



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Person × environment interactions on adolescent delinquency: Sensation seeking, peer deviance and parental monitoring



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ARTICLE INFO

Article history:

Received 16 May 2014

Received in revised form 10 October 2014

Accepted 27 November 2014

Keywords:

Delinquency

Adolescence

Sensation seeking

Peer deviance

Parental monitoring

Mediation

Moderation

ABSTRACT

Sensation seeking is a personality trait that is robustly correlated with delinquent behavior in adolescence. The current study tested specific contextual factors hypothesized to facilitate, exacerbate or attenuate this risk factor for adolescent delinquency. Individual differences in sensation seeking, peer deviance, parental monitoring and self-reported delinquent behavior were assessed in a sample of 470 adolescents. Peer deviance partially mediated the effects of sensation seeking and parental monitoring on adolescent delinquency. We also found evidence for a three-way interaction between sensation seeking, peer deviance and parental monitoring, such that the highest rates of delinquency occurred from the concurrence of high sensation seeking, high peer deviance, and low levels of parental monitoring. Results highlight the importance of considering peer- and family-level processes when evaluating personality risk and problematic adolescent behavior.

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1. Introduction

Sensation seeking, defined as a disposition to select and prefer novel, stimulating, or exciting experiences, is an intrapersonal risk factor for delinquent behavior (Harden, Quinn, & Tucker-Drob, 2012; Harden & Tucker-Drob, 2011; Popham, Kennison, & Bradley, 2011). Population-average developmental increases in sensation seeking and delinquent behavior co-occur across adolescence (Moffitt, 1993; Steinberg et al., 2008), and individual differences in longitudinal changes in sensation seeking account for much of the adolescent spike in delinquent behavior (Harden et al., 2012). As personality risk for adolescent delinquency, sensation seeking may index a “reaction range” for the emergence of delinquency (Nigg, 2006), with environmental contexts possibly mediating and/or moderating this risk. Researchers have therefore begun to examine specific contextual factors that facilitate, exacerbate or attenuate personality risk for delinquent behavior. In the current

paper, we consider the relations between sensation seeking and two social contexts: deviant peers and parental monitoring.

Peer deviance is a robust contextual correlate of adolescents' delinquent behavior (Kandel, 1986), an association that reflects social selection and social influence (Burk, Vorst, Kerr, & Stattin, 2011; Wills & Cleary, 1999). Social selection is a process by which adolescents with dispositions toward delinquency select (and are selected into) deviant peer groups (Gottfredson & Hirschi, 1990; Kandel, 1978). Social influence occurs when befriending and socializing with deviant peers increases one's likelihood to engage in delinquent behavior. Sensation seeking may play both mediating and moderating roles in these peer dynamics.

As a mediator, sensation seeking may be a psychological mechanism of social selection, shaping who an adolescent's friends are. For instance, affiliating with deviant peers may be one way that adolescents high in sensation seeking find a social-ecological niche that is conducive to their motivational and behavioral dispositions. Consistent with this hypothesis, affiliation with deviant peers has been found to mediate the link between sensation seeking and marijuana use (Hampson, Andrews, & Barckley, 2008; Yanovitzky, 2005).

As a moderator, sensation seeking may also play a role in social influence, affecting how an individual responds to peer influence. High sensation seekers may be more responsive to the immediate rewards of peer interaction and approval and thus more vulnerable

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to deviant social influence. Consistent with moderating relations between personality and contextual risk, behavior genetic research has found evidence for gene \times peer deviance interaction effects, whereby genetic risks on substance use are exacerbated among adolescents with deviant peers (Harden, Hill, Turkheimer, & Emery, 2008). Although the specific genetic vulnerabilities underlying these effects are unknown, other research has shown that sensation seeking is a heritable personality trait (Koopmans, Boomsma, Heath, & van Doornen, 1995) that partly accounts for heritable variation in adolescent delinquency (Harden et al., 2012). These findings suggest the effects of peer groups on delinquent behavior may be intensified when genetic risk for delinquency—including risk conferred by high sensation-seeking—is present.

