta^2 = .11$). As can be seen in Figure 3, this session by condition interaction indicated that the influence of condition on BART score depended on the session (the probing of the interaction effect is presented below). Results of this repeated measures ANOVA are presented in Table 2.

Additional analyses were conducted to further explore the nature of this session by condition interaction effect. First, the effect of experimental session within each of the three conditions was tested. Specifically, when examining simple effects with individual repeated measures analyses within each condition, participants had significantly higher BART scores at the experimental session than the baseline session in the encouraging ($F(1, 60) = 63.13, p = .001$; partial $\eta^2 = .51$), present ($F(1, 60) = 10.70, p = .002$; partial $\eta^2 = .15$), and alone ($F(1, 60) = 6.65, p = .01$; partial η^2

= .10) conditions. That is, all three conditions significantly increased from the baseline session to the experimental session (conditional means across sessions and results of individual repeated measures ANOVAs are presented in Table 3). It is notable that the effect size was considerably higher in the encouraging condition compared to the other two conditions and modestly higher in the present condition than in the alone condition.

Next, to examine the effect of condition at the baseline session and at the experimental session, simple effects were analyzed in two separate ANOVA analyses using the baseline session BART score and the experimental session BART score as dependent variables, respectively. As expected, no significant condition effect was found at the baseline session ($F(2, 182) = .62, p = .53$). For the experimental session, a significant effect for condition was found ($F(2, 182) = 8.36, p = .001$). Post-hoc analyses with Tukey's test indicated that the encouraging condition significantly differed from both the alone ($p = .001; d = -0.72$ medium/large effect size; Cohen, 1988) and the present ($p = .04; d = -0.45$ medium effect size) conditions. The difference between the alone condition and the present condition was not significant ($p = .23; d = -0.29$ small effect size).

Exploratory Aim

Next, in order to test for moderation, a repeated measures ANOVA was conducted with the within subject factor as the BART score at each session (baseline and experimental) and condition (alone, present, encouraging) and each of the proposed moderators as independent variables. To control for Type I error due to multiple comparisons, an error rate of .01 was used. None of the proposed moderators

(ethnicity, gender, risk-taking behavior, resistance to peer influence, friendship closeness, friendship discord, and peer popularity) were significant; there were neither significant session by moderator two-way interactions nor session by condition by moderator three-way interactions².

Chapter 4: Discussion

Main Outcomes

Older adolescence (ages 18-20) is a time of heightened risk-taking behavior. In particular, this period has been characterized by the propensity towards engagement in risky behaviors (e.g., substance use and abuse, risky sexual behavior, reckless driving) that have the potential for serious physical and psychological consequences. An accumulation of research has demonstrated that peers play a considerable role in older adolescent risk behavior engagement with risk taking often occurring in the peer social context (Borsari & Carey, 2001; Chassin et al., 2009; Chen et al., 2000; Simons-Morton et al., 2005). Although the extant literature has provided insight into the means by which peers may influence risk behavior engagement, studies to date possess a number of limitations. As such, questions have remained about the means by which peers can exert influence in the immediate context of risk behavior engagement and which factors impact susceptibility/resistance to peer influence.

To better understand the proposed influence of peers during risk behavior engagement, the current study aimed to understand whether older adolescents act in a

² Please see the appendix for additional moderation analyses.

riskier manner in the presence of peers and whether peer presence alone influences risk behavior or whether a direct influence process (e.g., peer encouragement of risk behavior) is necessary. Further, the study aimed to examine potential moderators of peer influence. Using a behavioral risk-taking task as the outcome measure, 183 adolescents came to the lab alone once and then were randomized to one of three conditions (alone, present, encouraging). When the target was randomized to peers present or peers encouraging conditions, the target brought in two same-gender, close friends for the experimental session. In the alone condition, the participant returned without friends. This design allowed for the examination of differences in risk-taking behavior when peers were a) not present; b) in the same room and able to see participant behavior on the risk task, but unable to provide any form of advice or encouragement; and c) in the same room, able to see participant behavior on the risk task, and given the instruction to encourage risk behavior. In this way, it was possible to isolate peer presence and awareness of behavior from the additional influence of risk encouragement.

The primary aim of the study was to examine whether older adolescent risk-taking behavior is influenced by the presence of peers and the encouragement of risk behavior by peers. Results from the study demonstrated a significant interaction of session and condition. Specifically, when examining the change from baseline to experimental session individually for each of the conditions, all three conditions significantly increased from the baseline to experimental session. Yet, the effect of the experimental manipulation was considerably more robust for the encouraging condition compared to the other two conditions. At the baseline session the three

groups (alone, present, encouraging) were not significantly different from one another but at the experimental session, the encouraging condition had significantly higher risk taking on the BART compared to both the alone and peers present conditions. The alone and peers present conditions were not significantly different from each other on risk taking at the experimental session.

Together these results suggest that while the presence of peers does have some impact on risk-taking behavior among older adolescents, this effect is not significantly different from those who completed the task in the absence of any peer presence. Having peers encourage risk taking on the task did have a significant impact; participants in this condition had a significant increase in risk-taking behavior and this significantly differed from both the peers present and alone conditions. Thus, an increase in risk-taking behavior was observed when peers explicitly encouraged such behavior, clearly identifying the desired and socially rewardable outcome.

It is not surprising that older adolescents were significantly more risky when being encouraged by their peers. This is consistent with a long line of research demonstrating that peers have a significant impact on risk behavior engagement (Prinstein & Dodge, 2008). So, while this finding is not unexpected, it does fill in an important gap in the literature as it experimentally demonstrates an effect of direct peer encouragement on risk-taking behavior. This is particularly notable as the literature on peer influence has been overly reliant on cross-sectional designs which provide little insight into understanding what type of influence peers can have an impact in the immediate context of risk behavior engagement. Prior research specific

to direct peer influence has been somewhat limited. In terms of methodology, a number of studies had relied on retrospective report of the occurrence and nature of direct influence. Retrospective surveys are subject to self-report bias and social desirability factors that could possibly result in a youth denying the influence of peers or inaccurately representing the nature of their responses to active peer influences. In addition, assessing the frequency of being encouraged to engage in a risk behavior does not reveal whether the risk behavior actually takes place. Prior experimental work has studied the impact of peer influence more generally (allowing peer input on how a task is performed; Gardner & Steinberg, 2005) rather than directly modeling encouragement. Therefore, this study directly addresses limitations in prior work and clearly demonstrates that the direct encouragement by peers leads to significantly more risk taking.

The finding that the presence of peers led to significantly more risk taking but not significantly more so than in the alone condition was somewhat contrary to what has been suggested in the literature. It has previously been purported that the mere presence of peers may be enough to bias increased risk behavior engagement. Two sets of explanations have been put forth to support this claim. The first is focused on the idea that the presence of peers would influence behavior through perceived attitudes and behaviors of others and the social rewards perceived to follow from initiating those attitudes and behaviors. For example, adolescents who believe that risk behavior will bring them acceptance or approval by peers are more likely to engage in that behavior. The second hypothesis proposed by Steinberg and colleagues is that the presence of peers activates the same neural circuitry implicated

in reward processing, and that this impels adolescents toward greater risk behavior engagement (Chein et al., 2011; Steinberg, 2007; 2008; 2009).

A number of potential explanations can be set forth for why in the current study the presence of peers did not significantly differ from the alone condition. First, due to the novelty of the task, it may be that there was not enough information available to the target participant on what was considered to be accepted or admired by peers. This stands in contrast to “real world” risk behaviors that would have a learning history for the target and peers. Modeling and perceived norms are two such implicit ways that an adolescent may be provided information about which behaviors are accepted and admired, considered appropriate in a given social context, and therefore what behaviors are likely to lead to social acceptance and reinforcement³. In the current study, the target did not have any information from the peers about the task; that is, they had not seen the peers perform on the task or have information about norms on the task. Thus, due to the novelty of the task the target did not know what type of performance would bring them approval by their peers (unlike the encouraging condition in which this was explicitly stated by the peers).

