The Legal High: Factors Affecting Young Consumers' Risk Perceptions and Abuse of Prescription Drugs

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Over the past decade, adolescent prescription drug abuse (PDA) has become such a serious public health problem that it is now classified as an epidemic. In addition, people who abuse prescription drugs are also at greater risk for engaging in other maladaptive behaviors. The purpose of this study is to examine some key adolescent perceptions toward PDA, the incremental role of nonlinear effects, and their interaction effects with demographic variables. Using regression-based techniques, the authors report results from survey response data from more than 1,000 13- to 18-year-olds from 40 geographically dispersed areas in the United States. The results show that the effects of adolescent anxiety, the need to be popular, being a "good teen," and the use of other restricted substances have both nonlinear effects and interaction effects with demographic characteristics on PDA risk perceptions and PDA itself. Perceptions of the risk of PDA partially mediate these effects. The authors offer implications of the pattern of results for consumer welfare and public policy.

Keywords: prescription drug abuse, adolescent risk perceptions, quadratic effects, adolescent drug use

Among adolescents, prescription drug abuse (PDA)—defined as the intentional use of a medication without a prescription, in a way other than prescribed or for the experience or feeling it causes (Substance Abuse and Mental Health Services Administration [SAMHSA] 2013)—has become a serious public health concern over the past decade. Although estimates vary somewhat, several findings provide support for this conclusion: A 2012 study indicates that 24% of teens reported having abused or misused a prescription drug at least once in their lives—a 33% increase from the level reported in 2008 (National Institute on Drug Abuse [NIDA] 2013). In addition, another study indicates that 15% of high school seniors reported using a prescription drug for purposes other than what it was prescribed for (NIDA 2014). Although research interest in adolescent PDA has increased over the past decade, little is known about psychological factors that affect both adolescent perceptions of the risks associated with PDA and the abuse itself (Young, Glover, and Havens 2012). Specifically, the relationships among the psychological dispositions that adolescents perceive within themselves and in others, the nonlinear effects of such dispositions, and the interactions of these dispositions with other variables on risk and PDA have yet to be examined. These nonlinear and interaction effects are the primary focus of the present study.

It is important to study nonlinear and interaction effects for two reasons. First, research concentrating on extreme levels of a predictor variable (curvilinear effects) can offer more diagnostic information to marketing and communications management, the public health community, and policy makers than simple linear effects (Agustin and Singh 2005; Andrews, Netemeyer, and Burton 2009). For example, research has shown that at the very highest and very lowest levels of customer satisfaction, the customer satisfaction → loyalty link is different from that at moderately high or moderately low levels of satisfaction (Agustin and Singh 2005). This finding enables marketers to more effectively pinpoint customer relationship strategies, strengthen already strong relationships, and devise strategies for remedying weak relationships.

Second, curvilinear effects can be instrumental in finding "tipping points" for well-intentioned policy initiatives (e.g., Martin et al. 2013). For example, Andrews, Netemeyer, and

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Burton (2009) report that consumers with the highest levels of objective nutrition knowledge showed a negative quadratic effect on their intent to buy a product high in negative nutrients (e.g., sodium, saturated fat). Such an outcome also demonstrates that those with low or moderate levels of knowledge are at a higher risk for consuming unhealthy foods, suggesting that policy makers might focus on providing easy-to-understand nutrition information on food labels. Furthermore, research has shown that some fear-appeal campaigns designed to deter a risky behavior (e.g., teen smoking, teen drinking) may result in reactance effects; that is, at a certain point, the fear → risky behavior relationship becomes positive rather than negative (Witte and Allen 2000). Thus, the direction of a quadratic effect may differ from the linear effect, and conclusions drawn from linear effects alone might be somewhat misleading. Consideration of nonlinear effects may enable researchers to better understand these tipping points and make adjustments to policy efforts and communication initiatives.

Through an examination of interaction effects, external validity is advanced by a more thorough understanding of how and when a theory's focal variables interact with key background factors operationalized as moderator variables (Cook and Campbell 1979). A common path to enhance the generalizability of findings of key dependent variables is to examine these background factors (e.g., demographic variables, environmental conditions) in settings that may affect the relationships between predictors and outcome variables (Lynch 1999).

In summary, the contributions of our research are to (1) assess specific linear effects, incremental nonlinear effects, and interaction effects relevant to prescription drug risk and abuse among adolescents and (2) address the mediating role of perceived risk on PDA. It can be argued that the marketing and policy research community has not sufficiently addressed adolescent PDA, which is a topic of substantial interest to various U.S. agencies and policy makers (e.g., Food and Drug Administration [FDA] 2007; NIDA 2014; SAMHSA 2013). Understanding the linear and nonlinear effects of predictors that influence PDA may be useful for policy makers in identifying tipping points for adolescents at the greatest risk for PDA.

Background on PDA

Several factors have contributed to adolescent PDA in the United States, including an increase in the number of prescriptions written, aggressive direct-to-consumer marketing, perceived safety of prescription drugs, and their ease of availability (Hall, Howard, and McCabe 2010; NIDA 2014; Volkow et al. 2011). For example, in 2000, health care providers had written 131 million prescriptions for opioid pain relievers, but by 2010 this number had risen to 210 million, an increase of 62%. In 2010, the amount of prescription opioids prescribed was sufficient to medicate every U.S. consumer around the clock for one month (Centers for Disease Control [CDC] 2014a), and many of these opioids ultimately fall into the hands of consumers who abuse them. In 2000, health care providers wrote 20 million prescriptions for stimulants; however, this number more than doubled to 45 million by 2010 (NIDA 2013). Thomas et al. (2006) report a 385% increase in the number sedative prescriptions written specifically for adolescents between 1994 and 2001.

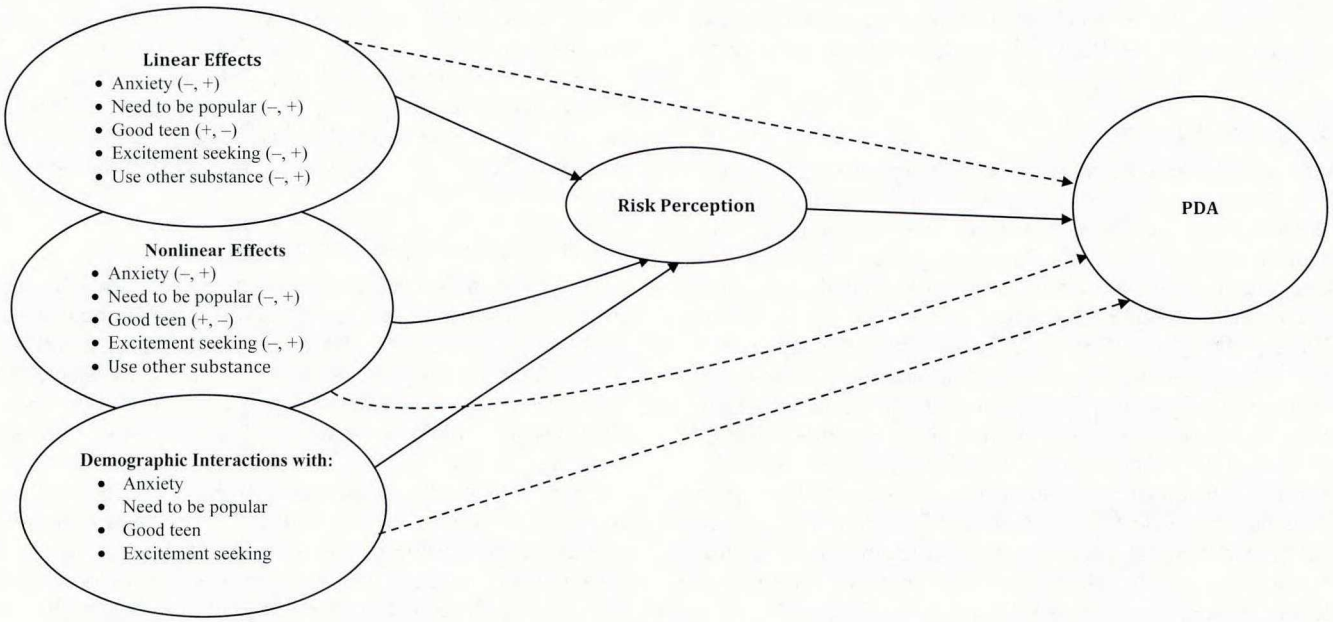
Direct-to-consumer marketing and advertising expenditures have also increased dramatically from approximately $2.5 billion in 2000 to $4.5 billion in 2009 (Ventola 2011). Some have suggested that this aggressive marketing sends the message that prescription drugs are a routine part of life, leading adolescents to believe that the nonmedical use of government-approved prescription drugs is safe and that such drugs can be used in any manner without adverse consequences (Ellen, Bone, and Stuart 1998; Friedman 2007; Martin et al. 2013). However, overdose deaths due to abuse of prescription drugs exceeded 20,000 in 2008, with almost 75% of those coming from opioid pain relievers (CDC 2012). Recent evidence also has suggested that marketing cues such as advertising, labeling/directions on drug packages, and promotion from the medical community desensitize adolescents to the dangers of prescription drugs (Ellen, Bone, and Stuart 1998; Friedman 2007; Martin et al. 2013; Pechmann et al. 2005, 2011). In terms of access, adolescent abusers typically obtain prescription drugs from friends or family members (Boyd et al. 2007; NIDA 2013; Viana et al. 2012; Young, Glover, and Havens 2012). In one study, 24% of high school students reported loaning or giving away their prescription medications, and up to 15% reported trading their prescription medications among friends (Boyd et al. 2007).