Finally, the negative effects of sensation seeking on adolescent delinquency may wane in protective environments. Parental monitoring, defined by Dishion and McMahon (1998, p. 61) as “parenting behaviors involving attention to and tracking of the child’s whereabouts, activities, and adaptations,” is a protective factor that may mitigate the deleterious effects of various risks on adolescent behavior (Hill & Tyson, 2009; Lac & Crano, 2009). From the perspective of social control theory (Hirschi, 1969), antisocial behavior is prevented by bonds to conventional society, including parents. Parental monitoring, by both constraining certain behaviors and by communicating awareness and caring about adolescents’ activities, may function as a key mechanism of social control (Longmore, Manning, & Giordano, 2013). Specifically, parental monitoring may buffer the negative effects of high sensation seeking by preventing adolescents’ affiliation with deviant peers and by limiting the influence of those peers (Kiesner, Poulin, & Dishion, 2010; Steinberg, Fletcher, & Darling, 1994). In a large sample of adolescents, lower levels of peer deviance mediated the protective effect of parental monitoring on alcohol use (Kim & Neff, 2010). Moreover, a study with late adolescents found that the relation between peer influence and drinking behavior was moderated by parental monitoring (Wood, Read, Mitchell, & Brand, 2004). Finally, molecular genetics research has found evidence of a gene \times parental monitoring interaction, whereby genetic risks for externalizing behavior decrease under high levels of parental monitoring (Dick et al., 2009, 2011).

1.1. Goals of the current study

Building off previous research, we test five hypotheses in this study. First, high levels of sensation seeking and peer deviance and low levels of parental monitoring will independently predict adolescent delinquency. Second, peer deviance will partially mediate the effect of sensation seeking on delinquent behavior, such that adolescents high in sensation seeking will select deviant peer groups and, in turn, increase risk for delinquency. Third, peer deviance will also moderate the association between sensation seeking and delinquency, such that adolescents high in sensation seeking will be more vulnerable to the influence of deviant peers. Fourth, peer deviance will mediate the protective effect of parental monitoring on delinquent behavior, such that high levels of parental monitoring will prevent adolescents from affiliating with deviant peers and, in turn, prevent exposure to contextual risk for delinquency. Fifth, the protective effects of parental monitoring will be highest for youth high in both intra- and inter-personal risk. Therefore, we hypothesize that parental monitoring will moderate the combined influence that sensation seeking and peer deviance has on delinquency, such that a three-way interaction between sensation seeking, peer deviance and parental monitoring will be observed. Although many of the individual pieces of this model have been tested in previous research, this study is the first to test a comprehensive model that includes a three-way interaction

between sensation seeking, peer deviance and parental monitoring.

2. Method

2.1. Participants

Participants were 470 adolescent siblings (identical and fraternal twins⁵), ages 13–17 years, from the Texas Twin Project (Harden, Tucker-Drob, & Tackett, 2013). Participants were identified from public school rosters and recruited via telephone call and/or mailing to join an on-going twin registry. The sample was 52% male (48% female). The racial composition of the sample was 58% non-Hispanic Caucasian, 21% Hispanic/Latino, 11% African-American, 1% Native American, 2% East Asian, 3.0% Southeast Asian and 4% mixed-race/other. The highest level of education completed by parents ranged from 6th grade to graduate school. Approximately 7% of parents did not complete high school, 7% completed no more than high school, 3% completed a vocational or technical degree, 19% attended college but did not obtain a degree, 6% completed an associate degree, and 58% a bachelor degree or higher.

Participants were assessed in the summer, and they had either been enrolled in high school during the previous school year or were expected to enroll in the fall. Verbal and written consent was obtained from participants, and the study was granted a federal certificate of confidentiality to ensure honest reporting without risk of legal sanction. Parents completed a survey, and adolescents visited the laboratory, during which time they completed a number of computerized tasks and a survey. Trained research assistants administered all tasks; different research assistants assessed each sibling separately.