A second explanation, addressing Steinberg’s hypothesis, is that the presence of peers (in the absence of direct encouragement) has a diminished impact as adolescents age. In the recently published study conducted by Chein and colleagues (2011), the presence of peers did not lead to increased risk-taking behavior in the 19-22 age group. An important caveat to note is that it is somewhat difficult to directly apply these findings to the current study as only 9.3% of the current sample falls into the younger age categorization (14-18) in the Chein study. Chein and colleagues

³ Please see the appendix for an additional discussion of modeling and norms.

attribute the lack of peer presence influence in the 19-22 age group to the maturation of brain systems that support decision-making, suggesting that the presence of peers is not rewarding for this older age group and thus does not lead to increased risk behavior. To support this maturation hypothesis, other work utilizing a self-report instrument that assesses susceptibility to peer pressure has found that resistance to peer influences increases with age (Steinberg & Monahan, 2007). Although this is a self-report measure of susceptibility and thus would likely vary from behavioral assessment, this does lend some support to the idea that the impact of peer influence diminishes with age. Yet, based on the current findings it may be that older adolescents are less susceptible to the mere presence of peers but remain susceptible to direct encouragement.

When considering the present findings on peer presence in relation to the experimental studies on social facilitation and risk-taking behavior (described in the introduction) a few differences are observed. First, the social facilitation experiments used known risk behaviors including gambling and aggression. The one study that used a novel task (Nawa et al., 2008) did not find an impact of social presence. Second, the difference in findings being a result of an unknown versus known person observing the risk taking cannot be ruled out. Hence, considering the present findings in the context of prior work, a number of additional components call for further investigation including known versus unknown risk behavior and social presence, information on perceived attitudes and behaviors related to the task, and developmental period.

The results of the current study show that the alone condition had a significant increase in risk taking on the task from the baseline to the experimental condition. Considering the equivalence of external factors in the baseline and experimental sessions (i.e., no experimental manipulation, same room, came alone to the lab again), this suggests that some learning took place on the task. Prior work has been mixed on changes in BART with repeated administration. One study, administering the BART approximately 11.5 days apart to healthy adults, found that risk behavior on the BART did not change over time (White, Lejuez, & de Wit, 2008). Of note this was a different version of the BART task consisting of 60 balloon trials with varying levels of payoff values. In another study with undergraduate students, Lejuez and colleagues (2003) administered the BART three times on a single test day. Results of this study indicated small but significant increases in risk behavior between administrations. Thus, additional work is needed to better understand the change in BART with repeated administration.

The exploratory aim of the study was to examine gender, ethnicity, risk-taking behavior, resistance to peer influence, friendship quality, and peer popularity as potential moderators in the primary aim due to their basis in the literature as factors that are likely to affect the relationship between peer influence and risk taking. Contrary to prior expectations, none of the proposed moderators had a significant effect, despite adequate power to detect such effects. This suggests that the experimental conditions had an equal effect across participants. A number of potential hypotheses can be set forward to explain the lack of moderation. First, the gold standard approach to measuring popularity is sociometric measures of peer status

based on nominations completed by a full sample of adolescents (Prinstein, 2007). However, this approach has been exclusively conducted with younger adolescents who are in middle or high school (Prinstein, 2007). Sociometric measures have not been applied to college age youth due to a number of issues related to practicality. Among college students there is no single setting that can best capture the variety of peer relationships and reputations that college students may form within their peer network (Prinstein, 2007) and further, with a large undergraduate student body (e.g., over 20,000 as in the present study), it would be impossible to have all students on one nomination roster. Examining one specific group (e.g. fraternity or sorority) could be confounded by the homogeneity of comparison peers as sociometrics are designed to examine reputations relative to a comparison group (i.e., standardized scores that indicate preference as compared to other youth on the same nomination roster; Zakriski & Prinstein, 2001). Thus, future research would greatly benefit from the development of a means to assess popularity on a college campus. In terms of other measurement issues, with resistance to peer influence and friendship quality, one could speculate about measurement artifacts; that is, face validity of the measure for resistance to peer influence and lack of range in friendship quality by fault of requesting students to bring in two same-gender, close friends. However, examination of the data does not support this conjecture as each measure is normally distributed with an adequate range. In sum, the lack of significant moderation by the proposed variables suggests that the experimental manipulations were equally consistent for study participants.

Limitations and Future Directions

The present study has several limitations worth noting. For the encouraging condition, participant interactions were not video or audio-taped nor were peer participants provided a script with an encouragement dialogue. These design decisions were made due to concerns with the potential impact these features (recordings, script) would have on external validity (Plante, 2010). That is, in the case of video/audio recordings, there was concern that the participants would behave in a more socially desirable manner due to knowledge of being observed and recorded. In the case of a script, it was thought that it would come across as artificial to the target participants or might limit their interaction because of fear of being judged by the staff. This benefit to external validity comes at the cost of a manipulation check and information on the nature of dialogue that took place in the peer encouraging condition. Future work could benefit from an understanding of what type of encouragement peers used as well as how the target responded or handled this pressure, expanding upon prior work that has coded peer interactions on problem-solving tasks (Allen et al., 2006; Dishion, Andrews, & Crosby, 1995).

Whereas the previously described decisions were made to protect external validity, one threat to external validity is that the peers were instructed to and benefitted from encouraging risk behavior in the encouraging condition. This design decision was made to facilitate breaking down the various type of peer influence (direct versus indirect). Yet despite the advantages of the laboratory design in precision and ability to yield more objective data about peer influence, it is uncertain whether the peer motivation in the encouraging condition (i.e., payment for

encouragement) is a valid representation of peer motivation in a naturalistic setting where there may be no real benefit for peer encouragement. Furthermore, this design choice means that it is unclear what would happen if peers were present in the room and not given any instruction to encourage or discourage risk behavior (but allowed to provide commentary). It may be that, without specific instruction to encourage risk, peers would provide encouragement in both directions (toward riskier behavior and more conservatism). With coding of peer interactions, this approach could provide information about what types of peer groups gravitate towards risk behavior (rather than prescribing all groups to be in the encouragement of risk behavior).

A related point is that the current study focused solely on encouragement of risk behavior. Yet, based on the strong effect of peer encouragement on risk behavior engagement, it is worthwhile to consider whether peers only have such a strong influence in the negative direction. That is, strong peer influence processes should make it as likely that a youth would be influenced to engage in risk behavior as they would be susceptible to encouragement to *not* engage in such behavior and/or to engage in an alternative prosocial behavior (Allen & Antonishak, 2008). There are innumerable examples of peer influence leading to positive outcomes (e.g., involvement in a sport or volunteer activities). As such, future work would benefit from an examination of if/how peer influence leads to less risk behavior engagement.

Finally, older adolescents were chosen for the current study because they represent the developmental period in which risk behavior is peaking (Pittman, & Richmond, 2008) and in which peers have been shown to play a critical role in risk behavior engagement (Borsari & Carey, 2001). Second year students were selected in

order to limit potential variability due to length of friendship. It was felt that first year students may not have had enough opportunity to develop friendships (particularly during the fall semester). Based on preliminary findings of developmental differences in the influence of peer presence on risk behavior engagement (Chein et al., 2011), future work would benefit from an expansion of this study design to younger adolescents in order to empirically test whether peer presence versus encouragement has a differential effect in younger versus older adolescents (i.e., opportunity for age groups to be compared).

Conclusion

Older adolescence has been characterized in part by the propensity towards engagement in risky behaviors (e.g., substance use and abuse, risky sexual behavior, reckless driving) that have the potential for serious physical and psychological consequences. The goal of the proposed experimental study was to better understand the influence of peers during risk behavior engagement among older adolescents. The experimental design of the current study addresses limitations of prior work on peer influence in the immediate context of risk behavior engagement and serves as a first step to future research. This study has the potential to advance understanding of peer influence in several meaningful ways as it 1) moves beyond retrospective report of peer influence, 2) expands upon previous experimental work by addressing the nature of the task and the way in which the peer influence is manipulated (direct influence rather than collaboration), 3) provides basic testing of peer presence, 4) breaks down the “peer effect” to examine different types of influence (i.e., direct versus indirect), and 5) takes a step to understand potential factors that may impact

vulnerability to peer influence. The methodological strengths of this study, including random assignment to peer conditions, provide good reason to feel confident about the internal validity of the findings. Together the results suggest that in older adolescence the presence of peers alone does not bias increased risk behavior engagement. Instead, based on the findings that the largest influence on risk behavior engagement took place when peers directly identified the valued behavior on the task (encouraging condition), it may be that older adolescent risk behavior is largely motivated by behavioral reinforcement and perceived social rewards.

