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Analogue Study of Peer Influence on Risk-Taking Behavior in Older Adolescents

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Abstract

This experimental study aimed to examine whether adolescents act in a riskier manner in the presence of peers and whether peer presence alone influences risk behavior or if a direct influence process is necessary. Utilizing a behavioral task assessing risk-taking, 183 older adolescents (18–20 year olds) came to the laboratory alone once and then were randomized to one of three conditions: alone, peers present, peers encouraging. An interaction was found such that at baseline there were no significant differences between the three conditions but at the experimental session there was a significant increase in risk task scores particularly for the encouraging condition. These findings challenge proposed models of the interaction between peer influence and risk taking by providing evidence that 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.

Keywords

peer influence; risk-taking; older adolescent; behavioral task

Older adolescence (ages 18–20) is a period characterized by a propensity towards involvement in risky behaviors (e.g., substance use and abuse, risky sexual behavior, reckless driving) that have the potential for serious physical and psychological consequences (Johnston, O'Malley, Bachman, & Chulenberg, 2005). An abundance of research has demonstrated that older adolescent risk taking often occurs in the presence of peers (Steinberg, 2009). Although extant literature has provided insight into the means by which peers may influence risk behavior engagement (Prinstein & Dodge, 2008), a number of methodological limitations remain. Specifically, it is not well understood how peer influence truly manifests in the immediate context of risk behavior engagement and consequently if the influence of peers has been overestimated. A situational effect may take place whereby

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the presence of the peers and/or their influence in that moment directly increases risk taking (e.g., Steinberg, 2009). Moreover, if there is a causal situational effect, a critical question is whether the effect is due to the presence of peers alone or to a direct influence process (i.e., a peer encourages a behavior).

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 hit on a joint) to overt encouragement and orders (e.g., forcing others to drink during drinking games). Studies of direct influence are relatively limited among older adolescents and have focused on alcohol use (Borsari, & Carey, 2001). The existing research has shown that direct offers to drink are associated with alcohol use and alcohol-related problems (Wood, Read, Palfai, & Stevenson, 2001). Further, qualitative work suggests that not drinking at college social functions is regarded as an unusual behavior that elicits several offers to drink (Rabow & Duncan-Schill, 1994). Thus, nondrinking students at parties are repeatedly offered drinks and often exposed to teasing from friends and report feelings of inferiority.

In addition to these descriptive studies based on self-report, some experimental work examining direct peer influence has also been conducted. In a seminal study, Gardner and Steinberg (2005) investigated peer influence and its effect on risk taking across a range of age groups from middle adolescence through young adulthood. Participants were randomized to complete self-report and behavioral measures of risk taking either alone or with two same-gender, same-aged peers. The peers were provided by the experimenters and were informed that they could call out any advice during the behavioral task and questionnaires, while the participant was instructed that he or she could choose whether or not to follow the advice of his or her peers. Results demonstrated that compared with those who completed the measures alone, 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.

Through an experimental manipulation, this study provided support for the importance of peer influence on risk taking among adolescents, but leaves open important questions about the nature of that influence. One particularly relevant question is the extent to which peer influence on risk taking is a function merely of peer presence or of the direct influence-related actions by the peers. The Gardner and Steinberg (2005) study shows that direct advice will influence risk behavior among adolescents but the implemented design did not allow for examining if the impact was due merely to the presence of the peer. Understanding this distinction in the mechanisms underlying peer influence has direct implications for prevention and intervention efforts.

Within the immediate context of risk behavior engagement, it may be that the manner by which a peer influences behavior is not through direct communication as described above but rather through an implicit process manifested in the simple presence of peers alone as social influence. For example, in the driving literature 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). It has been proposed that to the extent to which

risk behavior is a method for maintaining or obtaining reputation and social status, risk taking will be more likely when a peer is present to observe it (Jacquin, Harrison, & Alford, 2006). Peers are thought to provide information regarding what behaviors are accepted and admired, what behaviors are considered appropriate in a given social context, and therefore what behaviors are likely to lead to social acceptance and reinforcement (Borsari, & Carey, 2001). As such, the presence of another person may lead an individual to assess his or her own behavior more closely, in terms of adherence to what is considered normative and acceptable (Deaux & Major, 1987). Similarly focusing on the role of peer presence, Steinberg has proposed that social presence biases decision making in favor of rewarding, social-processing outcomes (Steinberg, 2007; 2008; 2009).