Whereas the aforementioned statistics and factors have clearly contributed to knowledge about adolescent PDA, our study focuses on adolescent psychological dispositions and perceptions regarding PDA. Several studies have shown that PDA is positively associated with depression, anxiety, impulsivity, sensation seeking/excitement, and various measures of peer/social pressure (Conway et al. 2013; McCabe and Cranford 2012; NIDA 2013; Pechmann et al. 2011; Vaughn et al. 2012; Viana et al. 2012). Studies have also shown a negative relationship between PDA and the health risks associated with PDA (Friedman 2007; SAMHSA 2013). However, invariably, researchers have examined only linear effects of any of these perceptions and have ignored their incremental nonlinear effects and potential interactions with other variables. Thus, the objective of this research is to examine the effects of a set of adolescent psychological dispositions, including their potential nonlinear effects, and their interactions with demographics and the use of other restricted substances in affecting PDA. We examine five adolescent dispositions related to PDA: (1) anxiety, (2) need to be popular, (3) excitement seeking, (4) being a "good teen," and (5) perceived risk. We also address the indirect (potentially mediated) effects of these interactions and nonlinear effects on PDA through effects on the perceived risk of prescription drugs.

Proposed Effects on PDA and the Mediating Role of Risk

As Figure 1 suggests, we anticipate linear effects of several adolescent psychological dispositions on perceived risk of and abuse of prescription drugs (PDA). For example, we expect that anxiety, the need to be popular (defined as ado-

Figure 1. Proposed Linear and Nonlinear Effects on Adolescent PDA



Notes: The model tests the linear effects of the adolescent dispositions (e.g., anxiety, need to be popular) and the use of restricted substances as well as the incremental nonlinear effects (represented by the curved lines to risk perception and PDA) of these predictors. Dashed lines indicate effects that we propose to be partially mediated by risk perception. The initial sign next to each predictor indicates the direction of the expected relationship with risk perception; the second sign indicates the anticipated relationship with PDA. Risk perception and PDA will be negatively related. We also use selected demographics (e.g., gender, age) as control variables and to assess interactions with dispositions on risk perception and PDA.

lescents' desire to appear popular to peers and seem "cool" through their use of alcohol or drugs), and excitement seeking are negatively related to risk perceptions of PDA and positively related to actual PDA. We expect being a "good teen" (defined as being well adjusted and having positive parental involvement) to be positively related to risk perceptions and negatively related to PDA. Although several of these linear effects are consistent with prior findings in the literature (Conway et al. 2013; McCabe and Cranford 2012; Young, Glover, and Havens 2012), they should be notable to adolescent health communication managers as well as the marketing and policy community interested in adolescent risk and PDA. In addition, we expect that use of other illegal or restricted substances for adolescents (e.g., alcohol, marijuana) will be negatively related to risk perceptions and positively related to PDA in a linear fashion (NIDA 2011).

However, our primary research questions focus on the set of incremental quadratic (nonlinear) and interaction effects indicated in Figure 1. First, we propose nonlinear effects of anxiety, need to be popular, being a good teen, excitement seeking, and use of other restricted substances on perceived risk and PDA. As previously noted, focusing on extremely high (or low) levels of antecedent predictors may reveal conceptually and practically useful findings with important implications (e.g., Agustin and Singh 2005; Andrews, Netemeyer, and Burton 2009). Second, we examine a set of demographic-based moderating effects of the psychological disposition → PDA risk and psychological disposition → PDA linkages. From a consumer welfare and policy perspective, examining these effects may help identify the segments of adolescents in which PDA is most likely to result in the most substantial negative consequences.

Curvilinear Effects

Anxiety

Theory suggests that adolescents who have extremely high anxiety may be the most likely to abuse prescription drugs as a means of alleviating their acute level of anxiety (McCabe et al. 2009). Although we are not aware of any research testing a proposed quadratic relationship, there is some empirical evidence that suggests such an effect. For example, people with extremely high episodic anxiety/depression are far more likely to underestimate the dangers (e.g., addiction, unintentional overdose) of overusing prescription drugs as well as to abuse antipsychotics and anxiety-reducing prescription drugs compared with those at more moderate levels of episodic anxiety/depression (Viana et al. 2012). A recent study supports this premise, as a group of adolescents with the highest level of anxiety showed the highest levels of sedative misuse relative to two other anxiety groups (Hall, Howard, and McCabe 2010). Another study shows that a group of adolescents reporting the highest levels of lifetime anxiety had a pronounced level of nonmedical opioid abuse and severely underestimated the risk of the negative consequences of opioid abuse relative to

three other adolescent groups (Vaughn et al. 2012). In both of these studies, the general pattern between abuse and anxiety appeared to be nonlinear. Therefore, in addition to a positive anxiety → PDA relationship, we also expect a negative anxiety → PDA risk quadratic effect and a positive anxiety → PDA quadratic effect.

Need to Be Popular

It is well accepted that adolescence is a time of peer pressure–induced needs to "fit in," be popular, and look cool (Fitzsimons and Moore 2008; Martin et al. 2013). At the very highest level of these needs, research has suggested that assessment of the risk of PDA drops dramatically, and thus, actual abuse increases dramatically (McCabe and Cranford 2012; NIDA 2013, 2014). Evidence from the adolescent peer pressure literature supports this premise. Adolescents who are highly susceptible to peer influence, including the need to be cool and popular, tend to show a much higher level of abuse of pain relievers and tranquilizers than adolescents at lower or moderate levels of susceptibility to peer influence (Ford 2008; Sung et al. 2005). One psychological mechanism that has been advanced as leading to this abuse is a lower risk perception of taking larger-than-prescribed doses of tranquilizers/pain relievers (Ford 2008; Martin et al. 2013). Thus, we expect a negative need to be popular → PDA risk quadratic effect and a positive need to be popular → PDA quadratic effect.

Excitement Seeking

Several studies have offered indirect evidence suggesting a negative excitement seeking → PDA risk quadratic effect and a positive excitement seeking → PDA quadratic effect. For example, studies examining the effects of sensation seeking (Arria et al. 2008; Herman-Stahl et al. 2006), "getting a kick out of danger" (Vaughn et al. 2012), and fearlessness (Hall, Howard, and McCabe 2013) have suggested that adolescents at the highest level of these concepts are substantially more likely to underestimate the risk of drug use in general and have a pronouncedly greater likelihood of PDA. In particular, the personality traits of desire for risk taking and excitement seeking show pronounced effects for drug abuse and, specifically, PDA (Herman-Stahl et al. 2006; Schepis and Krishnan-Sarin 2008). Indeed, Herman-Stahl et al. (2006) suggest that such people severely underestimate the risk of prescription drug overuse relative to those with lower levels of propensity to take risks and excitement/thrill seeking. As such, we expect excitement seeking to show nonlinear effects on perceived PDA risk (a downward-sloping curve) and PDA (an upward-sloping curve).