Appendices

Moderation

As an additional analysis, moderation was examined within the three conditions separately (moderation of the within-subjects effect within each of the conditions, eliminating the between subjects component). Following the steps outlined by Judd and colleagues (2001) for testing moderation in within subject designs, the conditions for moderation are satisfied when the independent measure significantly predicted scores that represent the difference between the two dependent measures. Accordingly, a BART difference score was calculated by subtracting the BART baseline session score from BART experimental session score; then, regression was used to test whether the moderator was a significant predictor of the difference score. These analyses were done separately within each condition. Gender, ethnicity, and risk-taking behavior were examined as moderators in all three conditions. Resistance to peer influence, friendship closeness, friendship discord (both friendship quality variables), and peer popularity were examined for the present and encouraging conditions. To control for Type I error due to multiple comparisons, an error rate of .01 was used. Using this approach, none of the proposed moderators were significant.

Modeling

Modeling refers to imitation of risk-taking behavior of others such as close friends - one's behavior corresponds to another's concurrent behavior (Maisto, Carey, & Bradizza, 1999). Laboratory study of modeling became popular in the late 1970s

and early 1980s in alcohol use research. In general, the modeling research has almost exclusively been focused upon alcohol use. Overall, the modeling research within alcohol use indicates that participants exposed to heavy-drinking models consume more than students exposed to light drinking models or no models at all. Borsari, & Carey (2001) have identified three characteristics of the model influence on participant consumption of alcohol: 1) target youth match the concurrent drinking of a confederate, a previous observation of a model does not influence the target youth's subsequent drinking, 2) composition of the group of confederates influences participant alcohol use: when two confederates drink at different rates, participants model the fast rate of drinking, and 3) the sociability of the confederate (warm or cold) during the session influences modeling. Modeling is a means through which peers may be indirectly exerting influence in the immediate context of risk behavior engagement.

Norms

One socialization process that has been studied in depth among college populations is normative influences. Norms are defined as properties of groups that characterize where a group is located along an attitudinal or behavior dimension (Miller & Prentice, 1996) and have been divided into two types: descriptive and injunctive (Cialdini, Reno, & Kallgren, 1990). Descriptive norms are defined as individuals' perceptions about the prevalence of a behavior thus providing information about what is normal. Injunctive norms describe the appropriate course of action in a given situation and thus provide information about what ought to be done (Cialdini et al., 1990). Norms are a large part of the literature on college student

alcohol use; specifically, college students have been shown to misperceive their peers, assuming more drinking, more heavy drinking, and more comfort with drinking than is actually the case (Borsari, & Carey, 2003; Perkins, Haines, & Rice, 2005). These misperceived norms have demonstrated relations with heavy drinking and alcohol-related problems in college student samples (Perkins & Berkowitz, 1986; Larimer, Turner, Mallett, & Geisner, 2004).

As stated above, norms are a large part of the literature on college student alcohol use. College students have been shown to misperceive their peers, assuming more drinking, more heavy drinking, and more comfort with drinking than is actually the case (Borsari, & Carey, 2003; Perkins et al., 2005). Studies have revealed similar overestimation for other kinds of drug use (Perkins, Meilman, Leichliter, Cashin, & Presley, 1999) and for other health risk behaviors (Gibbons, Helweg-Larsen, & Gerrard, 1995). Within the alcohol use literature, these misperceived norms have demonstrated relations with heavy drinking and alcohol-related problems in college student samples (Perkins & Berkowitz, 1986; Larimer et al., 2004) and have been observed among students soon after matriculation into college (Read, Wood, Davidoff, McLacken, & Campbell, 2002). Both elevated descriptive and injunctive norms are thought to make excessive alcohol use seem common and acceptable. Students may feel pressures to match the drinking behavior they perceive other students engaging in (descriptive norm) and approving of (injunctive norm).

These findings have prompted numerous norms campaigns on campuses that involve giving students accurate statistics on what their peers think, feel, and do in drinking situations (i.e., alter the perception of norms to which college students

conform). In a survey of 118 four-year colleges and universities across the US, Wechsler and colleagues (2003) found that 57 (48%) had implemented a social norms campaign. However, the success in reducing drinking among college students has been mixed (Lewis & Neighbors, 2006; Wechsler et al., 2003). Prentice (2008) has provided a summary of when/how norms interventions work best. These best conditions include heavy drinkers, small, residential campuses, when accompanied by personalized feedback, when the message about norms falls within students' latitude of acceptance, and when it encompasses a group with which students identify (e.g., fraternity members, teammates, friends).

Tables

Table 1

Descriptive Statistics and Examination of Differences between Conditions at the Baseline Session

Variable	Total Sample (n = 183)	Alone (n = 61)	Present (n = 61)	Encouraging (n = 61)	F / χ^2	p
Days Between Sessions	9.62 (3.88)	8.89 (3.56)	10.36 (4.04)	9.60 (3.95)	2.24	.11
<i>Target Demographic Variables</i>						
Age (M(SD))	19.00 (.57)	19.10 (.57)	19.10 (.60)	19.30 (.53)	2.46	.09
Gender (% Female)	63.9	62.3	68.9	60.7	1.00	.61
Race (% non-Hispanic White)	53.0	50.8	54.1	54.1	3.30	.97
Year in school (% sophomores)	100	100	100	100	-	-
<i>Friend 1 Demographic Variables</i>						
Age (M(SD))	19.25 (.81)	-	19.20 (.83)	19.31 (.79)	.61	.44
Gender (% Female)	63.9	-	67.2	60.7	.57	.45
Race (% non-Hispanic White)	55.7	-	59.0	52.5	1.39	.85
Year in school (% sophomores)	66.4	-	67.2	65.6	3.29	.35
Length of Friendship (M(SD))	30.64 (45.29)		23.36 (31.47)	38.17 (55.41)	3.27	.07
<i>Friend 2 Demographic Variables</i>						
Age M (M(SD))	19.37 (1.23)	-	19.23 (.76)	19.51 (1.57)	1.56	.21
Gender (% Female)	63.9	-	67.2	60.7	.57	.45
Race (% non-Hispanic White)	59.0	-	57.4	60.7	6.40	.27
Year in school (% sophomores)	67.8	-	68.9	66.7	2.32	.51
Length of Friendship (M(SD))	22.74 (30.60)		21.68 (26.56)	23.81 (34.43)	.14	.71
<i>BART</i>						
PumpsAdjAvg (M(SD))	38.61 (12.40)	37.79 (13.76)	40.08 (12.12)	37.97 (11.27)	.64	.53
<i>Moderators</i>						
RPI (M(SD))	2.96 (.42)	2.95 (.44)	2.98 (.43)	2.96 (.39)	.12	.89
Risk-Taking Behavior (M(SD))	1.60 (1.63)	1.64 (1.75)	1.29 (1.33)	1.87 (1.76)	1.90	.15
Friendship Closeness (M(SD))	65.11 (14.92)	-	62.80 (16.08)	64.95 (14.34)	.61	.44
Friendship Discord (M(SD))	9.13 (3.35)	-	8.64 (2.77)	8.81 (2.88)	.10	.75
Popularity (M(SD))	2.77 (.47)	-	2.80 (.42)	2.81 (.39)	.01	.91

Note. The reported sample size is for the number of targets (total and in each condition). BART = Balloon Analogue Risk Task; PumpsAdjAvg = Pumps Adjusted Average; RPI = Resistance to Peer Influence.