Several lines of research provide indirect support for the influence of peer presence. For example, Jacquin and colleagues (2006) demonstrated that when provoked, college-age youth show more aggression when in the presence of peers than when alone. In a more rigorous study by Chein and colleagues (2011), participants 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. Using a speaker system, peers were permitted to speak extemporaneously 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. However, the peers could not make any other statements including anything that would influence the participant's behavior. Results indicated that adolescents aged 14–18 were riskier in the peer presence condition than when alone, although this was not the case for the older two age groups (19–22 and 24–29).

In contrast to the above mentioned laboratory studies, some research indicates the impact of peer presence alone may be limited. As the primary example, data from an fMRI study that examined social influence on a monetary betting task (Nawa, Nelson, Pine, & Ernst, 2008) demonstrated that completion of the betting task in a social (presence of peer) and non-social (no peer present) condition resulted in differential neural activation across conditions, but the behavioral pattern of decision making and reaction time did not differ by condition. These results must be considered in light of multiple issues including a small sample size, specific relevance of the task to real world risk taking, and the lack of familiarity with the peers (peers met for the first time on the day of the study).

Thus, despite some improvements in methodological sophistication, the ability to make causal inference about the role of peers in the immediate context of risk behavior engagement has been limited. Experimental designs in which peer influence can be modeled and manipulated in the laboratory are needed to test causal roles of peer influence more stringently and to eventually examine mechanisms. Leveraging this benefit of an experimental design, the current experimental study aims to understand whether youth 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.

Method

Participants

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. To be eligible for the study, the target participant had to be: 1) between 18 and 20 years of age, 2) a student at the University of Maryland, 3) proficient in English, and 4) able to bring in two same-gender, close friends for the experimental session. The peers were selected by the target participants 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). No other inclusion or exclusion criteria were used.

Of the 188 targets who completed the initial session (baseline), 5 target participants were excluded from the present analyses for the following reasons: 1) did not come in for the experimental session (denoted by no response to phone or email inquiries; n = 2) and 2) 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 demographics form as having just met (n = 2)). Thus, the attrition rate was 2.66%. Characteristics of the sample can be seen in Table 1.

Procedure

The study used a repeated measures design: two sessions spaced 1–3 weeks apart. Each assessment session lasted approximately 40–60 minutes and included the completion of questionnaires and the Balloon Analogue Risk Task (BART), a behavioral task assessing risk-taking. On the BART, participants are instructed to “pump up” 30 balloons on a computer to accrue money. A balloon could pop at any point, and if it did, accrued money for that balloon would be lost unless, before the pop, the participant stopped pumping and clicked a button to save the accrued money into a permanent bank. Participants weigh the increasing risk of popping each balloon against the potential gain of continuing to pump the balloon and accruing money. Further details regarding this task are outlined below. All study procedures were approved by the University of Maryland Institutional Review Board.

Target participants came to the laboratory alone 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). 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 task is designed so that optimal payment is received by the target on the BART when performance is not overly conservative or risky. 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. The peers were asked to not disclose information on their payment to the target participant. 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—In the alone condition, the target completed the BART alone. In the peers present condition, the peers were in the room with the target when the target performed the BART (the peers sat beside the target such that they were able to view the computer screen throughout the task). 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. 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.

Measures

Demographics[1]—The participants completed a basic demographic form regarding personal information. The form included age, gender, race/ethnicity, and education level. In

[1]In addition to these demographics variables, potential moderators were considered including resistance to peer influence, friendship quality, and risk-taking behavior. None were significant and thus results are not presented here.

the peer presence and encouraging conditions, the peer form included a question on duration of friendship with the target.

