Peers and Adolescent Risk Taking

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Abstract

Adolescent risk taking occurs most often when teens are in the presence of their peers. An extensive body of prior work has attempted to explain this phenomenon with respect to peer pressure, social conformity, and affiliation with deviant peers. Recent experimental work, however, suggests that peer influences on adolescent decision making may be rooted in an even more basic process by which social context alters adolescents' sensitivity to the potential rewards of risky decisions. Emerging findings from empirical studies pursuing this alternative account of peer influences on adolescent decision making are presented, along with a consideration of some key directions for future research.

INTRODUCTION

Relative to other age groups, teenagers and young adults are known to exhibit an increased tendency to engage in risky decision making (Steinberg, 2004). However, contrary to intuition and popular belief, much of the research on adolescent risk taking suggests that adolescents are actually very similar to adults when it comes to their perception of, and reasoning about, risk. Why then do teenagers, despite these seemingly mature skills, more frequently make risky decisions? An important clue comes from a consideration of the context in which adolescent risk taking so often takes place—namely, when adolescents are with their friends.

While adolescents may be like adults when it comes to recognizing the dangers associated with their actions, and to reasoning about the likely costs of those actions, they are differentiated from adults (and also from younger children) with respect to the amount of time they spend with friends, the value that they place on social relationships, and the influence that those relationships have on their behavior (Brown, 1990; Brown & Larson, 2009; Burnett & Blakemore, 2009; Chassin, Presson, Sherman, Montello, & McGrew, 1986). Indeed, one of the predominant characteristics of adolescent risk taking is that it is much more likely than that of adults to occur in the presence of peers. This is true for many real-world risk taking behaviors. Supporting findings

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come, for example, from investigations of drug use (Borsari & Carey, 2001), crime (Zimring, 1998), and driving (Simons-Morton, Lerner, & Singer, 2005; Williams, Ferguson, & McCartt, 2007). Consider the evidence regarding risky and reckless driving. On the basis of actuarial data provided by the insurance industry, and on studies of naturalistic driving behavior, we know that a significant predictor of a teen driver being in a collision or near collision is the presence of other passengers in the vehicle. Among teen drivers there is even a relationship between the specific number of passengers and the likelihood of being in a serious accident (more accidents occur when there are more passengers). This is not true of older drivers, for whom collision rates do not vary as a function of the presence or number of passengers. It is based on these findings that many states in the United States have implemented graduated licensing policies that restrict when, and with whom, teenagers can drive.

FOUNDATIONAL RESEARCH

There is an extensive body of prior research focused on peer affiliation (e.g., selection and socialization into certain peer groups) and the impacts of explicit and implicit peer pressure on youth's decisions (see, e.g., Prinstein & Dodge, 2008). This work, for the most part, has focused more on the interpersonal relationships that predicate risk taking, rather than the specific mechanisms through which the peer context exerts influence over adolescent decision making (cf. Brechwald & Prinstein, 2011). Moreover, much of the prior work has relied on correlational and naturalistic methods that can provide only limited insight into relevant causal processes. Accordingly, if we hope to better understand the causal origins of adolescents' vulnerability to peer influence, we must complement research on peer affiliation and peer pressure with work applying experimental methods.

Consider a potentially simple, and somewhat uninteresting, explanation for the correlation between adolescent risk-taking and the presence of peers. Perhaps adolescents are found to take more risks when they are with their friends simply because they spend so much time around friends. It is likely that adolescents also shop more often with friends, and watch movies more often with friends, and so on, but we would not say that friends *cause* these behaviors.