Table 2

Main Repeated Measure ANOVA Results

	<i>df</i>	<i>F</i>	<i>p</i>	η_p^2
Session	1	67.37	.001	.27
Session X Condition	2	11.38	.001	.11
Within group error	180			

Note. Session = baseline and experimental. Condition = alone, present, and encouraging.

Table 3

Condition Balloon Analogue Risk Task Score Means across Sessions and Individual Repeated Measures ANOVA Results

Condition	Baseline Session (<i>M(SD)</i>)	Experimental Session (<i>M(SD)</i>)	<i>F</i>	<i>p</i>	η_p^2
Alone	37.79 (13.76)	41.08 (13.21)	6.65	.01	.10
Present	40.08 (12.12)	44.77 (11.97)	10.70	.002	.15
Encouraging	37.97 (11.27)	50.15 (11.74)	63.13	.001	.51

Figures

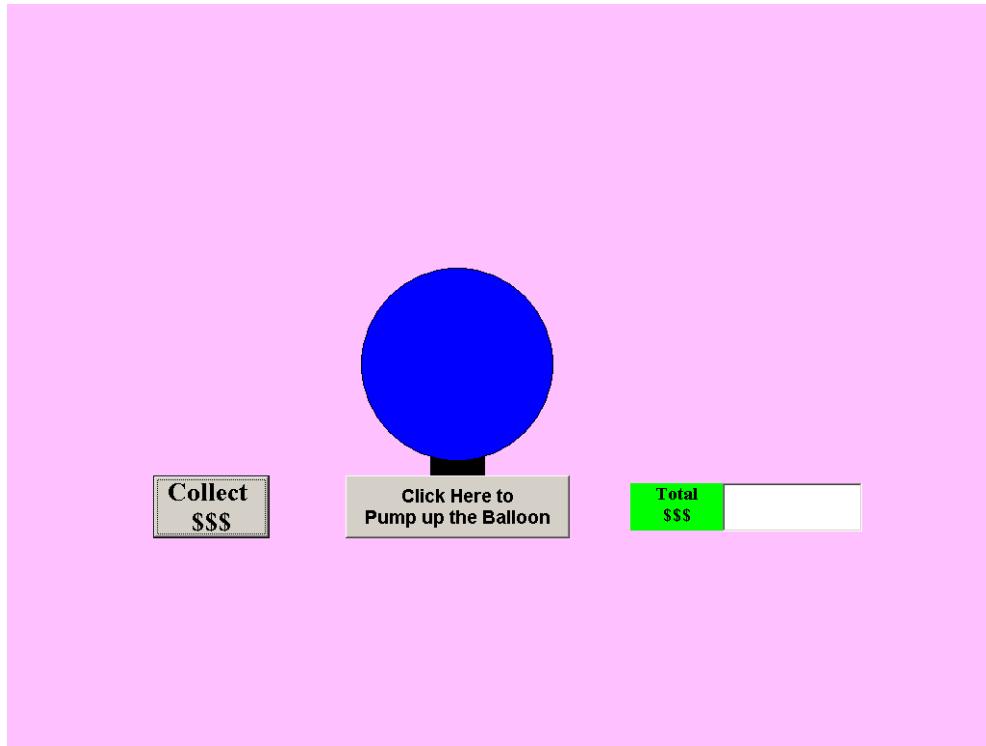


Figure 1. Schematic of the Balloon Analogue Risk Task.



Figure 2. Photo of experimental room set-up.

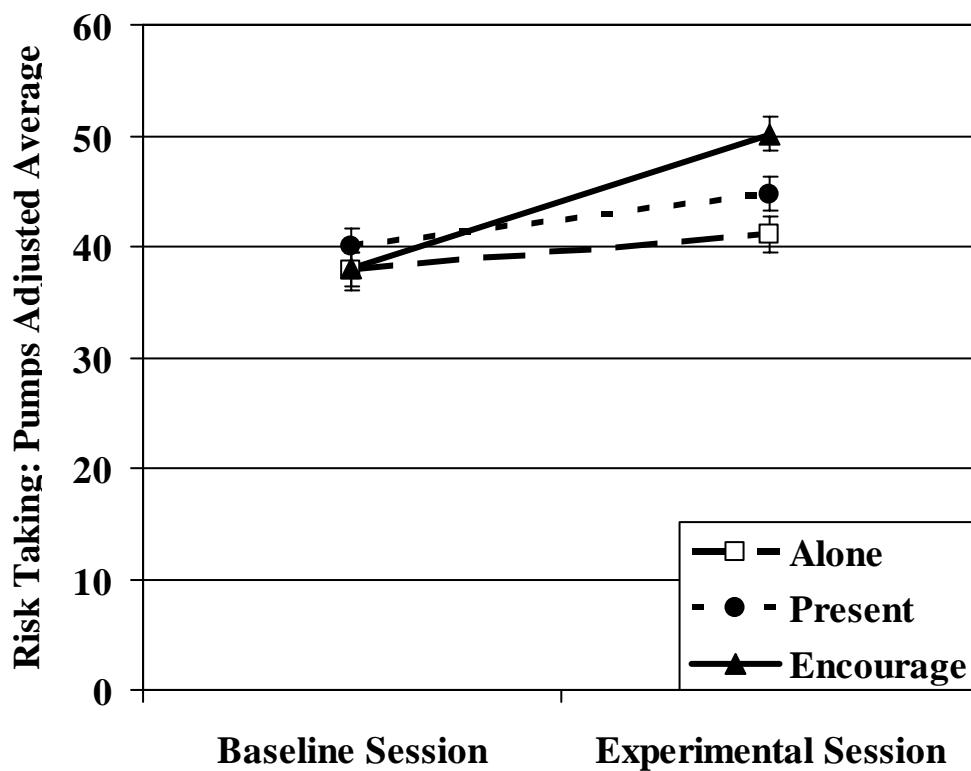


Figure 3. Balloon Analogue Risk Task performance at the baseline and the experimental sessions across condition. Error bars represent standard errors.

References

- Aiello, J.R., & Douthitt, E.A. (2001). Social facilitation theory from Triplet to electronic performance monitoring. *Group Dynamics, 5*(3), 163-180.
doi:10.1037/1089-2699.5.3.163
- Aklin, W.M., Lejuez, C.W., Zvolensky, M.J., Kahler, C.W., & Gwadz, M. (2005). Evaluation of a behavioral measure of risk taking propensity with inner-city adolescents. *Behaviour Research and Therapy, 43*(2), 215-228.
doi:10.1016/j.brat.2003.12.007
- Albert, D., O'Brien, L., DiSorbo, A., Uckert, K., Eagan, D., Chein, J., & Steinberg, L. (2009, April). *Peer influences on risk taking in young adulthood*. Poster presented at the 2009 Society for Research in Child Development Biennial Meeting, Denver, CO.
- Allen, J.P., & Antonishak, J. (2008). Adolescent peer influences: Beyond the dark side. In: M.J. Prinstein, & K.A. Dodge (Eds), *Understanding Peer Influence in Children and Adolescents* (pp. 141-160). New York: Guilford Press.
- Allen, J.P., & Brown, B.B. (2008). Adolescents, peers, and motor vehicles: The perfect storm? *American Journal of Prevention Medicine, 35*(3), S289-S292.
doi:10.1016/j.amepre.2008.06.017
- Allen, J.P., Porter, M.R., & McFarland, C. (2006). Leaders and followers in adolescent close friendships: Susceptibility to peer influence as a predictor of risky behavior, friendship instability, and depression. *Development and Psychopathology, 18*, 155–172. doi:10.1017/S0954579406060093

American Cancer Society. (2007). *Cancer prevention & early detection facts and figures*. Atlanta, GA: American Cancer Society.