Risk-Behavior—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 in order to describe the sample more fully. The modified YRBSS assessed engagement in the following behaviors: a) drunk driving (defined as either riding with someone who had been drinking alcohol or driving when had been drinking), b) been in a physical fight, c) smoking cigarettes, d) binge drinking (defined as having 5 or more alcoholic drinks in a row), e) marijuana use, and f) other illicit drug use (cocaine, huffing, heroin, methamphetamine, ecstasy). Target participants reported on their frequency of engagement for these risk behaviors on a Likert-type scale during the past 30 days. Items were then summed into a risk behavior composite. Internal consistency was adequate (Cronbach's α = .70) with no item detracting from alpha.

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 Soloman (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).

Data Analysis Plan

Data were entered and analyzed using the statistical package *PASW* version 18 (formerly named SPSS Statistics). 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.

Results

Preliminary Analyses

As a preliminary analysis, descriptives of the study variables were examined 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. The three conditions (alone, present, encouraging) did not significantly differ on any study variable (*p*s > .07) at the baseline session.

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 suggests that the session influences BART performance. However, to qualify this main effect, 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 2, 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 $\eta^2 = .10$) 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. As previously stated, 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).

Discussion

The aim of this study was to examine if adolescents act in a riskier manner in the presence of peers or if peers must actively encourage risk behavior. The findings suggest that the peers present condition did not significantly differ from the alone condition. Alternatively, having peers encourage risk taking on the task demonstrated impact; participants in this condition exhibited an increase in risk-taking behavior that significantly differed from the other two conditions. Thus, an increase in risk-taking behavior was observed in the condition in which peers explicitly encouraged such behavior, clearly identifying the desired and socially rewardable outcome.

The finding of increased risk taking as a result of direct peer encouragement is consistent with a long line of research demonstrating that peers have a substantive influence on risk behavior engagement (Prinstein & Dodge, 2008). 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 finding is particularly notable as the literature on peer influence has been overly reliant on cross-sectional, retrospective designs. Even in the highly informative prior experimental work, peer influence was captured more generally (allowing peer input on how a task is performed to optimize shared earnings; thus, resulting in the possibility of peers encouraging both "safe" and "risky" behavior; Gardner & Steinberg, 2005) rather than directly modeling encouragement (i.e., peers were instructed to and benefitted from encouraging risk behavior). Therefore, this study directly addresses questions raised 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 (in the absence of any direct encouragement) did not lead to significantly more risk taking, was somewhat contrary to what has been suggested in the literature (Chein et al., 2011; Jacquin et al., 2006; Steinberg, 2007; 2008). 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 reinforcement. 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). Another possible explanation for this is based on task differences, as the BART may be less sensitive to peer effects than tasks previously used such as Chicken (Gardner & Steinberg, 2005) and therefore, may require a higher threshold for peer effects. Of note, should this be the case, it makes the current significant findings even more robust. A third possible explanation is that the presence of peers has a diminished impact on adolescents of this age. Chein and colleagues (2011) recently reported that the presence of familiar peers did not lead to increased risk-taking behavior in their 19–22 age group. The authors attribute the lack of peer presence influence in the 19–22 age group to the maturation of brain systems that support decision-making. It may be that older adolescents are less susceptible to the mere presence of peers but remain susceptible to direct encouragement.

It is important to be mindful that we chose not to counterbalance to ensure that the alone session could serve as a "pure" baseline for all participants. As one consequence of this decision, there clearly were practice effects as the alone condition showed a significant increase from the first to second administration despite equivalence of external factors in the two sessions (i.e., no experimental manipulation, same room, came alone to the lab again). This type of increase has been found in previous studies using the BART (e.g., Lejuez, 2003). As such it is important to pay less attention to the significant increase from the baseline to experimental session that was found in all conditions, and instead to the difference in the increase across conditions.

The present study has limitations worth noting. For the encouraging condition, participant interactions were not video or audio-taped nor were peer participants provided a script. These design decisions were made due to concerns with the potential impact these features would place on external validity (Plante, 2010). The benefit to external validity comes at the cost of a manipulation check and information on the nature of dialogue that occurred 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 Porter, & McFarland, 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 decision was made to facilitate disentangling of the types of peer influence. Yet despite the advantages of the laboratory

design in precision and ability to yield more objective data about peer influence, it remains uncertain if 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 such explicit benefit for peer encouragement.