2.2. Measures

2.2.1. Parental education

Parents reported their highest completed level of education on a 22-point scale, ranging from grade school to a professional or doctorate degree. Ratings for both parents were standardized and then used to calculate a mean score.

2.2.2. Sensation seeking

Individual differences in sensation seeking were measured using the Brief Sensation Seeking Scale (BSSS), which consists of 8 items. For example ‘I would like to explore strange places’ and ‘I prefer friends who are excitingly unpredictable’. Items were rated on a scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Previous research has found that the BSSS shows high reliability and construct validity (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002; Stephenson, Hoyle, Palmgreen, & Slater, 2003).

2.2.3. Peer deviance

Peer deviance was measured with an 22-item self-report questionnaire adapted from Thornberry, Lizotte, Krohn, Farnworth, and Jang (1994), which asked adolescents how many of their friends engage in various delinquent behaviors, including stealing and destroying property, and prosocial behaviors, such as participating in school activities and getting along with teachers. Items were rated on a scale ranging from 1 (*None of them*) to 4 (*All of them*).

⁵ Although twin samples are often used to conduct behavioral genetic analyses, the focus of the current paper is on the phenotypic associations between study constructs. Accordingly, twin pair resemblance is not used to make inferences about genetic influences. (Standard errors and parameter estimates were statistically corrected for non-independence of observations within twin pairs.)