Andrews, J.A., Tildesley, E., Hops, H., & Li, F. (2002). The influence of peers on young adult substance use. *Health Psychology, 21*, 349–357.
doi:10.1037//0278-6133.21.4.349

Arnett, J.J. (2005). The developmental context of substance use in emerging adulthood. *Journal of Drug Issues, 35*, 235–253. Retrieved from
<http://www2.criminology.fsu.edu/~jdi/>

Arnett, J.J., Offer, D., & Fine, M.A. (1997). Reckless driving in adolescence: ‘state’ and ‘trait’ factors. *Accident Analysis and Prevention, 29*, 57– 63.
doi:10.1016/S0001-4575(97)87007-8

Bachman, J.G., Wadsworth, K.N., O'Malley, P.M., & Schulenberg, J. (1997). Marriage, divorce, and parenthood during the transition to young adulthood: Impacts on drug use and abuse. In J. Schulenberg, & J. Maggs (Eds.), Health risks and developmental transitions during adolescence (pp. 246-269). NY: Cambridge University Press.

Bachman, J.G., O'Malley, P.M., Schulenberg, J.E., Johnston, L.D., Bryant, A.L., & Merline, A.C. (2002). *The decline of substance use in young adulthood: Changes in social activities, roles, and beliefs*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Bailey, J.A., Fleming, C.B., Henson, J.N., Catalano, R.F., & Haggerty, K.P. (2008). Sexual risk behavior 6 months post-high school: Associations with college

- attendance, living with a parent, and prior risk behavior. *Journal of Adolescent Health*, 42, 573-579. doi:10.1016/j.jadohealth.2007.11.138
- Baer, J.S., Kivlahan, D.R., & Marlatt, G.A. (1995). High-risk drinking across the transition from high school to college. *Alcoholism: Clinical and Experimental Research*, 19, 54-61. doi:10.1111/j.1530-0277.1995.tb01472.x
- Baumeister, R.F., & Leary, M.R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497-529. doi:10.1037//0033-2909.117.3.497
- Baxter, J.S., Manstead, A.S.R., Stradling, S.G., Campbell, K.A., Reason, J.T., & Parker, D. (1990). Social facilitation and driver behaviour. *British Journal of Psychology*, 81, 351– 360. Retrieved from
<http://www.bps.org.uk/publications/journals/journaltitles/bjp.cfm>
- Bearinger, L.H., & Resnick, M.D. (2003). Dual method use in adolescents: A review and framework for research on use of STD and pregnancy protection, *Journal of Adolescent Health*, 32, 340-349. doi:10.1016/S1054-139X(03)00018-1
- Bingham, C.R., Shope, J.T., Parow, J.E., & Raghunathan, T.E. (2009). Crash types: Markers of increased risk of alcohol-involved crashes among teen drivers. *Journal of Studies on Alcohol*, 70, 528-535. Retrieved from
<http://www.jsad.com/>
- Bond, R., & Smith, P. (1996). Culture and conformity: A meta-analysis of studies using Asch's (1952b, 1956) line judgment task. *Psychological Bulletin*, 119, 111-137. doi:10.1037//0033-2909.119.1.111

Borsari, B., & Carey, K.B. (2001). Peer influence on college drinking: A review of the research. *Journal of Substance Abuse*, 13, 391-424. doi:10.1016/S0899-3289(01)00098-0

Borsari, B., & Carey, K.B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol*, 64, 331-341. Retrieved from <http://www.jsad.com/>

Borsari, B., & Carey, K.B. (2006). Influence of the quality of peer relationships on college drinking. *Drug and Alcohol Review*, 25, 361-370. doi:10.1080/09595230600741339

Boyer, T.W. (2006). The development of risk-taking: A multi-perspective review, *Developmental Review*, 26, 291–345. doi:10.1016/j.dr.2006.05.002

Brook, J.S., Whiteman, M., Czeisler, L.J., Shapiro, J., & Cohen, P. (1997). Cigarette smoking in young adults: Childhood and adolescent personality, familial, and peer antecedents. *Journal of Genetic Psychology*, 158, 172–188. doi:10.1080/00221329709596660

Brooks-Gunn, J., & Furstenberg, F., Jr (1989). Adolescent sexual behavior. *American Psychologist*, 44, 249–257. doi:10.1037//0003-066X.44.2.249

Brown, B. B. (1990). Peer groups and peer cultures. In S.S. Feldman & G.R. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 171 – 196). Cambridge, MA: Harvard University Press.

Brown, B. (2004). Adolescents' relationships with peers. In R. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology*, 2nd edition (pp. 363–394). New York: Wiley.

Brown, B.B., Bakken, J.P., Ameringer, S.W., & Mahon, S.D. (2008). A comprehensive conceptualization of the peer influence process in adolescence. In M.J. Prinstein & K.A. Dodge (Eds.), *Understanding Peer Influence in Children and Adolescents* (pp. 17-44). New York: Guilford Publications.

Brown, B.B., Dolcini, M.M., & Leventhal, A. (1997). Transformations in peer relationships at adolescence: implications for health-related behavior. In: J. Schulenberg, J.L. Maggs, & K. Hurrelman (Eds.), *Health risks and developmental transitions during adolescence* (pp. 161-189). New York: Cambridge University Press.

Byrnes, J.P., Miller, D.C., & Schafer, W.D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125*, 367-383. doi:10.1037/0033-2909.125.3.367

Capaldi, D.M., Dishion, T.J., Stoolmiller, M., & Yoerger, K. (2001). Aggression toward female partners by at-risk young men: the contribution of male adolescent friendships. *Developmental Psychology, 37*, 61–73. doi:10.1037//0012-1649.37.1.61

Centers for Disease Control and Prevention (CDCP). (2001). National school-based Youth Risk Behavior Survey. Public-use data documentation. Atlanta, GA: Author.

Centers for Disease Control and Prevention (CDCP). (2003). *Sexually transmitted disease surveillance, 2002*. U.S. Department of Health and Human Services, Atlanta, GA.

Centers for Disease Control and Prevention (CDCP). (2005). *Sexually transmitted disease surveillance, 2004*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention.

Chassin, L., Hussong, A., Barrera, M. Jr., Molina, B.S.G., Trim, R., & Ritter, J. (2004). Adolescent substance use. In R.M. Lerner, & L. Steinberg (Eds.). *Handbook of adolescent psychology, 2nd Edition* (pp. 199–230). Hoboken, NJ: Wiley.

Chassin, L., Hussong, A., & Beltran, I. (2009). Adolescent substance use. In: R. Lerner, & L. Steinberg (Eds.), *Handbook of Adolescent Psychology, 3rd Edition* (pp. 723-763). Hoboken, NJ: John Wiley & Sons Inc.

Chen, L., Baker, S.P., Braver, E.R., & Li, G. (2000). Carrying passengers as a risk factor for crashes fatal to 16- and 17-year-old drivers. *JAMA: The Journal of the American Medical Association*, 283, 1578–1582.
doi:10.1001/jama.283.12.1578

Chen, K., & Kandel, D.B. (1995). The natural history of drug use from adolescence to the mid-thirties in a general population sample. *American Journal of Public Health*, 85, 41-47. doi:10.2105/AJPH.85.1.41

Chein, J., Albert, D., O'Brien, L., Uckert, K., & Steinberg, L. (2011). Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Developmental Science*, 14(2), F1–F10. doi:10.1111/j.1467-7687.2010.01035.x

Cialdini, R.B., & Reno, R.R., & Kallgren, C.A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places.

Journal of Personality and Social Psychology, 58, 1015-1026.

doi:10.1037//0022-3514.58.6.1015

Clapp, J.D., Lange, J.W., & Shillington, A.M. (2003). Two Studies Examining Environmental Predictors of Heavy Drinking by College Students. *Prevention Science*, 4, 99-108. doi:10.1023/A:1022974215675

Clapp, D., Reed, M.B., Holmes, M.R., Lange, J.E., & Voas, R.B. (2006). Drunk in public, drunk in private: The relationship between college students' drinking environments and alcohol consumption. *American Journal of Drug and Alcohol Abuse*, 32, 275–285. doi:10.1080/00952990500481205

Clark, D.B., & Moss, H.B. (2010). Providing Alcohol-Related Screening and Brief Interventions to Adolescents through Health Care Systems: Obstacles and Solutions. *Public Library of Science – Medicine*, 7(3), e1000214.

doi:10.1371/journal.pmed.1000214

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

Cohen, G.L., & Prinstein, M.J. (2006). Peer contagion of aggression and health-risk behavior among adolescent males: An experimental investigation of effects on public conduct and private attitudes. *Child Development*, 77, 967-983.

doi:10.1111/j.1467-8624.2006.00913.x

College Portrait, University of Maryland – College Park. (2009). Retrieved from <http://www.collegeportraits.org/MD/UMCP/characteristics>

Cooper, M. L., Wood, P. K., Orcutt, H. K., & Albino, A. (2003). Personality and the predisposition to engage in risky or problem behaviors during adolescence.

