



# Age as a Curvilinear Moderator for Parental Solicitation and Adolescent Risk Behavior

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## Abstract

Parents have adopted a variety of strategies for monitoring their adolescent children; yet, some strategies are more strongly associated with risk-taking during adolescence. The present study examined how age moderates the association between parental monitoring and adolescent risk-taking. Participants ( $N = 117$ ,  $M_{\text{age}} = 15.21$  years) were predominantly female (64.1%), and the largest racial/ethnic group in the sample was Asian (57.3%). Participants' reports of risk behavior were regressed on participants' reports of parental monitoring, and age was explored quadratically as a curvilinear moderator. Among more frequently monitored adolescents, risk-taking was lower in mid-adolescence and higher in later adolescence; among less frequently monitored adolescents, risk-taking was higher in early and mid-adolescence and lower in later adolescence ( $R^2 = 0.26$ ,  $p < 0.01$ ). Parents should consider age-related developmental changes in adolescence (e.g., increased need for autonomy) and modify their monitoring efforts to match youths' developmental needs.

**Keywords** Parental monitoring effort · Parental solicitation · Parental supervisory effort · Adolescent risk behavior · Youth risk-taking

## Highlights

- Among participants who were more frequently monitored by their parents, greater parental monitoring efforts were associated with lower rates of risk-taking in mid-adolescence and higher rates of risk-taking in later adolescence.
- Among participants who were less frequently monitored by their parents, greater parental monitoring efforts were associated with higher rates of risk-taking in early and mid-adolescence and lower rates of risk-taking in later adolescence.
- It may be beneficial for parents to consider youths' developmental needs (e.g., increased need for autonomy) when building a monitoring strategy to address youths' risky behaviors.

There has been a long-standing debate over the role of parental monitoring in mitigating adolescents' engagement in risky behaviors. While some researchers suggest parents' (i.e., biological parents' and legal guardians') increased supervisory efforts are associated with adolescents' decreased engagement in risky behaviors (Romo et al., 2017; Stanton et al., 2000; Sampson & Laub, 1994), others suggest increased supervisory efforts are related to

adolescents' *increased* engagement in risk-taking (Wang et al., 2015). Stattin and Kerr (2000) attempted to solve this debate by examining the methodology of parental monitoring studies, consequently revealing that early findings on parental monitoring and deviancy in adolescence measured parents' monitoring knowledge (i.e., the parent's passive awareness of the child's whereabouts and activities)—not parents' monitoring efforts (i.e., the parent's active monitoring behaviors). Stattin and Kerr (2000) additionally found youth disclosure to be a particularly strong predictor of adolescents' risky behaviors. Findings from studies that failed to distinguish between parents' monitoring knowledge and parents' monitoring efforts may have inadvertently captured a combination of parents' passive attainment of information and their active surveillance

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efforts in predicting adolescent risk-taking. Nevertheless, even among studies that distinguish between parental monitoring knowledge and parental monitoring effort, findings appear inconsistent (Janssen et al., 2016; Kapetanovic et al., 2018). Research on parental monitoring effort and adolescent risk behavior may benefit from accounting for age-related changes throughout adolescence (e.g., an increase in risk-taking behavior, an increased need for autonomy; Steinberg et al., 2008; Eccles et al., 1993), as such changes might disparately impact younger and older teens' behaviors and perceptions of their parents' monitoring efforts. The present study, therefore, sought to examine how the association between parental monitoring effort and adolescent risk-taking behavior might operate differently on the basis of age.

## Parental Monitoring

Parental monitoring refers to a set of parenting behaviors related to the surveillance of children and the enforcement of rules. However, studies assessing this construct have traditionally utilized measures that tap into parents' knowledge of children's whereabouts, friends, and activities (Stattin & Kerr, 2000) rather than parents' active monitoring behaviors. Despite such traditional assessments, parents' active efforts to solicit information from their children (beyond parents' mere passive knowledge) may also be an important component to effective parental monitoring.