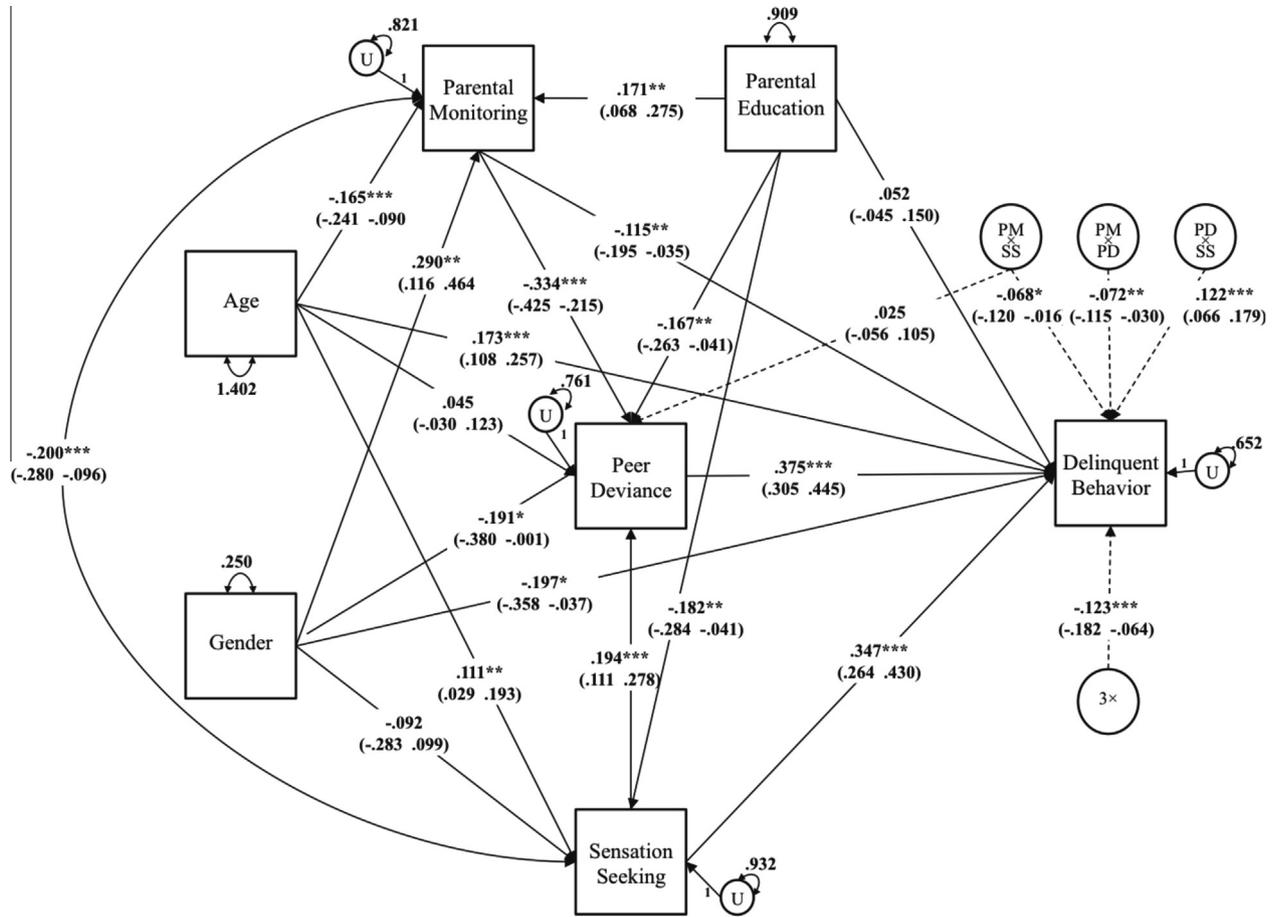


Fig. 1. Path diagram of mediating and moderating pathways to adolescent delinquency. Note: Unstandardized path coefficients reported. Focal predictors and self-reported delinquency standardized. Product terms computed from standardized predictors. 95% confidence intervals reported in parentheses. Male = 0, female = 1. 3x = sensation seeking x peer deviance x parental monitoring interaction. Interaction terms regressed on age, gender and parental education, and all covariances among interaction terms, covariates and study variables were estimated – these associations are not illustrated for ease of presentation. Results are therefore estimates from a fully saturated model.

Prosocial items were reverse scored before aggregating items to form a composite scale.

2.2.4. Parental monitoring

Parental monitoring was measured using a 15-item self-report questionnaire adapted from Capaldi and Patterson (1989). Items examined household rules and parental knowledge about friends and activities. Seven items assessed parental knowledge about adolescents’ friends and activities, which were rated on a scale ranging from 1 (*They don’t know*) to 3 (*They know a lot*). Eight items assessed parental control over adolescents’ friends and activities, and were rated on a 3-point scale (1 = *Never*, 2 = *Sometimes*, 3 = *Always*). For example, participants were asked whether they need permission to go out on weekends. All items were aggregated to form a composite scale.

2.2.5. Delinquency

A 36-item self-report measure adapted from Survey, Huizinga, Esbensen, and Weiher (1991) was employed. Adolescents were asked if they had ever engaged in a number of delinquent behaviors, ranging from minor offenses to relatively severe crimes. Minor offenses include, “been loud, rowdy, or unruly in a public place” and “been suspended or expelled from school”. Serious offenses include, “sold marijuana or hashish (‘pot’, ‘weed’, ‘hash’)” and “carried a hidden weapon (a knife or a gun).” Items were assessed on a 3-point scale (1 = *Never*, 2 = *Once*, 3 = *More than once*).

2.3. Data analysis

Data were analyzed using structural equation modeling in the software program Mplus version 7.1 (Muthén & Muthén, 1998–2010). All standard errors and model statistics were adjusted for nonindependence of data from children living in the same household (Asparouhov & Muthén, 2006). Age trends and gender differences associated with delinquency are well documented (Moffitt, 1993; Simourd & Andrews, 1994), and differences in parental education may confound parental monitoring and adolescent delinquency. Therefore, age, gender and parental education were treated as covariates in all analyses. Peer deviance and parental monitoring scales were log-transformed to correct for positive skew, and all focal predictors (but not age, gender and parental education) were standardized prior to computing interaction terms and conducting analyses. Inspection of the distribution of adolescent-report delinquency indicated the presence of a floor effect (i.e., left-censoring), as is common with measures of delinquency, which tend not to index minor social offenses. We therefore employed a Tobit model to produce unbiased parameter estimates for censored data (Muthén, 1990; Tobin, 1958).