Being a Good Teen

As noted previously, being a good teen has elements of being well adjusted (good mood) and having positive parental involvement. Both theory (Baumrind 1991; Fitzsimons and Moore 2008) and research (Conway et al. 2013; Vaughn et al. 2012; Young, Glover, and Havens 2012) suggest that good teens are the most likely to accurately assess the risks associated with abusing prescription drugs and the least likely to engage in PDA. There is also some indirect empirical evidence to suggest such effects. For example, teens who do well in school, experience positive parental involvement, and have high levels of adolescent self-esteem showed much lower rates of substance abuse (in general) than those with moderate to low levels of school performance, parental involvement, and self-esteem (Ford 2009; Viana et al. 2012; Young, Glover, and Havens 2012). This evidence indicates a positive quadratic effect (i.e., an upward-sloping curve) for the good teen → perceived PDA risk linkage and a negative quadratic effect (i.e., a downward-sloping curve) for the good teen → PDA linkage.

Use of Other Restricted Substances

Some research has suggested that adolescents who use other illegal substances (e.g., cigarettes, alcohol, marijuana) are also more likely to abuse prescription drugs. Several studies have shown this linear comorbidity effect (NIDA 2013, 2014). Yet what might happen at the very highest levels of usage of other restricted substances? Some evidence has indicated that at the highest levels of other substance abuse, teens view the dangers of abusing prescription drugs as minimal, which would suggest a downward-sloping negative effect for the use of other restricted substances → PDA risk relationship. However, theory and evidence are unclear as to the directionality of the use of other restricted substances → PDA curvilinear effect. At the very highest level, would teens use other restricted substances as a substitute for PDA or as a complement to PDA (NIDA 2011)? Given the conflicting rationale, we estimate the use of other restricted substances → PDA quadratic effect as an open question in terms of the possible positive or negative nonlinear effect.

Demographic Moderator Effects

As Figure 1 shows, we assess the moderating role of demographics for the effects of psychological dispositions on PDA risk and PDA. To our knowledge, such moderating effects have yet to be examined empirically. Several studies, however, have investigated the demographic correlates of PDA among adolescents, with mixed results. For example, Young, Glover, and Havens's (2012) recent meta-analysis shows that some studies have found that girls underestimate PDA risks relative to boys and, as such, abuse prescription drugs to a greater extent than boys. However, other studies have shown the opposite effect in terms of gender, and still others show no gender-based differences. A similar result was found for race: some studies have shown that Caucasians are more likely to abuse prescription drugs than other race classifications, but in other studies no racial differences were observed (Young, Glover, and Havens 2012, p. 15). The one consistent demographic correlate was age: the older the adolescent, the more likely he or she is to underestimate the risks of PDA, and the greater the likelihood of PDA.

Given these mixed linear/main effects and somewhat ambiguous conceptual rationale, we thought that it would be unwise to offer specific predictions regarding the degree to which demographics may moderate the psychological disposition → PDA risk and psychological disposition → PDA linkages. Still, we believe that it is important to consider potential interaction effects because understanding the degree to which demographic variables moderate effects on

risk perceptions and PDA potentially can assist in identifying the most appropriate adolescent targets for public service announcements (PSAs) or other possible PDA interventions (FDA 2007; SAMHSA 2013).

Mediated Effects

Figure 1 also shows the third set of relationships we examine in this research: perceived risk as a mediator of the linear, nonlinear, and interaction effects of the psychological dispositions on PDA. Because prescription drugs are legal products prescribed by physicians and approved by the FDA, many adolescents associate much lower risk with the nonsanctioned use of them than with substances subject to legal restrictions (Executive Office of the President 2011). Indeed, some research has suggested that the perception of harmlessness of prescription drugs (or PDA risk) is the primary predictor of PDA (Arria et al. 2008; Friedman 2007; NIDA 2011, 2013; SAMHSA 2013). However, others' risk perceptions may be positively affected by messages from the media, PSAs, or personal knowledge of the experiences of peers. The level of perceived risk then should at least partially account for effects of psychological dispositions on the abuse of prescription drugs. The level of perceived risk should be negatively related to PDA (Friedman 2007; NIDA 2011, 2013), leading to indirect effects between the nonlinear impact of the psychological dispositions and level of abuse (i.e., a mediating role of perceived risk). In the following sections, we discuss the procedure, measures, and results that pertain to the nonlinear, moderating, and mediating effects of interest.

Methods

Procedure

The study was conducted by the Partnership for Drug-Free Kids and was conceived and designed as a consumer research study to better understand the attitudes and behaviors of adolescents. The original research protocol and data collection used for this study comply with the Council of American Survey Research Code of Standards and Ethics (CASRO 2011).

Participants were recruited from shopping malls in 40 geographically dispersed areas in the United States. Mall intercepts were used to minimize potential direct or indirect influence of parents, peers, or school authorities on responses that might occur if interviews were conducted in a school or home setting. Mall intercepts offer somewhat greater control because they allow researchers to approach and screen participants in a one-on-one fashion. Mall intercepts are also comparable to telephone interviews in terms of data quality (Bush and Parasuraman 1985), and 79% of adolescents frequent a shopping mall in a given year (NIDA 2013).

Structured interviews were conducted with adolescents ranging in age from 13 to 18 years. Professional interviewers randomly approached participants at varying times throughout the day. Initial eligibility was determined by assessing the teens' basic knowledge of various legal and illicit substances. Using both general terms (e.g., "prescription drug without a doctor's prescription," "prescription pain reliever") and brand names (e.g., Vicodin, OxyContin, Robitussin, Xanax) to describe prescription drugs and some common over-the-counter drugs that could be abused (e.g., cough syrup, cold medicine), participants were given a list of 22 substances and asked about usage by their peers for each substance. If any of the drugs were checked off, the participant was deemed eligible to participate. After eligibility was determined, participants signed a consent form assuring them of anonymity, confidentiality, and that the data would be analyzed in aggregate only. Then, each participant completed a self-administered web-based questionnaire in a private facility within the shopping mall. The final sample consisted of 1,016 participants who were between 13 and 18 years of age.

Measures

Anxiety

We used the following six items from the general factor of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, and Lushene 1970) to assess anxiety on four-point scales ("disagree strongly/agree strongly"; M = 2.26, SD = .76, α = .85): (1) "I am often anxious," (2) "I have a lot of stress in my life," (3) "I often cannot relax or wind down," (4) "I often wish I could escape from my life," (5) "Sometimes I get depressed," and (6) "I have trouble concentrating."

Being a Good Teen

In line with theory and research using the Self-Report Family Inventory (SRFI; Beavers and Hampson 1990), we averaged four items on four-point scales ("disagree strongly/agree strongly") to assess being a good teen (M = 3.23, SD = .66, α =.76). Two items were adapted directly from the SRFI: (1) "I enjoy being with my family," and (2) "I value my parents' or guardians' opinions over those of my friends." The Partnership for Drug-Free Kids crafted the other two items to reflect the good teen concept embedded in SRFI research: (3) "I think it's important to get good grades in school," and (4) "I'm generally in a good mood."

Need to Be Popular

Three items on four-point scales ("disagree strongly/agree strongly") were drafted specifically for this study to assess adolescents' need to be popular (M = 2.08, SD = .73, α = .62): (1) "Sometimes I do things not because I want to but because my friends are doing them," (2) "I can't enjoy a party unless I can drink alcohol or take a drug," and (3) "It's very important for me to look cool."

Excitement Seeking

Drawing directly from the Mehrabian and Russell (1974) "excitement from risk" factor of the Arousal Seeking Tendency Scale, we averaged three items on four-point scales ("disagree strongly/agree strongly") to assess excitement seeking (M = 2.55, SD = .77, coefficient α = .67). The items were (1) "I like to do frightening or exciting things," (2) "I prefer friends who are exciting or unpredictable," and (3) "I like new and exciting experiences even if I have to break the rules."

Use of Other Restricted Substances

As a measure of the use of other restricted substances, we created an index by summing the responses (ranging from 0 to 4) to the following question: "Which of these substances have you used in the past year?" (coded as 1 = yes, 0 = no, for [1] beer/wine, [2] cigarettes, [3] liquor [gin, vodka, bourbon, whiskey], and [4] marijuana).