Despite these limitations, the present findings expand our understanding of the means through which older adolescents are influenced by peers to engage in risk-taking behavior. This study advances 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 way in which peer influence is manipulated, 3) provides basic testing of peer presence, and 4) breaks down the peer effect to examine the nature of direct and indirect influence on youth risk behavior. We believe this sets the stage for several research directions to further understand the basic elements of peer effects on risk taking and future work that can begin to consider its applications to prevention and early intervention approaches. Indeed while the scope of the current study limits its direct implications on intervention, some speculative implications can be made. Particularly important, in terms of intervention implications, are the findings that older adolescents are susceptible to the influence of peers and that experimental conditions had an equal effect across participants. That is, older adolescents have not yet matured out of being susceptible to direct peer influence and this finding appears to be consistent across participants. Furthermore, this study identifies that type of influence that is most salient (i.e., direct peer influence versus indirect). Thus, it would be prudent for interventions aimed at reduction of risk-taking behavior among adolescents and young adults to focus on the powerful role direct peer influence plays (e.g., using influence of peers to directly encourage positive/prosocial behavior, education to increase adolescent's awareness into the universal susceptibility of peer influence).

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References

Aklin WM, Lejuez CW, Zvolensky MJ, Kahler CW, Gwadz M. Evaluation of a behavioral measure of risk taking propensity with inner-city adolescents. Behaviour Research and Therapy. 2005; 43(2): 215–228.10.1016/j.brat.2003.12.007 [PubMed: 15629751]

Allen JP, Porter MR, McFarland C. Leaders and followers in adolescent close friendships: Susceptibility to peer influence as a predictor of risky behavior, friendship instability, and depression. Development and Psychopathology. 2006; 18:155–172.10.1017/S0954579406060093 [PubMed: 16478557]

Borsari B, Carey KB. Peer influence on college drinking: A review of the research. Journal of Substance Abuse. 2001; 13:391–424.10.1016/S0899-3289(01)00098-0 [PubMed: 11775073]

Brown, B. Adolescents' relationships with peers. In: Lerner, R.; Steinberg, L., editors. Handbook of adolescent psychology. 2. New York: Wiley; 2004. p. 363-394.

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

Chein J, Albert D, O'Brien L, Uckert K, Steinberg L. Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. Developmental Science. 2011; 14(2):F1–F10.10.1111/j.1467-7687.2010.01035.x [PubMed: 21499511]

Cohen, J. Statistical power analysis for the behavioral sciences. 2. Hillsdale, NJ: Erlbaum; 1988.

Deaux K, Major B. Putting gender into context: An interactive model of gender-related behavior. Psychological Review. 1987; 94:369–389.10.1037/0033-295X.94.3.369

Dishion TJ, Andrews DW, Crosby L. Antisocial boys and their friends in early adolescence: Relationship characteristics, quality, and interactional process. Child Development. 1995; 66:139–151.10.2307/1131196 [PubMed: 7497821]

Gardner M, Steinberg L. Peer influence on risk-taking, risk preference, and risky decision-making in adolescence and adulthood: An experimental study. Developmental Psychology. 2005; 41:625–635.10.1037/0012-1649.41.4.625 [PubMed: 16060809]

Harrison JD, Young JM, Butow P, Salkeld G, Soloman MJ. Is it worth the risk? A systematic review of instruments that measure risk propensity for use in the health setting. Social Science & Medicine. 2005; 60:1385–1396.10.1016/j.socscimed.2004.07.006 [PubMed: 15626532]

Jacquin KM, Harrison ML, Alford SM. Gender and peer presence influence responses to aggressive provocation. American Journal of Forensic Psychology. 2006; 24(3):29–44. Retrieved from http://www.forensicpsychology.org/journal.htm.

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. NIH Publication 05-5727. Bethesda, MD: National Institute on Drug Abuse; 2005. Monitoring the future: National survey results on drug use, 1975–2004. Volume I: Secondary school students.