The full model fit is illustrated in Fig. 1. Mean-centered age, gender and parental education were included as covariates of sensation seeking, peer deviance, parental monitoring, and delinquency. Direct paths from sensation seeking, peer deviance, and parental monitoring to delinquency were estimated, as well as indirect paths from sensation seeking and parental monitoring

through peer deviance. To evaluate moderating hypotheses, two-way interactions between each combination of focal predictors were estimated (sensation seeking × peer deviance, sensation seeking × parental monitoring, peer deviance × parental monitoring), as well as a three-way interaction (sensation seeking × peer deviance × parental monitoring).

3. Results

Table 1 summarizes descriptive and reliability statistics and zero-order correlations among study variables. Results from the full model are illustrated in Fig. 1. Note that because focal predictors were standardized, the main effects can be interpreted as population-average effects, i.e., effects holding all moderators at their mean levels. In support of our first hypothesis, sensation seeking ($b = .347$, 95% CI = .264, .430, $p < .001$), peer deviance ($b = .375$, 95% CI = .305, .445, $p < .001$) and parental monitoring ($b = -.115$, 95% CI = $-.195$, $-.035$, $p < .01$) had significant main effects on adolescent delinquency, even after controlling for age, gender and parental education. Second, high sensation seeking adolescents ($b = .194$, 95% CI = .111, .278, $p < .001$) and adolescents with lower levels of parental monitoring ($b = -.334$, 95% CI = $-.425$, $-.215$, $p < .001$) reported higher levels of peer deviance. Tests of indirect effects (see Table 2) indicated that affiliation with deviant peers partially mediated the association between sensation seeking and delinquency ($b = .073$ 95% CI = .039, .106, $p < .001$), as well as parental monitoring and delinquency ($b = -.125$, 95% CI = $-.168$, $-.083$, $p < .001$). That is, these results indicate that delinquency increases by approximately .07 standard deviations for every standard deviation increase in sensation seeking via the effect of sensation seeking on increased peer deviance. Likewise, adolescent delinquency is predicted to decrease by approximately .13 standard deviations for every standard deviation increase in parental monitoring via the effect of parental monitoring on reduced peer deviance.

In support of our moderation hypotheses, there were significant two-way interactions between sensation seeking and peer deviance ($b = .122$, 95% CI = .066, .179, $p < .001$), sensation seeking and parental monitoring ($b = -.068$, 95% CI = $-.120$, $-.016$, $p < .01$), and peer deviance and parental monitoring ($b = -.072$, 95% CI = $-.115$, $-.030$, $p < .01$). There was also a significant three-way interaction between sensation seeking, peer deviance and parental monitoring ($b = -.123$, 95% CI = $-.182$, $-.064$, $p < .001$), such that the association between sensation seeking and delinquency was magnified among adolescents who socialized with deviant peers and who were low in parental monitoring. See Fig. 2 for a plot of the simple slopes from the three-way interaction.

Note that, controlling for all other predictors, older adolescents were monitored less by parents ($b = -.165$, 95% CI = $-.241$, $-.090$, $p < .001$), and reported higher levels of sensation seeking ($b = .111$, 95% CI = .029, .193, $p < .01$) and delinquent behavior ($b = .173$, 95% CI = .108, .257, $p < .001$). Boys reported more delinquent behavior

Table 2
Total, direct & indirect effects on delinquency.

	Total		Direct		Indirect	
	B	S.E.	B	S.E.	B	S.E.
Sensation seeking	.420**	(.044)	.347**	(.042)	.073**	(.017)
Parental monitoring	-.240**	(.040)	-.115*	(.041)	-.125**	(.022)

Note: Mediator variable = peer deviance. B = unstandardized path coefficients for standardized variables. S.E. = standard error. * $p_{(two-tailed)} < .01$. ** $p_{(two-tailed)} < .001$.

than girls ($b = -.197$, 95% CI = $-.358$, $-.037$, $p < .05$) and were also more likely to report deviant peer affiliation ($b = -.191$, 95% CI = $-.380$, $-.001$, $p < .05$). Conversely, girls were more likely to be monitored by their parents ($b = .290$, 95% CI = .116, .464, $p < .01$). In sum, covariates and mediating and moderating pathways among focal predictors accounted for more than a third of the variance in adolescents' self-report delinquent behavior ($R^2 = .35$).

