

# Longitudinal Increases in Parent–Child Relationship Quality and Sensation Seeking Interact to Increase Risk-Taking During the College Transition

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João F. Guassi Moreira<sup>1</sup> and Eva H. Telzer<sup>2</sup>

## Abstract

We tested two competing predictions of whether changes in parent–child relationship quality buffer or exacerbate the association between sensation-seeking and risk-taking behaviors as individuals gain more independence during the high school–college transition. In the current longitudinal study, 287 participants completed self-report measures of sensation seeking, risk-taking, and parent–child relationship quality with their parents prior to starting college and again during their first semester. Overall, students displayed increases in risky behaviors, which were predicted by sensation seeking. Changes in relationship quality moderated the association between sensation seeking and risk-taking, such that sensation seeking predicted higher risk-taking behaviors during the first semester of college, but only for those who reported increases in relationship quality across the college transition. These results suggest that increased relationship quality may have an inadvertent spillover effect by interacting with sensation seeking to increase risky behaviors.

## Keywords

sensation seeking, risk-taking, family relationships, college transition, emerging adulthood

In the United States, the transition from high school to college often marks the beginning of independence from parents when youth have greater freedom and autonomy. This culturally significant transition coincides with a period in which individuals from around the world show the highest rates of sensation seeking across the life span (Steinberg et al., 2017). Indeed, a recent review compellingly found that individuals at this time period take greater risks than children, adolescents, and older adults, with sensation seeking peaking around the age of 19 years (Shulman et al., 2016). The combination of elevated sensation seeking and increased freedom that is associated with this transition period may generate both adaptive and detrimental outcomes. On the one hand, increased sensation seeking facilitates behaviors that are inherently risky, but adaptive, such as venturing out and establishing novel social networks and relationships (Spear 2000, 2011). On the other hand, increased access to risky situations, in conjunction with heightened sensation seeking, may lead to engagement of unhealthy risk behaviors including the use of alcohol and marijuana and greater rates of sexual activity with multiple partners (Fromme, Corbin, & Kruse, 2008).

Defined as an individual's dispositional tendency to seek out experiences that are novel, intense, and stimulating (Zuckerman, 1979), sensation seeking is the subject of a rich history of psychological investigation. In particular, biopsychological studies of sensation seeking have revealed that high sensation

seekers have increased neural and endocrine responses to novel situations that are complex and prospectively rewarding and are inclined to approach them (Joseph, Liu, Jiang, Lynam, & Kelly, 2009; Piazza, Deroche, Deminiere, Le Moal, & Simon, 1993). In the context of transitioning to college, individuals have access to numerous types of novel situations that are increasingly stimulating, complex, and physiologically arousing. In light of this, individuals who are experiencing developmentally heightened sensation seeking, and especially those who were already dispositionally high sensation seekers, are likely to be drawn to risky situations. A recent review provides evidence for this, suggesting that 19-year-olds engage in the highest rates of risk-taking behaviors across the life span (Shulman et al., 2016).

Crucially, the quality of parent–child relationships may affect the link between sensation seeking and subsequent peaks

<sup>1</sup>Department of Psychology, University of California, Los Angeles, CA, USA

<sup>2</sup>Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

## Corresponding Author:

Eva H. Telzer, PhD, Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, 235 E. Cameron Ave., Chapel Hill, NC 27599, USA.

Email: ehtelzer@unc.edu

in risk-taking behaviors that accompany the transition from high school to college. Evidence suggests that parental influence can modulate the neurobiological bases of sensation seeking so as to render risky scenarios less arousing and appealing, thereby limiting one's sensation-seeking predispositions toward risky behavior (Telzer, Ichien, & Qu, 2015). On the other hand, strong parent-child relationships promote increased independence, and individuals with better parent-child relationship quality tend to display greater autonomy and engage in more adult-like behavior (Mattanah, Lopez, & Govern, 2011). This would suggest that strong parent-child bonds would actually interact with sensation seeking to promote autonomy and influence individuals to approach new, potentially risky contexts.