Lejuez CW, Aklin WM, Daughters SB, Zvolensky MJ, Kahler CW, Gwadz M. 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. 2007; 36:106–111.10.1207/s15374424jccp3601_11 [PubMed: 17206886]

Lejuez CW, Aklin WM, Jones HA, Richards JR, Strong DR, Kahler CW, Read JP. The Balloon Analogue Risk Task differentiates smokers and nonsmokers. Experimental and Clinical Psychopharmacology. 2003; 11:26–33.10.1037//1064-1297.11.1.26 [PubMed: 12622341]

Lejuez CW, Read JP, Kahler CW, Richards JB, Ramsey SE, Stuart GL, Strong DR, Brown RA. Evaluation of a behavioral measure of risk-taking: The Balloon Analogue Risk Task (BART). Journal of Experimental Psychology: Applied. 2002; 8:75–84.10.1037//1076-898X.8.2.75 [PubMed: 12075692]

Nawa NE, Nelson EE, Pine DS, Ernst M. Do you make a difference? Social context in a betting task. Social Cognitive & Affective Neuroscience. 2008; 3:367–376.10.1093/scan/nsn032 [PubMed: 19015081]

PASW Statistics 18.0. Predictive Analytics SoftWare version 18.0. Armonk, New York: IBM; 2009.

Plante, TG. Contemporary Clinical Psychology. Hoboken, NJ: John Wiley & Sons Inc; 2010.

Prinstein, MJ.; Dodge, KA. Current issues in peer influence research. In: Prinstein, MJ.; Dodge, KA., editors. Understanding peer influence in children and adolescents. New York: Guilford; 2008. p. 3-13.

Rabow J, Duncan-Schill M. Drinking among college students. Journal of Alcohol and Drug Education. 1995; 40:52–64. Retrieved from http://vlex.com/source/journal-alcohol-drug-education-3082.

Regan, MA.; Mistopoulos, E. Understanding passenger influences on driver behaviour: implications for road safety and recommendations for countermeasure development. Victoria, Australia: Accident Research Centre, Monash University; 2003. Report #180

Steinberg L. Risk taking in adolescence: New perspectives from brain and behavioral science. Current Directions in Psychological Science. 2007; 16:55–59.10.1111/j.1467-8721.2007.00475.x

Steinberg L. A social neuroscience perspective on adolescent risk-taking. Developmental Review. 2008; 28:78–106.10.1016/j.dr.2007.08.002 [PubMed: 18509515]

Steinberg L. Adolescent development and juvenile justice. Annual Review of Clinical Psychology. 2009; 5:47–73.10.1146/annurev.clinpsy.032408.153603

Tabachnick, BG.; Fidell, LS. Using Multivariate Statistics. 5. Boston, MA: Pearson; 2007.

Wood MD, Read J, Palfai T, Stevenson JF. Social influence processes and college student drinking: The mediation role of alcohol outcome expectancies. Journal of Studies on Alcohol. 2001; 62:32–43. Retrieved from http://www.jsad.com/. [PubMed: 11271962]

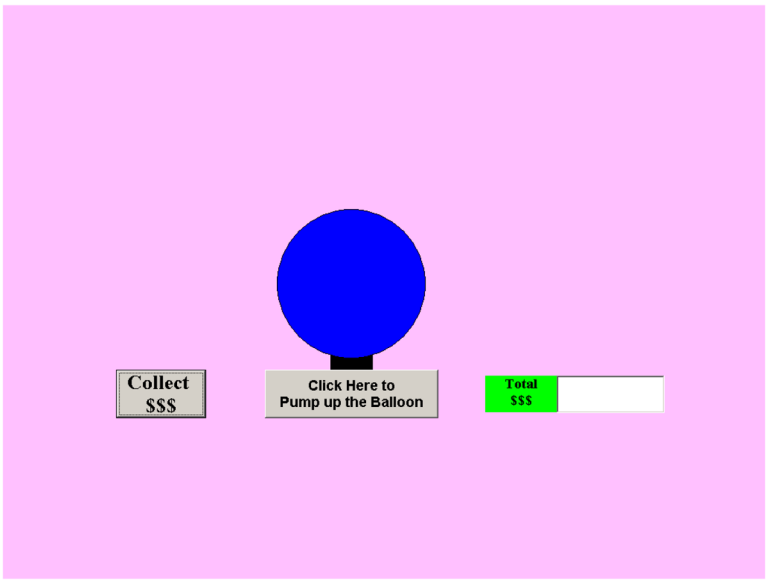

Figure 1.
Schematic of the Balloon Analogue Risk Task.