4. Discussion

This study documents a nexus of mediating and moderating pathways between adolescent sensation seeking, social contexts, and delinquent behavior. We find that, rather than conferring a uniform level of risk, sensation seeking may be better conceptualized as providing a “reaction range” (Nigg, 2006), which results in higher or lower levels of delinquent behavior in the presence of certain contextual factors. Specifically, higher sensation seeking is translated into deviant behavior when peers provide opportunities for delinquent behavior and when they lack parents who monitor and regulate their behavior.

Furthermore, results suggest that adolescents prone to personality risk may be more likely to engage in delinquent behavior because they often choose to befriend delinquent peers (i.e., mediation by social selection). In the context of deviant peers, these high sensation-seekers may also be more susceptible to peer influence, which further exacerbates risk for delinquency (i.e., moderation by socialization). Thus, personality guides the search for, and selection of, social-ecological niches that are conducive to one's proclivities and, furthermore, moderates social influence in the form of heightened vulnerability to contextual influence (Caspi, Roberts, & Shiner, 2005). In fact, personality traits such as sensation seeking may represent risk in one context, but resiliency in another (Nigg, 2006; Tackett, 2006). Clear delineation of specific contextual factors is therefore essential to better understand the associations between sensation-seeking and consequential adolescent outcomes.

The three-way interaction documented in the current study suggests that the pathway between personality risk, peer groups and delinquency is heightened in unrestrictive social environments, including environments facilitated by low levels of parental

Table 1
Zero-order correlations, descriptive & reliability statistics.

N = 470	α	M (SD)	R	Sex	SS	PD	PM	PE	DEL
Age		15.545 (1.185)	13.57–17.99	-.033	.127*	.137*	-.203**	.047	.262**
Sex		0.470 (0.500)	0 = M, 1 = F		-.044	-.145*	.151*	-.046	-.164*
SS	.718	3.179 (0.693)	1.13–5.00			.318**	-.270**	-.165*	.457**
PD	.867	1.732 (0.334)	1.05–2.91				-.415**	-.233**	.495**
PM	.801	2.624 (0.286)	1.07–3.00					.153*	-.409**
PE	.808	17.247 (2.879)	6.00–22.0						-.086
DEL	.877	6.432 (7.303)	0.00–50.0						

Note: Descriptive statistics for untransformed variables & correlations for transformed variables are reported. α = Cronbach's alpha. M = mean. (SD) = standard deviation. R = range. SS = sensation seeking. PD = peer deviance. PM = parental monitoring. PE = average of parental education. DEL = delinquent behavior. * $p_{(two-tailed)} < .01$. ** $p_{(two-tailed)} < .001$.

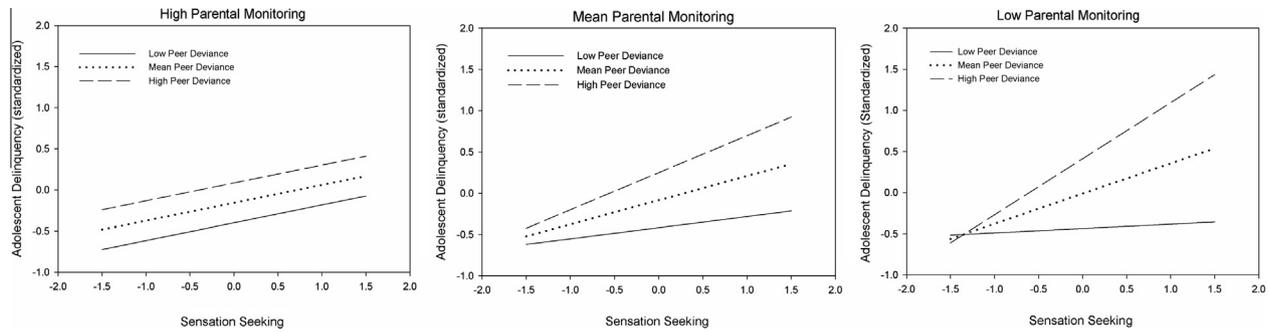


Fig. 2. Sensation seeking \times peer deviance \times parental monitoring interaction on delinquency. *Note:* Simple slopes calculated from parameters shown in Fig. 1. Predicted delinquency displayed for low (-1σ), average and high ($+1\sigma$) peer deviance. Panels present sensation seeking \times peer deviance interaction across high ($+1\sigma$), average and low (-1σ) parental monitoring.