FINDINGS FROM AN EMPIRICAL APPROACH

One way in which research can demonstrate that adolescent's decisions about risk are causally and directly impacted by the presence of peers is through an experimental manipulation of the social context in which

decisions are rendered. In an early example, Gardner and Steinberg (2005) conducted a study in which adolescents and older participants (a group of college students and also a group of older adults) were asked to play a risk-taking game called the *Chicken Game*. The key to the experiment was a manipulation of the social conditions during which the game was played. With random assignment, half of the participants played the game alone, and the other half played the game while flanked by two peers (of the same gender and approximate age) that they had invited with them to the experiment. The results were compelling and straightforward. Among the participants who played the game alone, overall risk behavior was relatively limited, and did not depend on age (everyone, regardless of their age, took about the same number of risks). In comparison, adolescents who played the game in the presence of peers took roughly twice as many risks as did those who played alone. This peer context effect was smaller, but still significant, among the college students, and absent among the older adults.

Such findings demonstrate that peers have a direct and specific impact on adolescent, but not adult, risk-taking, and help to rule out the most mundane explanation for the real world findings; teens are not just more likely to be with friends when they do reckless things, but rather, being with friends actually affects the way in which teens make decisions about whether or not to engage in risky behaviors.

For many, this is not an especially surprising discovery (after all, do not we already know that adolescents do things they would not otherwise do because of their friends?), and it does not provide much information about the processes that underlie the phenomenon. Maybe the friends who sat in on the Gardner and Steinberg experiment were especially distracting to adolescent participants, or more frequently tried to cajole them into greater risk taking. Perhaps other implicit factors drove the adolescents to conform to the expectations, or assumed social norms, of their peers. Maybe adolescents are just more inclined to conform to others' risky behaviors (as in social conformity or peer contagion), or are more concerned about trying to impress their friends because they are worried about fitting in, gaining social status, or avoiding social rejection.

Certainly, explicit peer pressure and conscious concerns about the social implications of one's actions could be at the root of some poor decisions that teenagers make. However, based on a series of more recent studies, it is beginning to look clear that none of these explanations (distraction, explicit peer pressure, social conformity, the desire to impress friends, etc.) reflects a *necessary* condition for the peer effect on adolescent decision-making. Rather, the findings point to something much more fundamental, something going on within the basic neurobiology of decision-making, which is affected by the social context in which adolescents' decisions are made.

The evidence comes from a group of studies using essentially the same peer manipulation as was used by Gardner and Steinberg (2005), but with different tasks, and with different controls over the interactions that could take place between study participants and the peer observers. One result addresses the possibility that peers influence adolescent decision-making by distracting the target adolescent's attention away from important information (imagine a scenario, e.g., where the passengers in a car are acting in a way that causes a teen driver to be less attentive to important events taking place on the roadway, such as a light turning red). If distraction were the root cause of the peer effect, then one would expect the presence of peers to be especially deleterious when adolescents are asked to perform especially attention-demanding tasks. Contrary to this expectation, the evidence thus far indicates that peer presence is not a significant factor in the performance of such tasks—such as the Go/No-go response inhibition task or Operation Span working memory task (these *null* findings have not been published, but see Albert, Chein, & Steinberg, 2013 for a lengthier description). Moreover, despite showing other changes in behavior when being observed by a peer audience, adolescents are still generally consistent (i.e., make similar choices across similar opportunities) and effective (i.e., accurate and fast) in performing most laboratory tasks (e.g., Weigard, Chein, Albert, Smith, & Steinberg, 2014), which suggests that the peer audience does not prevent them from being attentive to task-relevant information. Finally, investigations of how the peer context affects brain activity during decision making show context effects in regions associated with social and reward processing (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Peake, Dishion, Stormshak, Moore, & Pfeifer, 2013), but not in areas most typically associated with attention control.