Perceived Risk

We averaged five items on four-point scales ("disagree strongly/agree strongly") drafted for this study to assess perceived PDA risk (M = 2.86, SD = .73, coefficient α = .77): (1) "Prescription drugs, without a doctor's prescription, are much safer to use than street drugs"; (2) "Prescription pain relievers without a doctor's prescription are not addictive"; (3) "There is nothing wrong with using prescription drugs without a doctor's prescription once in a while if you need them"; (4) "Since parents sometimes give their kids some of their own prescriptions, it is OK to use prescription drugs without a prescription"; and (5) "Using any prescription drug without a doctor's prescription is very risky."

PDA

We averaged two items on four-point scales ("never/regularly") specifically drafted for this study to serve as a measure of prescription drug abuse (M = 1.55, SD = .79; r among items = .79): (1) "How often do you take a prescription drug without having a prescription for it yourself?" and (2) "How often do you take a larger-than-prescribed dose of a prescription drug for which you do have prescription?"

Demographic and Control Variables

Demographic information included gender (1 = male [51%], 0 = female [49%]), age (M = 15.60 years), race/ethnicity (1 = Caucasian [80%], 0 = other), and college plans (1 = "yes, plan to go," 0 = "no" or "not sure"). We assessed several control variables on the basis of prior research findings: (1) "Was the respondent currently taking a physician-prescribed drug?" (1 = yes, 0 = no); (2) "In the past year, was a parent of the respondent taking a physician-prescribed drug?" (1 = yes, 0 = no); (3) "In the past year, had a parent(s) discussed the risk of PDA with the respondent?" (1 = yes, 0 = yes); and (4) "In the past year, had a friend(s) discussed the risk of PDA with the respondent?" (1 = yes, 0 = no) (Conway et al. 2013; Johnston et al. 2008; NIDA 2013; Young, Glover, and Havens 2012). Table 1 shows summary statistics (i.e., means and standard deviations) and correlations among the study variables.

Analyses and Results

Measurement Checks

Given that some of the items in the measures were crafted specifically for this study, we conducted several internal consistency and validity-related measurement checks. First, we conducted a principal components factor analysis of the items for excitement seeking, anxiety, need to look popular, being a good teen, PDA risk, and PDA. We extracted five eigenvalues greater than 1 (1.01 to 6.66), with a sixth factor showing an eigenvalue of .96. These six factors (components) accounted for 61% of the variance in the data, with factors 1–6 accounting for 28.57%, 10.78%, 7.65%, 5.37%, 4.41%, and 4.17% of the variance, respectively. The factor loadings from a six-factor rotated solution showed that the items loaded on their intended factors. The ranges of the loadings for each factor were as follows: .61 to .73 for excitement seeking, .62 to .78 for anxiety, .56 to .72 for need to be popular, .71 to .78 for being a good teen, .64 to .75 for PDA risk, and .83 to .84 for PDA.

Second, we estimated a hypothesized six-factor confirmatory model consistent with the six focal constructs noted previously. This model fit the data well (χ^2 = 644.15, d.f. = 215; root mean square error of approximation = .04; com-

Table 1. Summary Statistics and Correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. PDA	1.55	.79	1.0										
2. PDA risk	2.86	.73	–.41	1.0									
3. Excitement seeking	2.55	.77	.29	–.31	1.0								
4. Anxiety	2.26	.76	.40	–.43	.60	1.0							
5. Need to be popular	2.08	.73	.42	–.39	.49	.58	1.0						
6. Being a good teen	3.23	.66	–.21	.19	.00	–.15	–.11	1.0					
7. Other restricted substances	.48	1.13	.37	–.19	.22	.26	.26	–.19	1.0				
8. Gender	.51	.50	.01	–.04	.07	–.01	.11	–.04	.02	1.0			
9. Age	15.60	1.65	.05	.05	.03	.04	–.02	–.04	.12	.04	1.0		
10. Race	.80	.40	–.02	.06	.02	.01	.00	–.01	.02	–.02	–.03	1.0	
11. Plan to attend college	.77	.42	–.17	.08	–.02	–.08	–.20	.17	–.15	–.13	–.03	.03	1.0

Notes: The variables of "respondent currently taking a prescription drug" (M = .13, SD =.34), "parent currently taking a prescription drug" (M = .34, SD = .47), "parents talking about prescription drug risk" (M = 6.27, SD = 16.16), and "friends talking about prescription drug risk" (M = 6.01, SD = 16.32) were virtually uncorrelated with all study variables; as such, we do not include them in Table 1. In general, correlations = .08 in absolute value are significant at the .05 level.

parative fit index = .98; nonnormed fit index = .97), and items again loaded highly on their respective factors (t-values ranging from 15.20 to 20.55, $p < .01$). The correlations shown in Table 1 suggest no major concerns with discriminant validity (no single construct explains more than 36% of the variance in any other construct), but we also assessed discriminant validity among the constructs by estimating a series of models in which the items of two constructs were constrained to load on the same factor. This results in comparing the fit of the hypothesized six-factor model with a set of five-factor models (Anderson and Gerbing 1988; Bagozzi and Yi 1988). For each comparison, the six-factor model fit better than the five-factor model. The differences between the six- and the five-factor models ranged from $\chi^2_{diff} = 116.26$ ($d.f._{diff} = 5, p < .01$) for the anxiety and need-to-be-popular items constrained to the same factor to $\chi^2_{diff} = 976.63$ ($d.f._{diff} = 5, p < .01$) for the excitement-seeking and good-teen items constrained to the same factor. These differences in model fit support the discriminant validity among study constructs.[1]

Effects on Perceived Risk

We first mean-centered all independent variables and created interaction terms for all aforementioned demographics and control variables listed previously with excitement seeking, anxiety, need to be popular, good teen, and use of other restricted substances. We used squared mean-centered excitement seeking, anxiety, need to be popular, good teen, and use of other restricted substances to create their quadratic terms (Cohen et al. 2003). We then estimated two sets of models. For the first set, we estimated two hierarchical regression models: Model 1 included the linear effects of demographics, control variables, excitement seeking, anxiety, need to be popular, good teen, and use of other restricted substances, and Model 2 hierarchically added the interaction and quadratic terms. In the second set of models, we then reestimated Models 1 and 2, including only the significant effects from the first set of models. However, we retained nonsignificant predictors if they were used in the creation of the interaction or quadratic terms. This procedure did not change the significance or the magnitude of any predictor variable retained from the first to the second set.

Model 1 showed significant linear effects of age, race, good teen, need to be popular, anxiety, and use of other restricted substances, all in the expected direction. Model 1 explained 24% of the variance in PDA risk. Model 2, which hierarchically added the quadratic and interaction effects, significantly increased R^2 to 27%. We observed the linear effects found in Model 1 in Model 2 as well: age ($\beta = .033$, $t = 2.74$, $p < .01$), race ($\beta = .117$, $t = 2.37$, $p < .05$), good teen ($\beta = .121$, $t = 3.89$, $p < .01$), need to be popular ($\beta = -.170$, $t = 4.84$, $p < .01$), anxiety ($\beta = -.261$, $t = 7.97$, $p < .01$), and use of other restricted substances ($\beta = -.219$, $t = 3.90$, $p < .01$). More important are the significant quadratic effects of Model 2 shown in the bottom portion of the second column of Table 2 ("Effects on Perceived Risk").

At the highest level of need to be popular, we observe a negative curvilinear effect ($\beta = -.123$, $t = 3.72$, $p < .01$), suggesting that adolescents who have the highest need to be popular underestimate PDA risk more than those at high or moderate levels. Figure 2, Panel A, provides a plot of this effect (with all other variables also included in the model) (Cohen et al. 2003). This plot shows that at an average score of 2.00 (out of 4) for need to be popular, the effect begins to slope increasingly downward with a mean of 2.82 for perceived risk; at a need-to-be-popular average of 3, the mean for perceived risk is 2.54; and at a need-to-be-popular average of 4, the mean for perceived risk is 1.96. The anxiety quadratic effect was positive ($\beta = .121$, $t = 3.67$, $p < .01$), which is opposite its linear effect ($\beta = -.261$, $t = 7.97$, $p < .01$). The plot of this quadratic effect (see Figure 2, Panel B) shows that at an anxiety level of 3.00 (out of 4), an inflection point occurs. At this level, the mean for perceived risk is 2.81, but at an anxiety level of 4, the perceived risk mean is 2.96. Similarly, the quadratic effect of use of other restrictive substances was also positive ($\beta = .073$, $t = 3.51$, $p < .01$) and, again, is opposite its linear effect ($\beta = -.219$, $t = 3.90$, $p < .01$). As Figure 2, Panel C, shows, at a use-of-other-restrictive-substances average level of 2.00, the curve begins to slope upward with a perceived risk mean of 2.70; at a use-of-other-restrictive-substances average level of 4.00, perceived risk is 3.04.