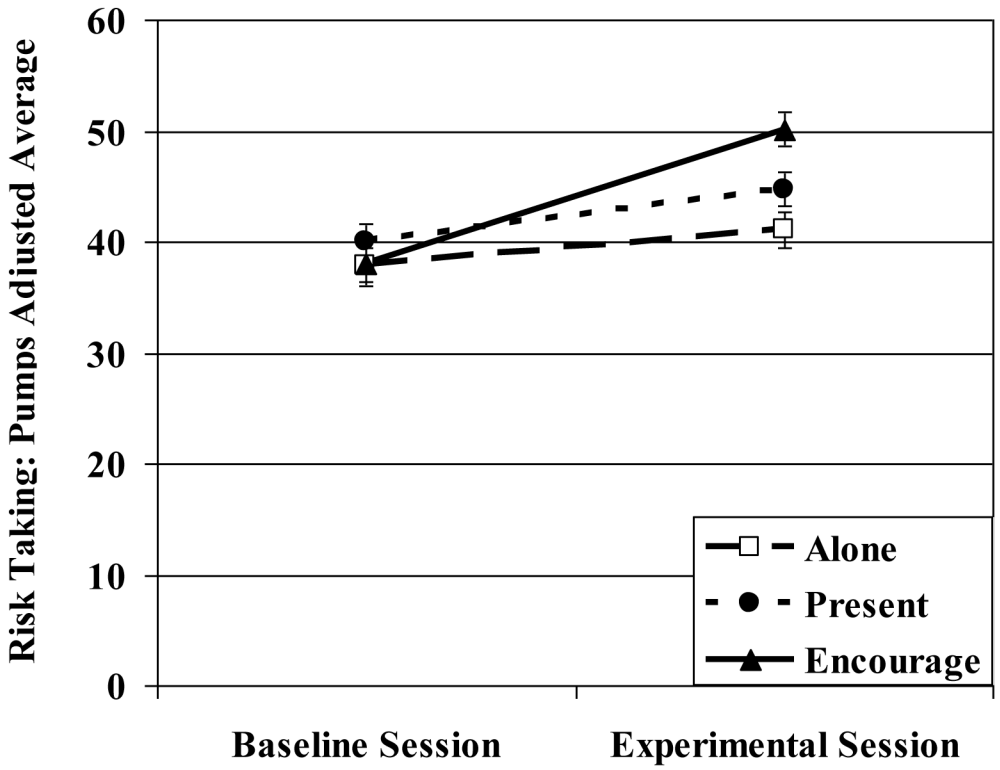

Figure 2.
Balloon Analogue Risk Task performance at the baseline and the experimental sessions across condition. Error bars represent standard errors.

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
Target Demographic Variables						
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
Risk-Taking Behavior (*M*(*SD*))	1.60 (1.63)	1.64 (1.75)	1.29 (1.33)	1.87 (1.76)	1.90	.15
Friend 1 Demographic Variables						
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
Length of Friendship (*M*(*SD*))	30.64 (45.29)		23.36 (31.47)	38.17 (55.41)	3.27	.07
Friend 2 Demographic Variables						
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
Length of Friendship (*M*(*SD*))	22.74 (30.60)		21.68 (26.56)	23.81 (34.43)	.14	.71
BART						
PumpsAdjAvg (*M*(*SD*))	38.61 (12.40)	37.79 (13.76)	40.08 (12.12)	37.97 (11.27)	.64	.53

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.

Table 2

Main Repeated Measure ANOVA Results

	df	*F*	*p*	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 (*M*(*SD*))	Experimental Session (*M*(*SD*))	*F*	*p*	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