In contrast, peers *do* seem to impact behavior (and brain activity) when teens complete tasks that involve risk taking (a choice between a safe versus risky, but potentially rewarding, option), or some aspects of reward processing (reward valuation, anticipation, or sensitivity). Importantly, the impact of a peer audience in these types of tasks is found even when the experimental conditions provide no opportunity for the peer observers to model the risk behavior, or to explicitly or overtly influence the participants' decisions. For instance, in Chein *et al*. (2011) we separated the participants and their peers into adjacent rooms. The participants played a simulated driving game while lying down alone inside of a functional magnetic resonance imaging (fMRI) scanner in one room, but they were told that two peers were going to watch their performance in the game from a computer screen in a neighboring room. Other than a brief, restricted, interaction between rounds of play, there was no way for the peers to communicate with, or explicitly influence, the participant. Nevertheless, a significant

peer effect was obtained—teenagers ran more traffic lights and crashed their cars more often when they thought that their peers were watching them than when they played without an audience. As with the real-world passenger findings, adult participants exhibited no such sensitivity to the peer audience. Thus, even under these restricted conditions, where there could be no explicit peer pressure and no opportunity for risky behavior to be modeled by others, there was still a peer influence on adolescent, but not adult, decision making.

This peer effect on adolescent behavior has since been found with even more tightly constrained social interactions. In a follow-up study using a deception in which participants were led to believe that a single, anonymous, peer observer was watching from a nearby room (in reality there was no one there, just an audio recording that gave stereotyped feedback to a few experimenter prompts), adolescent participants again showed an increased preference for risky choices (this time in a gambling task), despite having clear and precise information about the potential for negative outcomes, no prior social relationship with the observer (who did not actually exist), and no expectation of any lasting interactions with this unknown observer (Smith, Chein, & Steinberg, 2014). The same "anonymous peer" manipulation was used in another study (Weigard *et al*., 2014), this time involving a task that asked participants to make choices between lesser immediate rewards (e.g., $100 now) and larger delayed rewards (e.g., $1000 in a year). As had been found previously when actual friends served as the peer observers (O'Brien, Albert, Chein, & Steinberg, 2011), simply believing that an anonymous peer observer was watching from another room was enough to induce the late adolescent participants in that study to accept significantly smaller immediate reward offers; suggesting that being observed made them more sensitive to near-term rewards. Beyond providing further evidence that peers affect the way in which rewards are processed by adolescents, these findings are intriguing because they show that peer influence effects can arise even when there is no obvious way for the adolescent to "show off" or otherwise impress the observer (taking less money now rather than waiting for more money later is not likely to be viewed as especially daring or bold, or more acceptable to the peer audience).

Still, no matter how carefully an experiment controls the interactions that take place between a participant and his or her peers, or the personal attributes that the participants can display through their behaviors in the task, it is difficult to completely rule out the possibility that peer influences result from the implicit social cognitions that go on when an adolescent knows, or at least believes, that his or her actions are being observed. That is, maybe despite the experimental controls, participants in these experiments still think about how their actions will be perceived by the observer(s), and

accordingly make choices that they imagine will be more "impressive" or socially accepted.

At least one recent study begins to address this possibility, by exploring the peer effect not in human adolescents, but in mice (Logue, Chein, Gould, Holliday, & Steinberg, 2014). Mice are capable of many things, but mentalizing about the beliefs and expectations of others, and about the future social consequences of one's actions, are abilities that most scientists believe to be exclusively demonstrated by humans (and perhaps some advanced non-human primates, Frith & Frith, 1999). Nevertheless, like their human counterparts, adolescent (juvenile) mice in the Logue *et al*. (2014) study were found to increase their consumption of a rewarding substance (alcohol) when in the presence of peers, while older mice were unaffected by the social conditions. Although it is not yet clear whether this phenomenon reflects an evolutionarily conserved mechanism that also produces the peer effect found in human adolescents, the parallels are certainly suggestive.

Taken together, the data fail to support *any* of the intuitive accounts presented earlier. To reiterate, although distracted attention, explicit peer pressure, or the desire to impress one's friends may be relevant factors in some real-world adolescent risk taking, none of these is necessary to produce the effect. This state of affairs has led researchers to consider an alternative, neurobiological, account that does seem to fit the data: perhaps, as a result of specific patterns of brain development, adolescents are biologically predisposed to be more risk-taking, and more reward-seeking, when in social settings. More specifically, being around peers may prime the brain's incentive processing circuitry, thus increasing sensitivity to rewards and inducing an approach motivational state that makes adolescents more inclined to seek rewards despite the potential for costly outcomes (i.e., to take risks).