The significant interactions with demographics also revealed some interesting moderated effects. The gender × need to be popular interaction was negative ($\beta = -.130$, $t = 2.36$, $p < .05$). The plot of this interaction showed that boys with a high need to be popular had a lower mean PDA risk score (2.01) compared with girls with a high need to be popular (M = 2.43) (Cohen et al. 2003). Similarly, the race × need to be popular interaction ($\beta = -.127$, $t = 1.79$, $p < .05$)

[1]Given that the same source rated the items assessing dependent variables (DVs) and independent variables (IVs), there is the potential for common method variance (CMV) to inflate (or deflate) the relationships among DVs and IVs (Podsakoff et al. 2003). We conducted two sets of analyses to assess the potential effect of CMV. First, the Harman's single-factor test assesses the amount of variance captured by a general first factor when all items from all constructs (DVs and IVs) are entered into an exploratory factor analysis. As we have noted, we entered the excitement-seeking, anxiety, good-teen, need-to-be-popular, PDA-risk, and PDA items (six constructs) into a principal components analysis. A single first factor accounted for only 28% of the variance, and several factors emerged consistent with the measures of these six constructs. Indeed, five eigenvalues were greater than 1 (1.10 to 6.66) and a sixth eigenvalue of .96 explained 61% of the variance in the data. Furthermore, the rotated factor loadings showed excitement-seeking, anxiety, good-teen, and need-to-be-popular items loading on their respective constructs. These results suggest minimal contamination of CMV.

Second, we used the confirmatory factor approach suggested by Podsakoff et al. (2003, p. 894), which assesses the degree to which the pattern of correlations among predictors and DVs may have been inflated or deflated when adding a same-source first-order methods factor to the model. This approach typically requires equating item loadings within the same-source factor to be constrained to be equal for identification purposes, and we encountered this same issue. This "equating" procedure capitalizes on chance because, to our knowledge, there are no guidelines or conceptual rationale for determining which same-source factor loadings should be constrained to be equal. Still, we found several identifiable solutions that converged toward the same result: attenuation existed for two of the relationships. In the model without a same-source factor, the good teen–PDA risk disattenuated correlation was .25 ($t = 5.76$, $p < .01$), and the good teen–PDA disattenuated correlation was –.27 ($t = 6.37$, $p < .01$). In the model with a same-source factor, the good teen–PDA risk correlation was –.09 ($t = 1.34$, $p > .10$), and the good teen–PDA correlation was .18 ($t = 2.74$, $p < .05$). In summary, there was limited evidence that CMV may have affected our results for this one predictor.

Table 2. Regression Results for Perceived Risk and PDA

	Effects on Perceived Risk		Effects on PDA	
Predictors	**Coefficient**	**T-Value**	**Coefficient**	**T-Value**
Gender	–.025	.63	–.035	.86
Age	.033	2.74**	.020	1.63
Race	.117	2.37*	–.033	.65
Plan to attend college	—	—	–.100	1.96*
Perceived risk	—	—	–.226	7.47**
Good teen	.121	3.89**	–.131	4.04**
Need to be popular	–.170	4.84**	.166	4.56**
Anxiety	–.261	7.97**	.102	2.97**
Use other substances	–.219	3.90**	.266	4.62**
Popular quadratic	–.123	3.72**	.112	3.32**
Anxiety quadratic	.121	3.67**	.112	3.30**
Use other substances quadratic	.073	3.51**	–.046	2.15*
Gender × Popular	–.130	2.36*	—	—
Race × Popular	–.127	1.79*	—	—
Age × Good teen	–.044	2.50*	—	—
Gender × Good teen	—	—	–.118	1.94*
Race × Good teen	—	—	.157	1.88*
R^2	.27		.36	

*$p < .05$.
**$p < .01$.
Notes: Perceived risk, the proposed mediator, is shown only for the PDA outcome.

Figure 2. Quadratic Effects on Perceived Risk

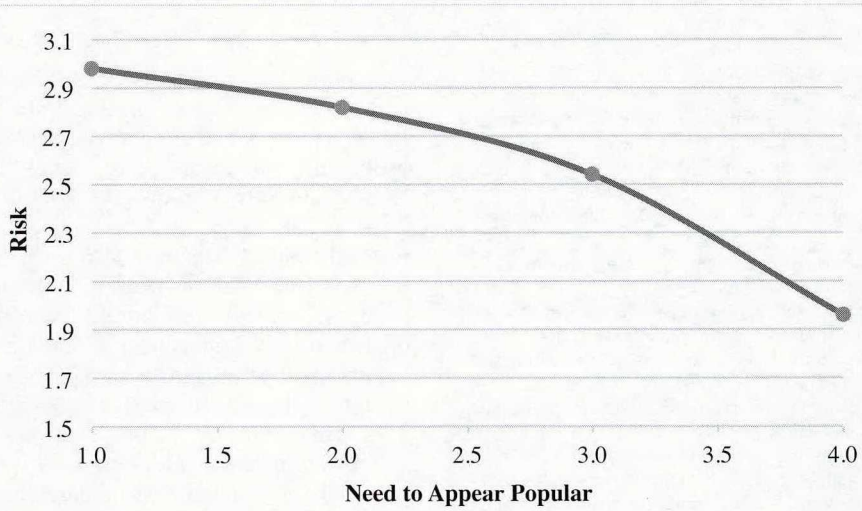
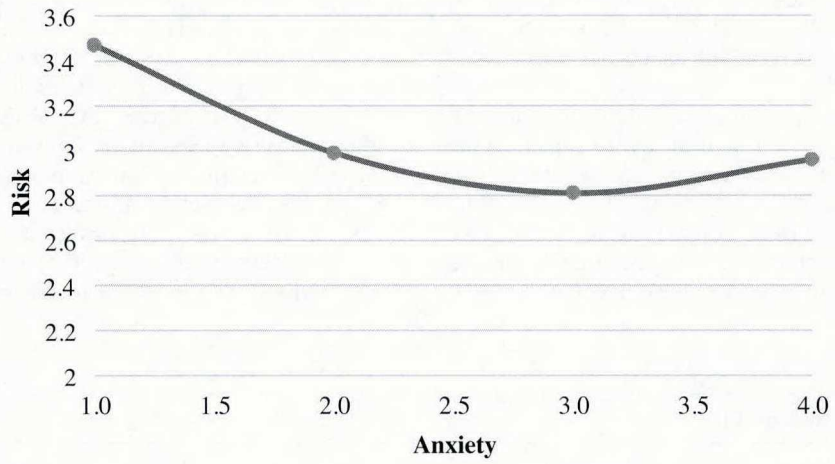
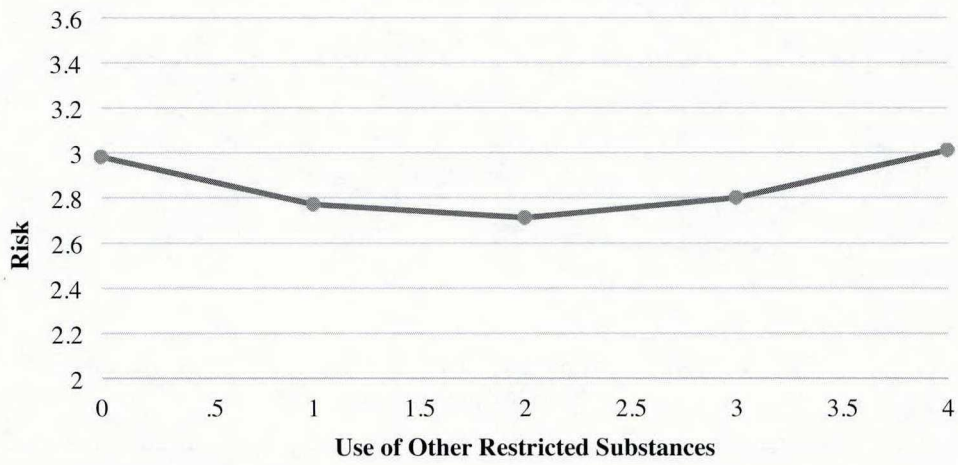


Figure 2. Continued

B: Quadratic Effect of Anxiety on Perceived Risk



C: Quadratic Effect of Use of Other Restricted Substances on Perceived Risk



revealed that Caucasians who scored high on need to be popular were more likely to underestimate the health risk of PDA than non-Caucasians with a high need to be popular ($M_{Caucasians} = 2.20$, $M_{non\text{-}Caucasians} = 2.44$). Finally, the age × good teen interaction was negative ($\beta = -.044$, $t = 2.50$, $p < .05$) and revealed that an older/low-scoring good teen had a mean risk score that was higher ($M = 2.80$) than a younger/low-scoring good teen ($M = 2.59$).