Therefore, there are two possible ways in which the quality of parent-child relationships may influence the association between sensation-seeking and risk-taking behaviors across the college transition. First, improvements in parent-child relationship quality may attenuate the link between sensation seeking and risk-taking. Because parent-child relationships have been shown to exert protective effects over risk-taking in adolescence (e.g., Telzer et al., 2015; Skeer, McCormick, Normand, Buka, & Gilman, 2009), it is possible that increases in relationship quality during the college transition may reduce the likelihood of risk-taking among emerging adults, perhaps by virtue of bolstering cognitive control over risky impulses (McCormick, Qu, & Telzer, 2016) or altering how individuals perceive and intrinsically value possible decisions for a given situation (Guassi Moreira & Telzer, 2018).

Alternatively, improvements in family relationships may actually enhance the association between sensation-seeking and risk-taking behaviors. Notably, individuals with strong family relationships go on to have better adjustment in a variety of domains during college and adulthood (Mattanah et al., 2011), suggesting that positive family relationships promote healthy separation and engagement in adult-like behaviors. Yet, counterintuitively, this may mean that emerging adults first attending college are also engaging in adult-like behaviors that could be unhealthy. In this scenario, improvements in parent-child relationship quality may enhance the extent to which individuals establish themselves as autonomous and independent (O'Connor, Allen, Bell, & Hauser, 1996), while indirectly leading to greater engagement in negative adult-like behaviors, such as drinking and reckless sexual exploration. Because individuals perceive that they have earned greater trust and independence from their parents, they may feel as if they have the ability to experiment in more adult-like behaviors (e.g., drinking, reckless casual sex).

Importantly, family relationships are not static during this time—previous research findings characterize family relationships as being fluid and evolving during the late teenage years and into emerging adulthood, especially during the college transition (Tsai, Telzer, & Fuligni, 2013). Thus, it is important to consider how changes in the quality of parent-child relationships across the high school-college transition influence how individuals with elevated sensation seeking interact with environments that endow them with greater freedom and autonomy.

In the current study, we set out to test two competing predictions of whether changes in parent-child relationship quality buffer or exacerbate the association between sensation-seeking and risk-taking behaviors as individuals gain more independence during the high school-college transition. We addressed these competing hypotheses in the current longitudinal study by examining how changes in the dynamics of family relationships interact with sensation-seeking tendencies to buffer or exacerbate risk-taking outcomes during the first semester of college.

## Method

### Participants

Participants included 287 ( $M_{\text{age}} = 18.61$  years,  $SD = .37$ ; 65.5% female) first-year college students from a large, public university in the Midwestern United States participating in a longitudinal study across two waves. To be eligible, all participants had to be living in a dormitory and not with their parents. Wave 1 (W1) took place 2 weeks prior to the start of the academic year when students were still living at home, and Wave 2 (W2) occurred approximately 2 months after the beginning of the academic year. Participants were ethnically diverse (43% White, 4% Black, 23% Asian, 8% Latino, 6% other, and 15% mixed race). All methods were approved by the university's institutional review board. Data are publicly available on the Open Science Framework (<https://osf.io/28ts9>).

### Procedure

Incoming first-year college students were contacted via their university e-mails prior to arriving on campus and again during the fall semester with an invitation to participate in a research study run through the psychology department. Only students who would be living in university housing were invited to participate. Those who agreed to participate were provided with a unique link to the survey. Participants who completed the study in full were mailed product vouchers to a local business and were entered into a drawing to win US\$100. Seven hundred and sixty-four individuals participated in the first wave and 515 participated in the second wave. Analyses reported in the current study include those with full data (i.e., data for all variables) at both waves.

### Measures

**Sensation seeking.** Sensation seeking was assessed at W1 by utilizing the Brief Sensation Seeking Scale (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). Participants used a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*) to answer 8 items about their dispositional levels of sensation seeking. Example items include "I would like to try bungee jumping" and "I like to do frightening things." Responses to the measure were averaged into a single score ( $\alpha = .80$ ).