- Journal of Personality and Social Psychology*, 84, 390–410.
doi:10.1037=0022-3514.84.2.390
- Corbin, W.R., Vaughan, E.L., & Fromme, K. (2008). Ethnic differences and the closing of the sex gap in alcohol use among college-bound students. *Psychology of Addictive Behaviors*, 22, 240-248. doi:10.1037/0893-164X.22.2.240
- Crandall, C.S. (1988). Social contagion of binge eating. *Journal of Personality and Social Psychology*, 55, 588-598. doi:10.1037/0022-3514.55.4.588
- Csikszentmihalyi, M. & Larson, R. (1984). *Being adolescent*. New York: Basic Books.
- Deaux, K., & Major, B. (1987). Putting gender into context: An interactive model of gender-related behavior. *Psychological Review*, 94, 369-389.
doi:10.1037/0033-295X.94.3.369
- DiBlasio, F., & Benda, B. (1992). Gender differences in theories of adolescent sexual activity. *Sex Roles*, 27, 221–240. doi:10.1007/BF00289926
- DiIorio, C., Dudley, W.N., Kelly, M., Soet, J.E., Mbwara, J., & Potter, J.S. (2001). Social cognitive correlates of sexual experience and condom use among 13-through 15-year-old adolescents. *Journal of Adolescent Health*, 29, 208-216.
doi:10.1016/S1054-139X(00)00200-7
- Diego, M.A., Field, T.M., & Sanders, C.E. (2003). Academic performance, popularity, and depression predict adolescent substance use. *Adolescence*, 38(149), 35-42.
- Dishion, T.J., Andrews, D.W., & Crosby, L. (1995). Antisocial boys and their friends

- in early adolescence: Relationship characteristics, quality, and interactional process. *Child Development*, 66, 139-151. doi:10.2307/1131196
- Dishion, T.J., Capaldi, D., Spracklen, K.M., & Li, F. (1995). Peer ecology of male adolescent drug use. *Development and Psychopathology*, 7, 803 – 824. doi:10.1017/S0954579400006854
- Dishion, T.J., & Owen, L.D. (2002). A longitudinal analysis of friendships and substance use: Bidirectional influence from adolescence to adulthood. *Developmental Psychology*, 38, 480–491. doi:10.1037//0012-1649.38.4.480
- Dishion, T.J., Patterson, G.R., Stoolmiller, M., & Skinner, M.L. (1991). Family, school, and behavioral antecedents to early adolescent involvement with antisocial peers. *Developmental Psychology*, 27, 172 – 180. doi:10.1037//0012-1649.27.1.172
- Dishion, T.J., Spracklen, K.M., Andrews, D.W., & Patterson, G.R. (1996). Deviancy training in male adolescents' friendships. *Behavior Therapy*, 27, 373 – 390. doi:10.1016/S0005-7894(96)80023-2
- Ellickson, P.L., Perlman, M., & Klein, D.J. (2003). Explaining racial/ethnic differences in smoking during the transition to adulthood. *Addictive Behaviors*, 28, 915–931. doi:10.1016/S0306-4603(01)00285-4
- Erickson, M., & Jensen, G.F. (1977). Delinquency is still a group behavior! Toward revitalizing the group premise of the sociology of deviance. *Journal of Criminal Law and Criminology*, 68, 262–273. doi:10.2307/1142849
- Friedman, L.S., Lichtenstein, E. & Biglan, A. (1985) Smoking onset among teens: An empirical analysis of initial situations. *Addictive Behaviors*, 10, 1–13.

doi:10.1016/0306-4603(85)90048-6

Furman, W. (1996). The measurement of friendship perceptions: Conceptual and methodological issues. In: W.M. Bukowski, A.F. Newcomb, & W.W. Hartup (Eds.), *The Company they Keep: Friendship in Childhood and Adolescence* (pp. 41-65). New York, NY, US: Cambridge University Press.

Furman, W., & Buhrmester, D. (1985). Children's perceptions of the personal relationships in their social networks. *Developmental Psychology, 21*, 1016-1024. doi:10.1037//0012-1649.21.6.1016

Furman, W., & Buhrmester, D. (2009). The Network of Relationships Inventory: Behavioral Systems. *International Journal of Behavioral Development, 33*, 470-478. doi:10.1177/0165025409342634

Futterman, D.C. (2005). HIV in adolescents and young adults: Half of all new infections in the United States. *Topics in HIV Medicine, 13*, 101–105.

Retrieved from <http://www.iasusa.org/pub/>

Gardner, M., & Steinberg, L. (2005). Peer influence on risk-taking, risk preference, and risky decision-making in adolescence and adulthood: An experimental study. *Developmental Psychology, 41*, 625-635. doi:10.1037/0012-1649.41.4.625

Graham, J., Marks, G., & Hansen, W. (1991). Social influence processes affecting adolescent substance use. *Journal of Applied Psychology, 76*, 291-298.

doi:10.1037//0021-9010.76.2.291

Harrison, J. D., Young, J. M., Butow, P., Salkeld, G., & Solomon, M. J. (2005). Is it worth the risk? A systematic review of instruments that measure risk

- propensity for use in the health setting. *Social Science & Medicine*, 60, 1385–1396. doi:10.1016/j.socscimed.2004.07.006
- Hebert, R. (2004). What's new in nicotine and tobacco research? *Nicotine and Tobacco Research*, 6, S279-S283. doi:10.1080/14622200412331320671
- Hops, H., Andrews, J.A., Duncan, S.C., Duncan, T.E., Tildesley, E. (2000). Adolescent drug use development: A social interactional and contextual perspective. In: A.J. Sameroff, M. Lewis, & S.M. Miller (Eds.), *Handbook of developmental psychopathology 2nd ed.* (pp. 589-605). Dordrecht, Netherlands: Kluwer Academic Publishers.
- House, J.S., Landis, K.R., & Umberson, D. (1988). Social relationships and health. *Science*, 241, 540 –545. doi:10.1126/science.3399889
- Jaccard, J., Blanton, H., & Dodge, T. (2005). Peer influences on risk behavior: An analysis of the effects of a close friend. *Developmental Psychology*, 41, 135-147. doi:10.1037/0012-1649.41.1.135
- Jacquin, K.M., Harrison, M.L., & Alford, S.M. (2006). Gender and peer presence influence responses to aggressive provocation. *American Journal of Forensic Psychology*, 24(3), 29-44. Retrieved from <http://www.forensicpsychology.org/journal.htm>
- Jessor, R., & Jessor, S.L. (1977). *Problem behavior and psychological development: A longitudinal study of youth*. New York: Academic Press.
- Johnston, L.D., O'Malley, P.M., Bachman, J.G., & Schulenberg, J.E. (2005). *Monitoring the future: National survey results on drug use, 1975-2004*.