Effects on PDA

With PDA as the dependent variable, we estimated three models in the initial set: (1) Model 1, with the linear effects of the demographics, control variables, and mean-centered perceived risk; (2) Model 2, which added the linear effects of mean-centered anxiety, need to be popular, good teen, excitement seeking, and use of other restrictive substances; and (3) Model 3, which added the interaction and quadratic terms. In the second set, we reestimated Models 1, 2, and 3 with only the significant effects from the first set but again retained those nonsignificant variables if they were used in the creation of the interactions or quadratic effects.

In the initial stage, Model 1 ($R^2 = .19$) showed significant linear effects of age, planning to attend college, and perceived risk ($\beta = -.411$, $t = 13.77$, $p < .01$). Model 2 increased R^2 to .33 with significant linear effects of good teen, need to be popular, anxiety, and use of other restrictive

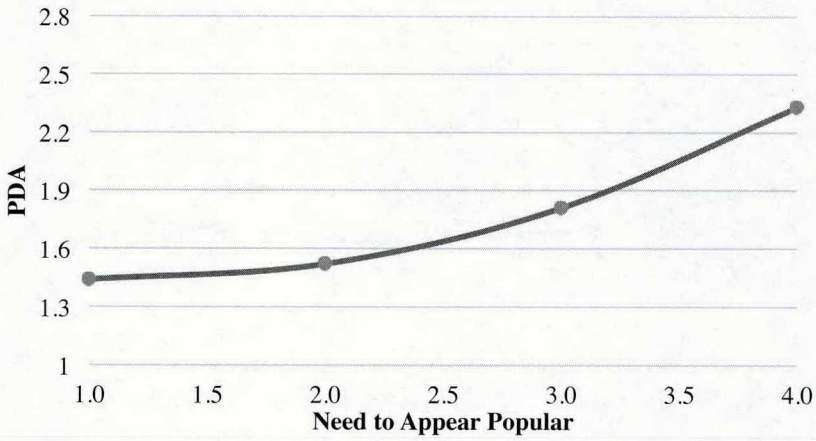
substances, all in the expected direction. The far column in Table 2 ("Effects on PDA") shows the final model (Model 3) results after adding the quadratic and interaction terms ($R^2 = .36$). The significant linear effects of Model 3 were as follows: plan to attend college ($\beta = -.100$, $t = 1.96$, $p < .05$), good teen ($\beta = -.131$ $t = 4.04$, $p < .01$), need to be popular ($\beta = .166$, $t = 4.56$, $p < .01$), anxiety ($\beta = .102$, $t = 2.97$, $p < .01$), and use of other restrictive substances ($\beta = .266$, $t = 4.62$, $p < .01$).

The curvilinear and interaction effects are of the greatest interest in this research. At the highest level of need to be popular, we observe a positive curvilinear/quadratic effect ($\beta = .112$, $t = 3.32$, $p < .01$), suggesting that adolescents who have the highest need to be popular are more likely to abuse prescription drugs than those at just high levels. A plot (Figure 3, Panel A) reveals that at an average score of 2.0 for need to be popular, its effect begins to slope increasingly upward with a mean of 1.52 for PDA; at a need-to-be-popular average of 4, the mean for PDA is 2.33. The anxiety quadratic effect was positive ($\beta = .112$, $t = 3.30$, $p < .01$). The plot in Figure 3, Panel B, shows that at an anxiety level of 2.00, its effect on PDA slopes upward (M =1.46); at an anxiety level of 4, the PDA mean is 2.01. The quadratic effect for use of other restrictive substances was negative ($\beta = -.046$, $t = 2.15$, $p < .05$) and opposite its linear effect ($\beta = .266$, $t = 4.62$, $p < .01$). As Figure 3, Panel C, illustrates, at a use-of-other-restrictive-substances level of 3.00, its effect on PDA (M = 1.95) started a downward slope; at level of 4.00 for use of other restrictive substances, PDA was 1.64.

We observed two significant interactions. Gender moderated the effect of being a good teen ($\beta = -.118$, $t = 1.94$, $p < .05$): a plot of this interaction showed that boys who scored

Figure 3. Quadratic Effects on PDA

A: Quadratic Effect of Need to Be Popular on PDA



B: Quadratic Effect of Anxiety on PDA

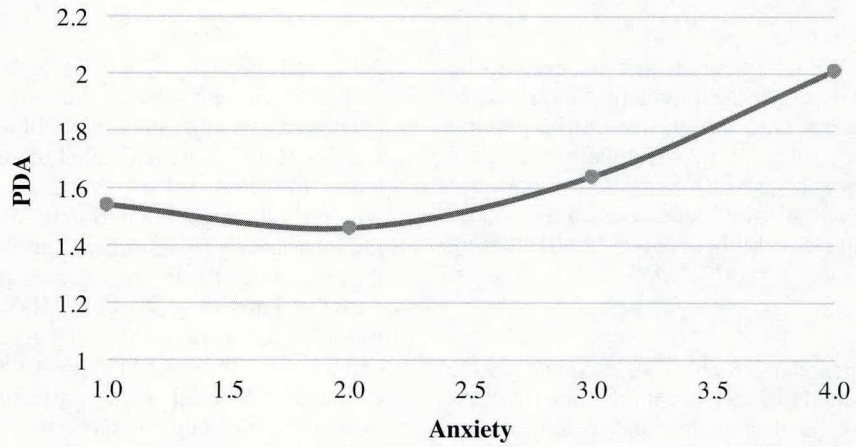
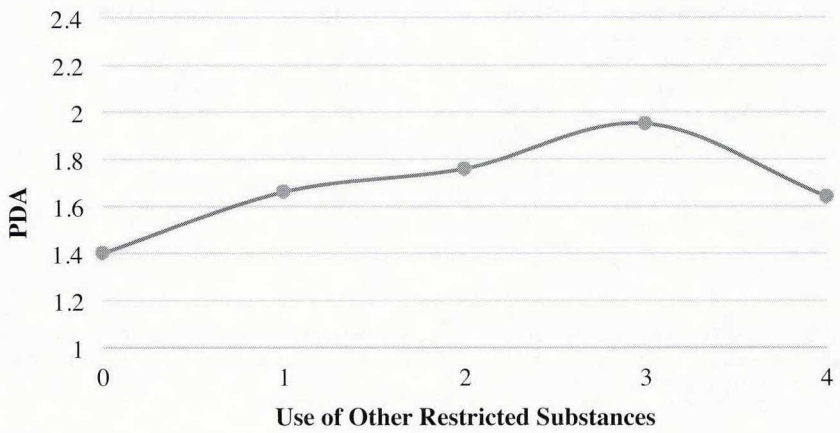


Figure 3. Continued

C: Quadratic Effect of Use of Other Restricted Substances on PDA



high on being a good teen (M = 1.34) were less likely to engage in PDA than girls who scored high on this disposition (M = 1.48). Race moderated the effect of being a good teen (β = .157, t = 1.88, $p < .05$). This plot revealed that low-scoring good-teen non-Caucasians had higher PDA scores (M = 1.66) than low-scoring good-teen Caucasians (M = 1.49).[2]

Mediation Analyses

The PDA results clearly show that several variables had significant effects on PDA while controlling for perceived risk, suggesting that risk did not fully mediate the effects of these predictors on PDA. Next, we use a mediated-moderation regression approach with PROCESS to directly examine mediation (Hayes 2013; Muller, Judd, and Yzerbyt 2005). With PROCESS, both Sobel tests and confidence intervals from 1,000 bootstrap samples are generated to assess mediation through an indirect effect of an independent variable on a dependent variable. If the Sobel test is significant and the confidence intervals do not contain a value of zero, significant mediation is evident (Hayes 2013). We estimate three models: (1) one regressing the independent variable(s) on the dependent variable without the mediator, (2) one regressing the independent variable(s) on the mediator, and (3) one in which both the independent variable(s) and the mediator are regressed on the dependent variable. In essence, the second column of Table 2 ("Effects on Perceived Risk") shows the second model, which assesses the independent variables → mediator relationships, and the third column of Table 2 ("Effects on PDA") shows the third model, the effect of the independent variables and mediator on the PDA dependent variable.