## Knowledge versus Effort

Stattin and Kerr (2000) argue parental monitoring consists of three categories: parental solicitation (i.e., the parent's efforts in obtaining information), parental control (i.e., the parent's enforcement of rules), and youth disclosure (i.e., the youth's volunteering of information). Though parental solicitation and parental control involve parent-driven monitoring behaviors, youth disclosure is driven by the youth's decision to provide their parents with information about their whereabouts and activities. Therefore, the conceptualization of parental monitoring as the parent's active tracking of the child (Laird et al., 2010) suggests that parental monitoring effort primarily encompasses the two parent-driven categories of parental solicitation and parental control, whereas parental monitoring knowledge is primarily comprised of youth disclosure, facilitated through either voluntary means or parents' attempts to solicit information (Keijsers et al., 2010).

Of the studies which have distinguished between parents' monitoring knowledge and parents' monitoring effort, researchers have primarily focused on how parents' knowledge predicts risky behaviors among adolescents

(Dittus et al., 2015). In one cross-sectional study, for example, Stattin and Kerr (2000) found that greater youth disclosure is associated with less risk-taking behavior, and more recent cross-sectional findings suggest parents who know more about their teens' whereabouts and activities have teens who engage in less sexual risk-taking (DiClemente et al., 2001; Dittus et al., 2015) and less delinquency and substance use (Kapetanovic et al., 2018). Existing longitudinal studies further confirm these associations, with findings suggesting that adolescents whose parents know about their whereabouts and activities engage in less delinquency and less substance use at subsequent points in time (Laird et al., 2003; Lippold et al., 2014). Therefore, youth disclosure seems to have protective qualities in terms of preventing unwanted or potentially risky behaviors.

Yet, there also appear to be reciprocal longitudinal effects between youth disclosure and problem behavior—the more teens engage in risky behaviors (e.g., delinquency), the less they subsequently disclose (Keijsers et al., 2010). Intuitively, such an association makes sense—teens who engage in risky behaviors may choose to field the information they provide to their parents about their whereabouts and activities in an attempt to avoid negative consequences. Indeed, qualitative findings from Marshall et al. (2005) revealed that, before telling their parents about any misbehavior, adolescents consider how their parents may respond to or use the disclosed information. The desire to avoid negative repercussions of engagement in risky behaviors may therefore impact an adolescent's willingness to voluntarily disclose such information. Notably, youth–parent relationship quality may play a role in adolescents' willingness to disclose and their engagement in risky behaviors. Indeed, adolescents who report greater parental warmth also report a greater willingness to disclose their whereabouts and activities (Klevens & Hall, 2014), and adolescents who report that their parents know more about their whereabouts and activities also report positive outcomes such as more motivation and engagement at school (Lowe & Dotterer, (2013)). Omitting research on parents' efforts to solicit information from teens, therefore, fails to address the circumstances under which parent-driven behaviors may be additionally protective against youths' risk-taking, beyond youths' voluntary disclosure alone.

## Monitoring Effort and Risk Behavior

Studies that have examined the association between parental solicitation and adolescent problem behaviors show conflicting results, with some linking parental solicitation to increased problems, and others linking it to fewer problems. For example, on one hand, Kerr et al., (2010) found parental solicitation to be predictive of adolescent delinquency across time. Likewise, Otto & Atkinson, (1997) found that

parents' efforts to monitor their children's schoolwork were associated with poorer academic outcomes. On the other hand, some researchers have found that increased parental solicitation is both cross-sectionally and longitudinally related to a decrease in antisocial behavior, academic failure, and substance use among adolescents (Barrera et al., 2001; Laird et al., 2010), and other researchers have reported that parents' solicitation efforts are not correlated with youths' delinquency at all (Keijsers et al., 2010). Such conflicting findings point to a need to further examine how—and in what contexts—parental solicitation might relate to teens' engagement in risk-taking behaviors.