- Volume I: Secondary school students.* NIH Publication 05-5727. Bethesda, MD: National Institute on Drug Abuse.
- Johnston, L.D., O'Malley, P.M., Bachman, J.G., & Schulenberg, J.E. (2009). *Monitoring the Future national survey results on drug use, 1975-2008.*
- Volume II: College students and adults ages 19-50.* NIH Publication No. 09-7403. Bethesda, MD: National Institute on Drug Abuse, 306 pp.
- Judd, C.M., Kenny, D.A., & McClelland, G.H. (2001). Estimating and testing mediation and moderation in within-participant designs. *Psychological Methods*, 6, 115-134. doi:10.1037//1082-989X.6.2.115
- Kandel, D.B. (1996). The parental and peer contexts of adolescent deviance: An algebra of interpersonal influences. *Journal of Drug Issues*, 26, 289–315.
Retrieved from <http://www2.criminology.fsu.edu/~jdi/>
- Kandel, D.B., & Andrews, K. (1987). Processes of adolescent socialization by parents and peers. *International Journal of Addictions*, 22, 319–342.
doi:10.3109/10826088709027433
- Kawachi, I.B., & Berkman, L.F. (2001). Social ties and mental health. *Journal of Urban Health*, 78, 458–67. doi:10.1093/jurban/78.3.458
- Kiene, S.M., & Barta, W. (2003). Personal narrative as a medium for STD/HIV intervention: A preliminary study. *Journal of Applied Social Psychology*, 33, 2327–2340. doi:10.1111/j.1559-1816.2003.tb01887.x
- Kiene, S.M., & Barta, W.D. (2006). A brief individualized computer-delivered sexual risk reduction intervention increases HIV/AIDS preventive behavior. *Journal of Adolescent Health*, 39, 404 –410. doi:10.1016/j.jadohealth.2005.12.029

- Kiene, S.M., Barta, W.D., Zelenski, J.M., & Cothran, D.L. (2005). Why are you bringing up condoms now? The effect of message content on framing effects of condom use messages. *Health Psychology*, 24, 321–326. doi:10.1037/0278-6133.24.3.321
- Kobus, K. (2003). Peers and adolescent smoking. *Addiction*, 98, 37–55. doi:10.1046/j.1360-0443.98.s1.4.x
- Larimer, M.E., Turner, A.P., Mallett, K.A., & Geisner, I.M. (2004). Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: Examining the role of descriptive and injunctive norms. *Psychology of Addictive Behaviors*, 18, 203–212. doi:10.1037/0893-164X.18.3.203
- Leigh, B.C. (1999). Peril, chance, adventure: Concepts of risk, alcohol use and risky behavior in young adults. *Addiction*, 94, 371-383. doi:10.1046/j.1360-0443.1999.9433717.x
- Leibsohn, J. (1994). The relationship between drug and alcohol use and peer group associations of college freshmen as they transition from high school. *Journal of Drug Education*, 24, 177–192. doi:10.2190/DVYX-PUX7-KA7T-1X4R
- Lejuez, C.W., Aklin, W.M., Daughters, S.B., Zvolensky, M.J., Kahler, C.W., & Gwadz, M. (2007). Reliability and validity of the youth version of the Balloon Analogue Risk Task (BART-Y) in the assessment of risk-taking behavior among inner-city adolescents. *Journal of Clinical Child and Adolescent Psychology*, 36, 106-111. doi:10.1207/s15374424jccp3601_11
- Lejuez, C.W., Aklin, W.M., Jones, H.A., Richards, J.R., Strong, D.R., Kahler, C.W., & Read, J.P. (2003). The Balloon Analogue Risk Task differentiates smokers

- and nonsmokers. *Experimental and Clinical Psychopharmacology*, 11, 26-33.
doi:10.1037//1064-1297.11.1.26
- Lejuez, C.W., Read, J.P., Kahler, C.W., Richards, J.B., Ramsey, S.E., Stuart, G.L., Strong, D.R., & Brown, R.A. (2002). Evaluation of a behavioral measure of risk-taking: The Balloon Analogue Risk Task (BART). *Journal of Experimental Psychology: Applied*, 8, 75-84. doi:10.1037//1076-898X.8.2.75
- Lewis, M.A., & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research. *Journal of American College Health*, 54, 213-218. doi:10.3200/JACH.54.4.213-218
- Lucas, K., & Lloyd, B. (1999) Starting smoking: girls' explanations of the influence of peers. *Journal of Adolescence*, 22, 647–655. doi:10.1006/jado.1999.0260
- Maisto, S.A., Carey, K.B., & Bradizza, C.M. (1999). Social learning theory. In K.E. Leonard, & H.T. Blane (Eds.), *Psychological theories of drinking and alcoholism, 2nd edition* (pp. 106-163). New York: Guilford Press.
- Martin, C.M., & Hoffman, M.A. (1993). Alcohol expectancies, living environment, peer influence, and gender: A model of college-student drinking. *Journal of College Student Development*, 34, 206–211.
- Miller, D.C., & Byrnes, J.P. (1997). Role of contextual and personal factors in children's risk-taking. *Developmental Psychology*, 33, 814-823.
doi:10.1037/0012-1649.33.5.814
- Miller, D.T., & Prentice, D.A. (1996). The construction of social norms and standards. In F.T. Higgins, & A.W. Kruglanski (Eds.), *Social psychology: handbook of basic principles* (pp. 799-829). New York: Guilford Press.

- Mohler-Kuo, M., Lee, J.E., & Wechsler, H. (2003). Trends in marijuana and other illicit drug use among college students: Results from 4 Harvard School of Public Health College Alcohol Study Surveys: 1993-2001. *Journal of American College Health*, 52, 17-24. doi:10.1080/07448480309595719
- Morrongiello, B.A., & Sedore, L. (2005). The influence of child attributes and social-situational context on school-age children's risk-taking behaviors that can lead to injury. *Journal of Applied Developmental Psychology*, 26, 347-361. doi:10.1016/j.appdev.2005.02.003
- Nawa, N.E., Nelson, E.E., Pine, D.S., & Ernst, M. (2008). Do you make a difference? Social context in a betting task. *Social Cognitive & Affective Neuroscience*, 3, 367-376. doi:10.1093/scan/nsn032
- Oostveen, T., Knibbe, R.A., & De Vries, H. (1996). Social influences on young adults' alcohol consumption; norms, modeling, pressure, socializing and conformity. *Addictive Behaviors*, 21, 187–197. doi:10.1016/0306-4603(95)00052-6
- Paul, E.L., & Kelleher, M. (1995). Precollege concerns about losing and making friends in college. *Journal of College Student Development*, 36, 513–521.
- Perkins, H.W., & Berkowitz, A.A. (1986). Using student alcohol surveys: Notes on clinical and educational Program applications. *Journal of Alcohol and Drug Education*, 31, 44-51. Retrieved from <http://vlex.com/source/journal-alcohol-drug-education-3082>
- Perkins, H.W., Haines, M.P., & Rice, R.M. (2005). Misperceiving the college drinking norm and related problems: A nationwide study of exposure to

- prevention information, perceived norms, and student alcohol misuse. *Journal of Studies on Alcohol*, 66, 470-478. Retrieved from <http://www.jsad.com/>
- Piehler, T.F., & Dishion, T.J. (2007). Interpersonal dynamics within adolescent friendships: Dyadic mutuality, deviant talk, and patterns of antisocial behavior. *Child Development*, 78, 1611-1624. doi:10.1111/j.1467-8624.2007.01086.x
- Pittman, L.D., & Richmond, A. (2008). University belonging and friendship quality during the transition to college: Links to self perceptions and psychological symptoms. *Journal of Experimental Education*, 76, 343-361. doi:10.3200/JEXE.76.4.343-362
- Plante, T.G. (2010). *Contemporary Clinical Psychology*. Hoboken, NJ: John Wiley & Sons Inc.
- Prentice, D.A. (2008). Mobilizing and weakening peer influence as mechanisms for changing behavior. In M.J. Prinstein & K.A. Dodge (Eds.), *Understanding Peer Influence in Children and Adolescents* (pp. 161-180). New York: Guilford.
- Preusser, D.F., Ferguson, S.A., & Williams, A.F. (1998). The effect of teenage passengers on the fatal crash risk of teenage drivers. *Accident Analysis and Prevention*, 30, 217-22. doi:10.1016/S0001-4575(97)00081-X
- Prinstein, M. J. (2007). Assessment of adolescents' preference- and reputation-based popularity using sociometric experts. *Merrill-Palmer Quarterly*, 53, 243-261. doi:10.1353/mpq.2007.0013