Thus, the first model determines whether the effect of each independent variable on the dependent variable is significant without controlling for the mediator. Note that because the gender × good teen and race × good teen interactions were not significant predictors of risk, their effects on PDA cannot be mediated. However, we included them as control variables using the PROCESS approach (Hayes 2013). Table 3 shows the PROCESS mediation results. Without the mediator (risk) in the model, all independent variables shown in column 2 of Table 3 ("Model Without the Risk Mediator") were significant predictors of PDA. When we added risk to the model, all independent variables remained significant, but their effects were attenuated. As column 3 of Table 3 ("Indirect Effects Through Risk Mediator") shows, we observe significant indirect effects for these independent variables. Sobel z-tests were significant ($p < .01$), and the 1,000 bootstrapped confidence intervals did not contain values of zero. These results indicate partial mediation.

Discussion

Overview of the Findings

There are many alarming statistics pertaining to adolescent PDA (NIDA 2011, 2013, 2014). In the United States, the

[2]Excitement seeking was not a significant predictor for perceived risk or PDA in any form (i.e., linear, quadratic, or interaction). The pattern of correlations among excitement seeking, anxiety, need to be popular, perceived risk, and PDA is informative in this regard (see Table 1). Excitement seeking showed respective correlations of .60 and .49 with anxiety and the need to be popular as well as respective correlations of –.31 and .29 with the dependent measures of perceived risk and PDA. The correlations for anxiety and need to be popular with risk were –.43 and –.39, respectively, and respective correlations for anxiety and need to be popular with PDA were .40 and .42. Thus, the high level of intercorrelations of excitement seeking with anxiety and need to be popular, combined with the finding that anxiety and need to be popular show stronger correlations with both risk and PDA, likely resulted in the nonsignificant effects for excitement seeking, despite significant bivariate correlations.

Table 3. The Mediating Role of Perceived Risk on PDA

	Model Without the Risk Mediator		Indirect Effects Through Risk Mediator		
	Coefficient	T-Value	Indirect Effect	Sobel z-Value	95% Confidence Interval
Good teen	–.159	4.83**	–.029	2.83**	(–.051, –.012)
Need to be popular	.200	5.40**	.034	3.44**	(.015, .055)
Anxiety	.163	4.76**	.061	4.84**	(.040, .090)
Use other substances	.315	5.38**	.050	3.40**	(.024, .084)
Need to be popular quadratic	.144	4.18**	.032	3.14**	(.014, .053)
Anxiety quadratic	.031	2.33*	.032	3.10**	(.013, .054)
Use other substances quadratic	–.016	2.88**	–.015	2.96**	(–.029, –.007)

*$p < .05$.
**$p < .01$.
Notes: The indirect effect including the proposed mediation of risk assesses the path from the independent variable × perceived risk × PDA outcome. Confidence intervals that do not include zero are statistically significant. Thus, in all cases, the results of the Sobel test and the bootstrapped confidence intervals support a significant role of risk as a mediator.

CDC has classified PDA as an epidemic, and the abuse of prescription painkillers alone exceeds $72 billion annually in direct health care costs (CDC 2014a). A recent National Survey on Drug Use and Health indicates that nearly one-third of people aged 12 years and older who used drugs illegally for the first time began by using a prescription drug for a nonmedical purpose (CDC 2014a).

Little research has attempted to link the role of factors that affect adolescent perceptions of the risks of PDA with how this risk, in turn, is related to prescription drug abuse (Young, Glover, and Havens 2012). Using a national sample of more than 1,000 adolescents between 13 and 18 years of age recruited from 40 locations in the United States, we extend current findings to consider the role of nonlinear (quadratic) effects and interactions with adolescent demographics. We also assess the role of perceived risk as an outcome as well as a mediator through which the linear and nonlinear effects of the predictors affect adolescent PDA.

As we expected, the results show that various psychological states (e.g., anxiety, need to be popular) and other restricted substance usage (e.g., alcohol, marijuana) among adolescents are linearly related to PDA. In addition, however, our findings suggest some substantial nonlinear relationships that extend beyond these direct effects. These nonlinear/quadratic effects are of interest for two important reasons.

First, these nonlinear effects explained 3% incremental variance in perceived risk and PDA. At first glance, a 3% increase in R^2 may seem relatively small, but substantial evidence has suggested that product term effects (moderators and quadratic effects) typically show squared partial correlations (incremental explained variance estimates) between 1% and 3% (e.g., MacCullum 1995; McClelland and Judd 1993). Indeed, several researchers have stated that obtaining nonlinear term effect sizes in the 3% range can be indicative of an important substantive result (Cohen et al. 2003; MacCullum1995; Siemsen, Roth, and Oliveira 2010). This view is further reinforced by literature that shows the difficulty of obtaining significant nonlinear effects in survey research with self-report measures (McClelland and Judd 1993; Siemsen, Roth, and Oliveira 2010). Given the importance of the topic, explaining 3% of additional variance in perceived risk and PDA through quadratic effects and interactions seems to be a meaningful result.

Second, as we noted previously, nonlinear effects are useful because they reveal tipping points or "threshold effects" (Lee, Seo, and Shin 2011); that is, nonlinear effects show the substantive researcher where an inflection point occurs. For example, the inflection point for need to be popular is approximately 2 on a four-point scale, suggesting that when teens feel the need to be popular at a moderate to high level, they are at a much greater risk for PDA relative to a strictly linear effect. From 3 to 4 on the scale, this nonlinear effect becomes even more pronounced. This finding may suggest to parents, school officials, and those designing antidrug abuse programs to focus on teens *before* they feel strong peer pressure associated with needing to appear cool. Specifically, using interventions before the effects increase at an accelerated rate seems to be of the greatest benefit from the perspective of reducing the likelihood of abuse. Likewise, teens who begin to show moderate levels of anxiety may be those most amenable to early counseling before anxiety reaches levels at which PDA is the strongest. Our results show an increasing (not just linear) slope at a moderate level of anxiety (2 on a four-point scale). This nonlinear effect becomes even more pronounced when anxiety levels increase from high (3) to very high (4). Thus, teens who show a moderate level of anxiety may be the most likely target for early intervention strategies because the effects become far more severe as anxiety reaches its highest level (Young, Glover, and Havens 2012).

Thus, as we noted previously, Panels A and C in Figure 2 show that as the need to be popular rises to high levels and other types of adolescent substance abuse are at moderate levels, perceived risk decreases in a nonlinear manner. This result suggests that for those with at least moderate levels of familiarity with other illegal substances and the highest need to be popular perceive the lowest risk of PDA.

Notably, the highest level of use of other illicit substances is associated with relatively high risk perceptions; perhaps those with the greatest level of experience with other substances are more aware of the risks associated with PDA. These results are also of particular interest because the directions of the quadratic effects are opposite those of the linear effects.

Similar results extend to self-reported PDA. Teens who (1) feel the greatest need to be viewed as popular and (2) are relatively high abusers of other substances are the most likely to report the highest PDA levels. For use of other restricted substances, the quadratic effect runs counter to the linear effect, and in such instances, conclusions based only on the linear effect could be misleading. Specifically, as the abuse of other substances becomes extremely high, PDA is somewhat lower. As Table 3 shows, both Sobel tests and bootstrapped confidence interval results indicate that perceived risk is a significant mediator of all effects of the predictors on PDA. Although the mediation is consistently significant, we note that risk only partially mediates all of the effects on PDA.