This sort of explanation for the impact of social context on adolescent decision making receives considerable support from work conducted in both humans and animals showing that social information is not only highly salient during adolescence, but is also associated with marked changes in the structure and function of the brain during adolescence (Blakemore, 2008; Douglas, Varlinskaya, & Spear, 2004). For instance, several studies indicate that social stimuli, such as faces, evoke an especially strong response during adolescence in certain brain regions, especially those involved in the processing and valuation of rewards (Hare *et al*., 2008; Scherf, Thomas, Doyle, & Behrmann, 2013; Somerville, Hare, & Casey, 2011). The connection between this increased "reward" response to social information and the peer effect on adolescent risk-taking is further supported by neuroimaging findings from the previously mentioned driving simulation study (Chein *et al*., 2011). In addition to a behavioral increase in risk taking when adolescents were watched by their friends, the study also found a concomitant increase in

the activation of the brain's reward centers. When friends were watching, reward areas were more excited, and when these areas were more excited as the participants approached a given intersection, there was an increased likelihood that a risk would be taken.

To sum up what we know at this stage, it is clear that social context is a very important feature of adolescent risk-taking behavior, and that although some adolescent risk taking may occur in response to explicit pressures, distraction, and so on, these processes do not readily account for the experimental research findings. Rather, the evidence suggests that the impact of peers on adolescent risk-taking may be the result of an evolutionarily conserved process through which the presence of conspecifics increases adolescents' sensitivity to potential rewards.

These are just the beginning findings from an emerging field of experimental work seeking to better understand adolescent decision-making and why it is especially vulnerable to social influences. There are so many remaining questions to be addressed by this research, and so many novel directions for it to go in.

KEY DIRECTIONS FOR FUTURE RESEARCH

The development of a fruitful, and adaptable, method for testing peer influences in the experimental laboratory (e.g., Gardner & Steinberg, 2005; Weigard *et al*., 2014, see also Nawa, Nelson, Pine, & Ernst, 2008; Prinstein, Brechwald, & Cohen, 2011), and the introduction of a valid and reliable self-report questionnaire for the assessment of individual differences in the propensity to resist peer influences, the Resistance to Peer Influence Scale (Steinberg & Monahan, 2007), together provide critical tools for researchers seeking to explore more nuanced facets of the peer effect, and to extend investigations of the phenomenon to other behaviors.

One very clear direction for future work is to ascertain the particular qualities of an individual that are most closely associated with preference for risk in general, and with vulnerability to social influence in particular. At this point we know very little about makes a given individual "at-risk" for susceptibility to peer influence, or what attributes or experiences might protect an adolescent from being unduly influenced. Although investigators have already begun to consider a number of potentially explanatory individual differences variables (pubertal status, genes, family and peer history, cognitive development, etc.), it has thus far proven surprisingly challenging to identify a reliable predictor of who will, and who will not, exhibit susceptibility. Given differences in the timing and slope of pubertal development for girls and boys, and evidence of gender differences in the maturation of reward and self-regulation (Shulman, Harden, Chein, &

Steinberg, 2014), exploration of gender differences in susceptibility to peer influence is one reasonable place to focus attention. However, while there are clear indications that males engage in more risk taking than do females (Steinberg, 2004), the evidence of sex differences in vulnerability to social influences is as of yet quite limited (Logue *et al.*, 2014; Simons-Morton, Lerner & Singer, 2005).

There is also some limited evidence that vulnerability to peer influence may relate to one's tendency to engage in substance use, and thus vulnerability to addiction. In one recent study (Cavalca *et al.*, 2013), adolescent smokers significantly increased risk-taking in a computerized task (the balloon analogue risk task) when they believed that they were playing with a peer (really just a computer) relative to when they had no observer, while non-smoking adolescents showed only slightly elevated risk taking in the peer condition. Some longitudinal and ecological studies, indicating that sensitivity to peers predicts later smoking status, lend further support to a relationship between vulnerability to peer influence and substance use (Perrine & Aloise-Young, 2004; Simons-Morton & Farhat, 2010).