**Risk-taking.** Risk-taking behaviors were measured at W1 and W2 using a modified version of the Adolescent Risk-Taking

**Table 1.** Means, Standard Deviations, and Bivariate Correlations of All Study Variables.

Variables	M (SD)	1	2	3	4	5	6
1. W1 sensation seeking	3.25 (.74)	1					
2. W1 risk-taking	1.44 (.36)	.43***	1				
3. W2 risk-taking	1.55 (.47)	.44***	.65***	1			
4. W1 parent-child relationship quality	3.49 (.76)	-.17**	-.34***	-.23***	1		
5. W2 parent-child relationship quality	3.67 (.77)	-.12*	-.25***	-.24***	.79***	1	
6. Δ parent-child relationship quality	0.19 (.50)	.07	.13*	-.03	-.30***	.35***	1

Note. Δ represents a difference score. W1 = Wave 1; W2 = Wave 2; M = mean; SD = standard deviation.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Scale (Alexander et al., 1990; Telzer, Fuligni, Lieberman, & Galvan, 2013). Participants indicated the frequency (1 = *never* to 4 = *many times*) of which they have engaged in several risk-taking behaviors (e.g., “I have raced a car or motorcycle” or “I have cheated on an exam or homework”). Employing the measure at both time points allowed us to control for prior risk-taking behavior in our analyses. Participants’ responses to the 12 items were computed into a single, mean score for each wave (W1:  $\alpha = .80$ , W2:  $\alpha = .81$ ).

**Parent-child relationship quality.** Participants completed the Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987) at both waves in order to measure parent-child relationship quality. Participants answered 20 items along a 5-point Likert-type scale (1 = *almost never or never* to 5 = *almost always or always*) about mutual trust and the quality of communication between adolescents and their parents. Sample items include “My parents trust my judgment” and “My parents accept me as I am.” The measure has been previously used to measure relationship quality between parents and their offspring, focusing particularly on adolescents’ perceptions of parental support (e.g., Qu, Fuligni, Gálvan, & Telzer, 2015). A mean score was computed for each wave (W1:  $\alpha = .94$ , W2:  $\alpha = .93$ ). In order to examine how changes in relationship quality moderate the link between sensation seeking and risk-taking, a difference score was created by subtracting parent-child relationship quality at W1 from W2.

## Results

### Attrition and Missing Data

In total, 1,148 and 727 individuals at Waves 1 and 2, respectively, began the survey. However, only 764 and 515 individuals at W1 and W2, respectively, provided substantial data (i.e., provided responses to the majority of the survey). Two hundred and eighty-seven participants provided complete data at both time points. We tested whether participants with only W1 data differed from those who provided two time points of data. Participants with one wave and two waves of data did not differ on levels of self-reported sensation seeking,  $t(860) = -0.69$ , n.s., Cohen’s  $d = .05$ , risk-taking at both waves, W1:  $t(729) = 1.46$ , n.s., Cohen’s  $d = .12$  and W2:  $t(314) = 0.98$ , n.s., Cohen’s  $d = .18$ , and W1 parent-child relationship quality,  $t(946) = 0.20$ ,

n.s., Cohen’s  $d = .01$ . Males were more likely than females to drop out of the study.

As a follow-up, we ran Little’s test to determine whether data were missing completely at random. Results revealed that our data were indeed missing completely at random,  $\chi^2 = 48.94$ ,  $df = 53$ ,  $p = .633$ , indicating that including only participants with complete data would not bias our results.

### Analysis Plan

First, we conducted regression analyses to examine whether sensation seeking at W1 predicts risk-taking at W2. Next, we conducted a standard moderation analysis specified by Aiken, West, and Reno (1991) to test whether changes in parent-child relationship quality moderate the association between sensation seeking and risk-taking. All analyses included W1 risk-taking as a covariate in order to control for prior risk-taking behavior. Given sex differences in adolescent risk-taking (Mahalik et al., 2013) and changes in parent-child relationship quality (Tsai et al., 2013), we initially controlled for gender in all analyses. We additionally controlled for socioeconomic status (derived from participant reports of parental education) and ethnicity. However, we found no differences between analyses which included gender (dummy coded 1 = *female*, 0 = *male*), socioeconomic status (coded continuously along a 1–10 Likert-type scale), and ethnicity (dummy coded 1 = *non-White*, 0 = *White*) as covariates and those which did not. In keeping with recent suggestions to report simpler models (Levesque, 2015), all statistics and analyses reported here exclude these covariates.