Implications for Public Policy and the Well-Being of Adolescent Consumers

Given that risk is a significant mediator of all the linear and quadratic effects we found, efforts to increase knowledge of risk associated with adolescent PDA seem to be a critical objective for policy makers and those concerned with the well-being of adolescents. Although it can be argued that awareness of the dangers of many illegal drugs (e.g., cocaine, ecstasy) has increased, many adolescents and young consumers are far less aware of the dangers associated with the misuse or abuse of prescription drugs (Executive Office of the President 2011). While there are more than 20,000 deaths per year due to abuse, for each overdose death from prescription painkillers there are 10 admissions for treatment due to abuse and 32 emergency department visits (CDC 2014a). Because prescription drugs are approved by the FDA, an institution perceived as cautious and highly concerned with safety, and because people may draw safety inferences from the increase in direct-to-consumer advertising of prescription drugs, the results reported here suggest that the risks associated with PDA need to be better communicated.

Given the consistent intervening role of risk, there seems to be a substantial amount of compelling objective information that could potentially increase the awareness of the risks and consequences associated with abuse. Enhancing education efforts through media campaigns may hold promise because they can disseminate behaviorally focused messages related to risk (Wakefield, Loken, and Hornik 2010). Some messages may focus on the number of deaths and relative risks of PDA compared with illegal drugs (CDC 2014a). For example, each year, there are more deaths from prescribed opioids than from heroin and cocaine combined (CDC 2012). Such messages may resonate and effectively communicate risk levels to adolescents with the greatest likelihood of abuse. However, it seems clear that campaigns targeting both adolescents and parents are needed. Because parents may not be aware of the level of risk or that their adolescent children may be abusing prescription drugs (FDA 2007), they may leave prescription drugs in open medicine cabinets, offering easy access. Increases in risk perceptions among parents regarding the extent of the problem may lead to reduced access to potentially dangerous drugs as well as greater communication between parents and their children (Executive Office of the President 2011).

Effective communication about risks to adolescents must use some combination of local, state, and federal actions. Because the quadratic results demonstrate that there is a segment of adolescents at substantially greater risk of abuse, local school administrators and physicians may be able to identify a more refined target for communications related to prescription drug problems. For example, school counselors, medical practitioners, or parents who recognize adolescents with very high levels of anxiety, strong concern about popularity, and moderate to high usage of other restricted substances should realize that these students have a high likelihood of PDA and that interventions for this target may be helpful. Of course, when measures of predictor variables are available, coefficients from our analyses could be used to easily calculate predictive scores for individual adolescents (or segments of adolescents) who are most likely to engage in PDA behavior and who represent a target for communications about the dangers of abuse. In addition, male teens with a high need to be popular and Caucasians seem to underestimate PDA risk relative to their counterparts, which suggests that these segments are appropriate targets for risk-related PSAs and promotional messages.

Communications to targeted high-risk segments of adolescents may also involve the use of social media because outlets such as Facebook, Twitter, and Instagram have the ability to use teens as peers offering emotion-laden messages about both the positive consequences of not abusing prescription drugs and the negative consequences of doing so (Fitzsimons and Moore 2008; NIDA 2014; Wakefield, Loken, and Hornik 2010). However, care must be taken in crafting such messages, particularly for adolescents with higher levels of anxiety and susceptibility to peer pressure (e.g., the need to look popular). Some evidence has suggested that these groups may be the most susceptible to a reactance effect if the message overmoralizes or judges a maladaptive behavior too harshly (Martin et al. 2013; Pechmann et al. 2011). Communicating PDA outcomes, including death and other negative consequences, in testimonials from credible teen sources through social media and allowing the message recipients to weigh the information themselves may be a strategy worth considering.

What else might be considered for the segment of adolescents with levels of psychological states that may lead to the greatest risk of PDA? It might be that this group of adolescents requires highly persuasive and emotional messages to have a substantial impact; this possibility could be examined in further research. Could the factors that have been shown to affect teen and young smoker intentions work for teen PDA? Recent evidence has demonstrated that graphic warning labels on cigarette packages and in ads induce

emotions such as fear, guilt, and remorse among young smokers to the point that they express greater intentions to quit smoking (Andrews et al. 2014; CDC 2014b). Although this approach may seem somewhat at odds with the aforementioned strategy, at second glance, it might not be. Adolescents have a high desire to please their peer groups, and a central message of the graphic warning approach is the negative effect of engaging in the maladaptive behavior on friends. A targeted campaign using fear, guilt, and remorse messages that stress highly embarrassing or negative outcomes and emphasizing sentiments such as "This is how your friends see you when you abuse prescription drugs" may be a viable alternative (Wakefield, Loken, and Hornik 2010). Similarly, there are many compelling stories of teenage overdoses resulting in severe consequences (e.g., death) that might effectively target adolescents who underestimate the risks of PDA (Partnership for Drug-Free Kids 2013).

Many of these approaches relate to increasing risk perceptions of the target market that is most at risk, but it should be noted that these results show that perceived risk only partially mediates the effects of the psychological dispositions on abuse. Thus, although it is obviously challenging to encourage adolescents to be less anxious or not abuse any other illegal substances, efforts to consider the problematic psychological dispositions remain important.

Limitations and Further Research

Our study is not without limitations. First, we note that although the large national sample of adolescents from diverse locations throughout the United States is one of our study's strengths, there are many other alternative samples and measures that remain of interest. Thus, as we have suggested, from a consumer welfare and policy perspective, this research has raised many unanswered questions that are appropriate for future studies. How effective would different potential messages and proposed media be in addressing adolescent risk perceptions and PDA? Are some messages and media particularly effective for the specific group of adolescents who seem to be at the highest risk due to their psychological dispositions? In this research, need for excitement was a nonsignificant predictor (see footnote 2), but are there other needs that would capture the underlying relationship more directly? Are there other negative psychological antecedents of interest (e.g., low self-esteem, depression) that should be directly addressed? In addition, how do effects overlap with the specific psychological dispositions examined in the data collected in this study?

In this article, we have focused on the adolescent market specifically. Although this market segment is critical, extending and comparing the findings with target markets of young adults (e.g., college students) would be of interest. Prescription drug abuse is a problem that cuts across many demographic segments, and striving to understand differences in relationships and implications remains of substantial concern for policy makers and consumer welfare.

A second limitation pertains to the measures used. Several of the key measures (e.g., need to be popular) were crafted specifically for this study; that is, they had not undergone rigorous validity testing before the data collection. Although we believe that these measures do possess face validity and meet acceptable levels of internal consistency and discriminant validity, greater confidence in some findings may have resulted from using established measures from relevant literature streams. For example, thoroughly validated measures may be most useful in identifying focal tipping points when considering nonlinear effects. Full-length, well-tested measures such as the State-Trait Anxiety Inventory (Spielberger, Gorsuch, and Lushene 1970) offer established norms (cutoff scores) for what are considered low, moderate, and high levels of anxiety. Tipping points will be more easily recognized and confirmed by using measures with well-established norms.

Furthermore, despite the anonymity and privacy provided to participants, given the nature of the topic of study—self-reported PDA—the potential for underreporting PDA exists and, as such, so does the potential for social desirability bias that may affect some relationships between PDA and predictors. The survey administered by the Partnership for Drug-Free Kids did not include a direct measure of social desirability bias, and we recognize this omission as a limitation of the study. To more directly test the extent of socially desirable reporting, future studies should include an index measure of social desirability (e.g., Marlowe–Crowne social desirability scale; Strahan and Gerbasi 1972) and assess the correlation with measures of predictors such as being a good teen and need to be popular.

In conclusion, from 1997 to 2007, the per capita use of prescription opioids increased by approximately 400%, and the confirmed overdoses of prescription opioids has more than tripled in the past two decades (CDC 2014a; Executive Office of the President 2011). This trend has led to a high level of abuse from adolescents, with some one-third of consumers 12 years or older using a prescription drug nonmedically as their first exposure to illicit drug use. We extend research in this area by focusing on mediating, nonlinear, and moderated effects and raise several issues for policy makers and constituencies interested in potential marketing and communication approaches that may help address this burgeoning public health problem.

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