monitoring. In other words, delinquency emerges when individuals with certain behavioral dispositions select risky social environments, which is more likely to occur in families that allow adolescents to affiliate with whomever they choose. Moreover, the moderating effect of parental monitoring suggests that, even if parents fail to prevent adolescents from affiliating with deviant peers, parents may still buffer the negative effects of peer deviance by restricting socialization. For example, even if adolescents affiliate with deviant peers, parental monitoring may limit social influence to relatively benign settings, like school classrooms, the cafeteria and supervised extracurricular activities; as opposed to risky environments, like unsupervised parties and late-night joy rides.

The current study builds off previous longitudinal work indicating that deviant peers predict future levels of adolescent delinquency (Curran, Stice, & Chassin, 1997; McCabe et al., 2005), and that parental monitoring predicts future involvement with deviant peer networks (Dishion, Patterson, Stoolmiller, & Skinner, 1991). The current project, however, used cross-sectional data. Therefore, these results do not allow us to make causal inferences about the associations uncovered. Future research using longitudinal data will allow us to examine whether sensation seeking prospectively predicts deviant peer affiliation or whether such affiliations prospectively predict individual delinquency. Additionally, the key constructs of interest were all measured using adolescent self-report. Adolescents may overestimate their peers' involvement in delinquent behavior and/or their peers' similarity to themselves (Bauman & Ennett, 1996). Importantly, the current results are broadly consistent with research that has used peers' reports of their own behavior to measure peer deviance (Harden et al., 2008).

Finally, this study focused on parental monitoring, as measured by adolescents' perceptions of parental rules and knowledge. Specific monitoring behaviors, however, are dynamically related to other dimensions of the family system. Parental rules may be communicated with empathy and respect for the adolescent's autonomy or may be experienced as intrusive and controlling (Grolnick, 2003; Soenens & Vansteenkiste, 2010). Parental knowledge may stem from parents' active surveillance efforts or from adolescent self-disclosure, and the latter is most strongly associated with lower delinquent behavior, both cross-sectionally and longitudinally (Kerr, Stattin, & Burk, 2010; Stattin & Kerr, 2000). Additionally, relations between delinquency and parental monitoring are reciprocal: Deviant teenagers disclose less information to their parents and are more likely to select unstructured settings that are difficult for parents or other adults to monitor (Kerr et al., 2010; Laird, Pettit, Bates, & Dodge, 2003). Overall, previous research on parental monitoring suggests that the interactive effects found in the current study may be further conditioned by aspects of the family system that facilitate adolescent self-disclosure, including parent-child attachment and previous histories of problem behavior.

In conclusion, the current study provides evidence for specific contextual factors that exacerbate and mitigate a well-established marker of personality risk: sensation seeking. We found that sensation seeking, deviant peer groups and parental monitoring interact to predict adolescent delinquency: Sensation seeking is most strongly related to delinquency in the context of more deviant peers and lower parental monitoring. These results highlight the importance of considering theoretically grounded, synergistic intersections among intrapersonal and contextual factors when elucidating the pathways that lead to adolescent delinquency.

Acknowledgements

We would like to thank Daniel Briley, Marie Carlson, Amanda Cheung & Laura Engelhart for thoughtful comments on previous drafts of this article. This work was supported by NIH grant R21-AA020588. The Population Research Center at the University of Texas at Austin is supported by National Institutes of Health (NIH) center grant R24-HD042849. Grant sponsors did not assist in the development of the study design, collection of data, analysis and interpretation of data, the writing of the manuscript or the decision to submit the manuscript for publication.

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