### Descriptive Statistics

Means, standard deviations, and bivariate correlations for all study variables are listed in Table 1. Parent-child relationship quality increased during the college transition,  $t(286) = -6.45$ ,  $p < .001$ , Cohen’s  $d = .38$ , as did risk-taking,  $t(286) = -5.17$ ,  $p < .001$ , Cohen’s  $d = .31$ . To test for potential gender differences, we conducted independent samples  $t$  tests on all study variables. Males and females did not differ in their self-reported levels of risk-taking,  $t_s(285) = 0.80$ ,  $-.11$  n.s., Cohen’s  $d_{W1} = .10$ , Cohen’s  $d_{W2} = .01$ , or parent-child relationship quality,  $t_s(285) = -1.30$ ,  $-1.17$  n.s., Cohen’s  $d_{W1} = .16$ , Cohen’s  $d_{W2} = .15$ , at both W1 or W2. Males and females also did not differ in their self-reported levels of sensation

seeking at W1,  $t(285) = 1.49$ , n.s., Cohen's  $d = .19$ . Sensation seeking at W1 was positively correlated with risk-taking at W1 and W2 and negatively correlated with parent-child relationship quality at W1 and W2. Relationship quality at W1 and W2 was negatively correlated with risk-taking at both waves.

### Sensation Seeking Predicts Risk-Taking

To examine whether sensation seeking prior to attending college is associated with risk-taking behaviors, we conducted a multiple regression analysis in which W2 risk-taking was specified as the outcome variable while W1 risk-taking and W1 sensation seeking were entered as predictor variables. Results show that sensation seeking is associated with risk-taking behavior,  $b = .13$ ,  $SE = .03$ ,  $\beta = .20$ ,  $p < .001$ , even when controlling for prior risk-taking, which was significantly associated with W2 risk-taking,  $b = .73$ ,  $SE = .06$ ,  $\beta = .56$ ,  $p < .001$ , adjusted  $R^2 = .453$ .

### Parent-Child Relationship Quality Moderates the Link Between Sensation Seeking and Risk-Taking

In order to explore whether the link between sensation seeking and risk-taking is conditional upon changes to parent-child relationship quality across the college transition, we conducted moderation analyses as specified by Aiken and colleagues (1991). First, we standardized scores of sensation seeking and changes in parent-child relationship quality and multiplied them together to obtain our interaction term (Sensation Seeking  $\times$   $\Delta$  Relationship Quality). Next, we entered the interaction term, the standardized variables, and W1 risk-taking into a multiple regression model predicting W2 risk-taking. The interaction term was significant, revealing that changes in parent-child relationship quality moderate the relationship between sensation seeking and risk-taking across the college transition,  $b = .06$ ,  $SE = .02$ ,  $\beta = .13$ ,  $p = .003$ , adjusted  $R^2 = .479$ . To verify that our moderation results were not driven by W1 relationship quality, we conducted a follow-up analysis in which we ran the same model as previously described and also included a standardized score for W1 parent relationship quality and a Sensation Seeking  $\times$  W1 Relationship Quality interaction term. This analysis yielded insignificant results for the new interaction term, while the original remained significant (Table 2), indicating that change in parent relationship quality moderates the association between sensation seeking and risk-taking above and beyond the effect of baseline levels of family relationship quality.<sup>1</sup>