- Prinstein, M.J., Boergers, J., & Spirito, A. (2001). Adolescents' and their friends' health-risk behavior: Factors that alter or add to peer influence. *Journal of Pediatric Psychology*, 26, 287-298.
- Prinstein, M.J. & Dodge, K.A. (2008). Current issues in peer influence research. In M.J. Prinstein, & K.A. Dodge (Eds.), *Understanding peer influence in children and adolescents* (pp. 3-13). New York: Guilford.
- Prinstein, M.J., Heilbron, N., Guerry, J.D., Franklin, J.C., Rancourt, D., Simon, V., & Spirito, A. (2010). Peer influence and nonsuicidal self injury: Longitudinal results in community and clinically-referred adolescent samples. *Journal of Abnormal Child Psychology*, 38, 669-682. doi:10.1007/s10802-010-9423-0
- Prinstein, M., Meade, C., & Cohen, G. (2003). Adolescent oral sex, peer popularity, and perceptions of best friends' sexual behavior. *Journal of Pediatric Psychology*, 28, 243–249. doi:10.1093/jpepsy/jsg012
- Rabow, J., & Duncan-Schill, M. (1995). Drinking among college students. *Journal of Alcohol and Drug Education*, 40, 52-64. Retrieved from <http://vlex.com/source/journal-alcohol-drug-education-3082>
- Read, J.P., Wood, M.D., Davidoff, O.J., McLacken, J., & Campbell, J.F. (2002). Making the transition from high school to college: The role of alcohol-related social influence factors in students' drinking. *Substance Abuse*, 23, 53–65. doi:10.1080/08897070209511474
- Regan, M.A., & Mistopoulos, E. (2003). *Understanding passenger influences on driver behaviour: implications for road safety and recommendations for*

- countermeasure development*. Victoria, Australia: Accident Research Centre, Monash University. Report #180.
- Reifman, A., & Watson, K. (2003). Binge drinking during the first semester of college. *Journal of American College Health, 52*, 73–81.
doi:10.1080/07448480309595727
- Revzina, N.V., & Diclemente, R.J. (2005). Prevalence and incidence of human papillomavirus infection in women in the USA: a systematic review. *International Journal of STD & AIDS, 16*, 528–537.
doi:10.1258/0956462054679214
- Rockloff, M.J., & Dyer, V. (2007). An experiment on the social facilitation of gambling behavior. *Journal of Gambling Studies, 23*, 1-12.
doi:10.1007/s10899-006-9042-4
- Rolinson, M.R., & Scherman, A.S. (2003). College student risk-taking from three perspectives. *Adolescence, 38*, 689-704.
- Schulenberg, J.E., O'Malley, P.M., Bachman, J.G., Wadsworth, K.N., & Johnston, L.D. (1996). Getting drunk and growing up: Trajectories of frequent binge drinking during the transition to young adulthood. *Journal of Studies on Alcohol, 57*(3), 289-304. Retrieved from <http://www.jsad.com/>
- Simons-Morton, B., Lerner, N., & Singer, J. (2005). The observed effects of teenage passengers on the risky driving behavior of teenage drivers. *Accident Analysis and Prevention, 37*, 973-982. doi:10.1016/j.aap.2005.04.014

- Smetana, J.G., & Asquith, P. (1994). Adolescents' and parents' conceptions of parental authority and personal autonomy. *Child Development*, 65, 1147–1162. doi:10.2307/1131311
- Steinberg, L. (2007). Risk taking in adolescence: New perspectives from brain and behavioral science. *Current Directions in Psychological Science*, 16, 55-59. doi:10.1111/j.1467-8721.2007.00475.x
- Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, 28, 78-106. doi:10.1016/j.dr.2007.08.002
- Steinberg, L. (2009). Adolescent development and juvenile justice. *Annual Review of Clinical Psychology*, 5, 47-73. doi:10.1146/annurev.clinpsy.032408.153603
- Steinberg, L. & Monahan, K.C. (2007). Age differences in resistance to peer influence. *Developmental Psychology*, 43, 1531–1543. doi:10.1037/0012-1649.43.6.1531
- Stevens, E. A. & Prinstein, M. J. (2005). Peer contagion of depressogenic attributional styles among adolescents: A longitudinal study. *Journal of Abnormal Child Psychology*, 33, 25-37. doi:10.1007/s10802-005-0931-2
- Substance Abuse and Mental Health Services Administration (SAMHSA). *Results from the 2004 National Survey on Drug Use and Health: National Findings*. Retrieved from
<http://www.oas.samhsa.gov/NSDUH/2k4NSDUH/2k4results/2k4results.htm#fig7.3>.
- Tabachnick, B.G., & Fidell, L.S. (2007). *Using Multivariate Statistics* (5th Ed.). Boston, MA: Pearson.

Thombs, D.L. (1999). *An introduction to addictive behaviors*, 2nd Edition. New York: Guilford Press.

Udry, J. (1987). Hormonal and social determinants of adolescent sexual initiation. In J. Bancroft (Ed). *Adolescence and puberty* (pp.70-87). New York: Oxford University Press.

Urberg, K.A., Luo, Q., Pilgrim, C., & Degirmencioglu, S.M. (2003). A two-stage model of peer influence in adolescent substance use: Individual and relationship-specific differences in susceptibility to influence. *Addictive Behaviors*, 28, 1243-1256. doi:10.1016/S0306-4603(02)00256-3

Volkow, N.D. (2004). Exploring the why's of adolescent drug abuse. *NIDA Notes*, 19(3), 1–2. Retrieved from

http://www.nida.nih.gov/NIDA_Notes/nv23index.html

Wechsler, H., Davenport, A., Dowdall, G.W., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college. A national survey of students at 140 campuses. *JAMA: The Journal of the American Medical Association*, 272, 1672-1677. doi:10.1001/jama.272.21.1672

Wechsler, H., Lee, J., Kuo, M., & Lee, H. (2000). College binge drinking in the 1990s: A continuing problem—Results of the Harvard School of Public Health 1999 College Alcohol Study. *Journal of American College Health*, 48, 199–210. doi:10.1080/07448480009599305

Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts. Findings from 4 Harvard School of Public Health College Alcohol

- Study Surveys: 1933-2001. *Journal of American College Health*, 50, 203-217.
doi:10.1080/07448480209595713
- Wechsler, H., Nelson, T.F., Lee, J.E., Seibring, M., Lewis, C., & Keeling, R.P. (2003). Perception and reality: A national evaluation of social norms marketing interventions to reduce college students' heavy alcohol use. *Journal of Studies on Alcohol*, 64, 484-494.
- White, H.R., & Jackson, K. (2004). Social and psychological influences on emerging adult drinking behavior. *Alcohol Research & Health*, 28, 182-190.
- White, T.L., Lejuez, C.W., & de Wit, H. (2008). Test-retest characteristics of the Balloon Analogue Risk Task (BART). *Experimental and Clinical Psychopharmacology*, 16, 565-570. doi:10.1037/a0014083
- White, H.R., McMorris, B.J., Catalano, R.F., Fleming, C.B., Haggerty, K.P., & Abbott, R.D. (2006). Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *Journal of Studies on Alcohol*, 67, 810-822.
- Wood, M.D., Read, J., Palfai, T., & Stevenson, J.F. (2001). Social influence processes and college student drinking: The mediation role of alcohol outcome expectancies. *Journal of Studies on Alcohol*, 62, 32-43. Retrieved from <http://www.jsad.com/>
- Zajonc, R.B. (1965). Social Facilitation. *Science*, 149, 269-274.
doi:10.1126/science.149.3681.269

Zakriski, A. L., & Prinstein, M. J. (2001). Sociometric status of child inpatients in clinical and normative peer groups: Is peer status in a clinical setting a useful measure of adjustment? *Journal of Applied Developmental Psychology*, 22(2), 1–17. doi:10.1016/S0193-3973(01)00074-0

Zarrett, N., & Eccles, J. (2006). The passage to adulthood: Challenges of late adolescence. *New Directions for Youth Development*, 2006(111), 13-28. doi:10.1002/yd.179

Zimring, F.E. (1998). *American youth violence*. Oxford, England: Oxford University Press.