Another avenue for exploration will be to consider whether, and how, prior life experiences moderate sensitivity to social context. There is early evidence, for example, that the experience of positive peer support and peer conflict may have differential impacts on maturation and brain development. In turn, this might affect the value individuals place on peer attitudes, the relative salience of peer contexts, and the impact of peers on both decision making behavior and concomitant brain activity (Telzer, Fuligni, Lieberman, Miernicki & Galván, 2014). Likewise, currently ongoing research seeks to determine whether experiences that exercise executive functioning and the capacity for self-regulation—that is, that encourage greater deliberation and reduce impulsivity—might also serve to buffer adolescents from susceptibility to peer influence. Such work on how individual traits and prior experience affect sensitivity to peers will also need to be complemented with research into factors that can affect the acute psychosocial and cognitive functioning of the individual (such a stress, fatigue, emotional arousal, substance-induced impairments, and cognitive load, etc.), and thus render the decision maker less (or possibly more) resistant to the influence of others.

Many questions can also be asked about the qualities of the peer audience that are most predictive of risk taking and peer influence. One seemingly reasonable speculation is that peers who are perceived as greater risk-takers might elicit greater risk-taking than peers who are perceived as comparatively conservative. Recently, this speculation was tested in an experimental simulated driving study (Simons-Morton *et al.*, 2014) in which confederate passengers made statements that would cause

them to be perceived as either risk-accepting or risk-averse. Consistent with expectation, driving with a risk-accepting passenger elicited greater risk-taking during the simulated drive. The findings from driving research also suggest that an older or parental audience member may actually have a moderating influence. However, the results from one very recent study (Wolf, Narges, Dumontheil, & Blakemore, 2013) suggest that younger teenagers are more influenced by the risk judgments of other teenagers than those of older adults (whereas children, older teens, and adults are more swayed by adult judgments). There is also some initial evidence that social rank of peers may be a relevant variable; that is, one's relative position within the social hierarchy may moderate sensitivity to peer influence, with higher status peers exerting a larger effect (Cohen & Prinstein, 2006; Teunissen *et al*., 2012). Other in progress work suggests a more complex picture, however, in which it is the degree to which an adolescent values the social status of a peer observer, rather than hierarchical status on its own, that predicts the extent of peer influence (Koski, Smith, Chein, Steinberg, & Olson, 2014). Once again, questions about the characteristics and composition of the peer audience (number, gender, social status, age, etc.) have only just begun to be considered in this budding area of study.

Progress in understanding which adolescents tend to exhibit the greatest sensitivity to peer influence, what peer qualities predict the greatest influence, and what other environmental variables moderate these impacts is likely to require a multi-modal approach. Already, we are seeing that the combined use of brain imaging methods, self-report instruments, and behavioral assessments of risk and reward-seeking behaviors (in experiments using both cross-sectional and longitudinal designs), is helping to bridge the findings on peer influences with broader discoveries on brain development and psychosocial maturation, and to better account for variation in real world behaviors. For example, changes in the structure (Grosbras *et al*., 2007; Paus *et al*., 2008) and function (Chein *et al*., 2011; Peake *et al*., 2013; Pfeifer *et al*., 2011) of the brain during the course of adolescent development have been found to relate to self-reported resistance to peer influence, and this relationship has been found to account for variance in both experimentally assessed and real-world world risk-taking behaviors. As we go forward, the same research tools that are used to explore relationships between psychosocial and brain development, social influence, and risk-taking, may be fruitfully applied to understanding other aspects of adolescent decision making behavior–not just risk-taking, but healthy and pro-social decisions, choices about education and career, and so on—that are affected by the social context in which such decisions are made.

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