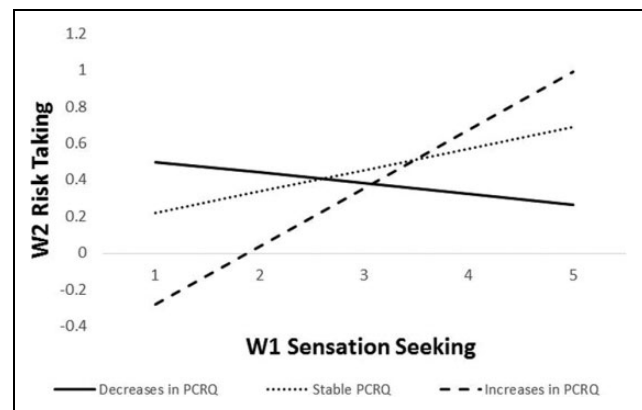
Next, we probed the interaction in accordance with methods specified by Aiken and colleagues (1991). We divided the sample based on those who scored at least 1 standard deviation above or below the mean on changes in relationship quality. As shown in Figure 1, those who showed the greatest increases (+1  $SD$ ,  $n = 40$ ) in relationship quality evidenced a significant, positive relationship between W1 sensation seeking and W2 risk-taking ( $b = .32$ ,  $SE = .11$ ,  $\beta = .37$ ,  $p = .008$ , adjusted  $R^2 = .390$ ). However, for those who showed the greatest decreases in relationship quality ( $-1$   $SD$ ,  $n = 35$ ), the

**Table 2.** Changes in Parent-Child Relationship Quality Moderate the Relationship Between W1 Sensation Seeking and W2 Risk-Taking.

Variables	$b$ (SE)	$\beta$
W1 risk-taking	.73 (.06)	.56***
W1 sensation seeking	.10 (.02)	.20***
W1 parent-child relationship quality	-.02 (.02)	-.05
$\Delta$ parent-child relationship quality	-.07 (.02)	-.14**
$\Delta$ parent-child relationship quality $\times$ W1 sensation seeking	.07 (.02)	.14***
W1 parent-child relationship quality $\times$ W1 sensation seeking	.01 (.02)	.02

Note.  $\Delta$  Represents a difference score.  $\Delta$  Parent-child relationship quality, W1 parent-child relationship quality, and W1 sensation seeking reflect centered scores. Adjusted  $R^2 = .477$ . W1 = Wave 1; W2 = Wave 2; SE = standard error.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



**Figure 1.** Sensation seeking at Wave 1 (W1) predicts risk-taking at Wave 2, but only for those who showed the highest increases in parent-child relationship quality. Slopes reflect regressions that controlled for W1 risk-taking. PCRQ = parent-child relationship quality.

relationship between W1 sensation seeking and W2 risk-taking was insignificant ( $b = -.06$ ,  $SE = .14$ ,  $\beta = -.07$ ,  $p > .250$ , adjusted  $R^2 = .164$ ; Figure 1).

## Discussion

We set out to test two competing predictions of whether changes in parent relationship quality buffer or exacerbate the association between sensation-seeking and risk-taking behaviors, as individuals gain more independence during the high school-college transition. Our results show that increases in relationship quality do not attenuate the link between sensation-seeking and risk-taking behaviors. Rather, individuals who reported increasing relationship quality evidenced a stronger association between sensation seeking and the propensity to take risks during their first semester of college. Our results therefore support hypothesis that increases in parent-child relationship quality may actually exacerbate the association between sensation-seeking and risk-taking behaviors

across the college transition. While seemingly counterintuitive, these results hint at the possibility that improvements to family relationship quality among individuals during the college transition may promote active exploration of one's environment. Unfortunately, the consequences of this may be negative, resulting in risky behaviors.

Notably, our effects were driven by changes in relationship quality and not simply by baseline levels of such, underscoring how fluctuations in the distal social context can have profound effects on behavior. This may have several potential explanations. For instance, a great portion of adolescent–parent conflict is centered on differing opinions of autonomy and independence (Steinberg & Morris, 2001). As individuals leave the home to attend college, some parents may view this as a time to relinquish some degree of control over their offspring's behaviors. Doing so may lead individuals with higher levels of sensation seeking to engage in more adult-like behaviors in addition to improving perceptions of relationship quality. Subsequently, such individuals who report higher levels of sensation seeking may be primed to take advantage of the full scope of their newfound freedoms across both positive and negative domains. That is, heightened perceptions of autonomy and independence may leave high sensation seekers with more confidence to explore their new environment, which includes scenarios that are risky.

Our results merit consideration from those aiming to develop interventions centered on using family relationships to reduce adolescent risk-taking. Individuals are experiencing peak levels of sensation seeking at this age (Steinberg et al., 2017), which is strongly linked to risky behaviors. The types of family relationships that are often encouraged—those which promote autonomy in adolescence—and have been shown to be related to reduced risk-taking (e.g., Gerard, Krishnakumar, & Buehler, 2006; Skeer et al., 2009), may actually have unintended consequences by their interaction with heightened sensation seeking. Thus, interventions that are focused on achieving reductions in risky behaviors by improving family relationships may be subject to iatrogenic effects if the interventions do not also target reductions in sensation seeking.

Future research is needed to determine whether our effects generalize to teens who elect not to attend college. Thus, follow-up studies should compare college-bound individuals and those who seek to gain employment upon graduating high school or those who attend 2-year colleges and do not move away from home. This is especially important since attending a 4-year university is sometimes considered a cultural milestone (Fromme et al., 2008), and unique characteristics of this period (e.g., establishing completely novel social networks, moving away from one's parents, etc.) may affect the associations between sensation seeking, parent relationship quality, and risk-taking. Along the same lines, it is intriguing whether we would have observed the same effects with individuals who were reared by nonparental guardians. Follow-up work may seek to investigate whether the effects reported here are consistent with other caretakers, such as grandparents (e.g., Kennison & Ponce-Garcia, 2012). An additional point for consideration is that we did not measure parental perceptions of relationship quality with their children. It remains

to be seen whether “objective” or parental measures of relationship quality also produce the same effect. Nonetheless, youths' own perceptions of parental relationship quality are more predictive of their adjustment than parental reports (Human, Dirks, DeLongis, & Chen, 2016), suggesting that youths' self-reports have predictive validity. Furthermore, although a strength of the current study was its longitudinal design, future work should consider the use of at least three time points that allow for the ability to run more powerful statistical analyses, such as latent growth curve modeling, in order to tease out a more thorough developmental trajectory. This may also allow us to better understand the generalizability of our results by revealing whether the same effect is found in late-college, emerging adults. Similar to the prior consideration, future studies should expand the amount of time between data collection. Although our data reflect meaningful changes in our variables of interest and highlight this is indeed an important transition period, the time between waves was relatively short. Follow-up studies should allow for greater time between waves of data collection to determine whether these processes are sustained over longer periods of time.

In sum, our study demonstrates that emerging adults experiencing a peak in sensation seeking are more prone to increases in their behavioral risk-taking when accompanied by improvements to relationship quality with their parents. Although high levels of parent relationship quality can promote healthy separation and the emergence of more adult-like behaviors, such behaviors may not always be beneficial to adolescents' health. The current study contributes to the literature on parental scaffolding of development and potentially serves as a cautionary tale for avoiding iatrogenic effects from family-centered interventions.

### Author Contributions

João F. Guassi Moreira contributed to conception, design, analysis, and interpretation; drafted the manuscript; critically revised the manuscript; gave final approval; and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Eva H. Telzer contributed to conception, design, analysis, and interpretation; drafted the manuscript; critically revised the manuscript; gave final approval; and agrees to be accountable for all aspects of work ensuring integrity and accuracy.

### Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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### Note

1. It is possible that absolute changes in parent–child relationship quality—regardless of direction—may have been driving our effect. To rule this out, we ran all relevant analyses with difference scores as absolute values, yielding null effects for the absolute change variables. All data are provided on the Open Science Framework.

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## Author Biographies

**João F. Guassi Moreira** received his bachelor's in psychology from the University of Illinois at Urbana-Champaign and is now a graduate student at the University of California, Los Angeles. He is interested in studying how a variety of social contexts influence well-being across youth and adolescence.

**Eva H. Telzer** received her PhD from the University of California, Los Angeles and is currently an assistant professor at the University of North Carolina, Chapel Hill. Her research program is focused on understanding social, cognitive, and emotional development from childhood to adulthood.