## Age-Related Changes in Adolescence

Conflicting findings surrounding parental solicitation suggest other elements related to risky behavior may be at play. Given that adolescence is a time of significant development in areas of sensation seeking and impulsivity (Steinberg et al., 2008) and a time of re-negotiation of control and autonomy within the adolescent–parent relationship (Smetana & Asquith, 1994), the association between parental solicitation and adolescent risk-taking may well be exacerbated or attenuated by normative developmental changes. Therefore, it is important to examine age as an additional factor affecting the association between parents' efforts to solicit information from their teen children and teens' engagement in risky behaviors.

### Sensation Seeking, Impulsivity, and Risk-Taking Behavior

Changes in sensation seeking and impulsivity throughout adolescence work in tandem to influence adolescents' engagement in risky behaviors (Steinberg et al., 2008). Sensation seeking—that is, the need for novel and stimulating experiences—is particularly pronounced in mid-adolescence (Steinberg et al., 2017), and increased sensation seeking has been linked to a variety of reckless behaviors, including risky sexual behavior, risky driving, drug and alcohol use, and property destruction (Arnett, 1996; Harden et al., 2012). Further, the association between sensation seeking and delinquency may be exacerbated by contextual factors. For example, Mann et al. (2015) found that adolescents high in sensation seeking who have delinquent peers and whose parents make less of an effort to monitor also exhibit increased engagement in delinquent behaviors (e.g., getting suspended from school, selling marijuana, carrying a hidden weapon).

The curvilinear trajectory of sensation seeking (i.e., a peak in mid-adolescence and a decline thereafter) is contrasted by a sharp linear decrease in impulsivity from 10 years of age and on (Steinberg et al., 2008). Among

adolescents, greater impulsivity is correlated with greater verbal and physical aggression (Piko & Pinczés, 2014), and slower declines in impulsivity are associated with greater alcohol and drug use across time (Quinn & Harden, 2013). Though under normative adolescent development impulsivity decreases linearly with age, risk-taking in adolescence does not follow the same pattern given that the decrease in impulsivity co-occurs with the curvilinear change in sensation seeking; instead, susceptibility to risk-taking behavior in mid-adolescence can be interpreted as a function of increased sensation-seeking and immature decision-making during this time (Steinberg et al., 2008). The vulnerability to risk-taking in adolescence may consequently be a result of the alignment between increased sensation seeking and low impulse control, which uniquely occurs in mid-adolescence.

### Autonomy and Stage-Environment Fit

Youths' need for autonomy also increases throughout adolescence—as teens progress through this developmental period, they become less accepting of parents' directives on personal matters, and they begin to think for themselves and independently regulate the activities in which they take part (Smetana & Asquith, 1994). At the same time, parents begin to give youth more leeway in making their own choices and maintaining their privacy, thereby leading to parents' decreased knowledge of adolescents' whereabouts and activities (see McElhaney et al., 2009). This developmental milestone suggests the impacts of parental solicitation might be particularly salient for older adolescents who are becoming more autonomous—perhaps even more so than the impacts of voluntary youth disclosure.

According to the stage-environment fit theory (Eccles et al., 1993), the stifling of this normative increase in autonomy may have detrimental consequences. Specifically, stage-environment fit theory posits that a mismatch between the needs of the developing adolescent and the characteristics of the adolescent's social environment will result in negative outcomes related to the adolescent's behavior, motivation, and psychological well-being (Eccles et al., 1993). As increased autonomy is an important element of normative adolescent development, teens who find themselves in environments that are not conducive to this need (e.g., teens whose parents fail to provide opportunities for autonomous decision making) may experience poorer outcomes than teens whose environments fit more appropriately with the stages of their development (Costa et al., 2016; Inguglia et al., 2015). Indeed, adolescents with more autonomy-supportive parents exhibit fewer internalizing (e.g., anxiety symptoms) and externalizing (e.g., stealing, getting into fights) behaviors (Vroljik et al., 2020). Given that older adolescents should have a greater expectation

of autonomy than their younger counterparts, the association between parents' autonomy-stifling behaviors (such as increased parental solicitation) and adolescents' engagement in risk-taking may be exacerbated among older teens.

## Hypotheses

The present study sought to examine how the association between parental solicitation and adolescent risk behavior might operate differently depending on age. In concordance with developmental literature, we hypothesized that more frequent parental solicitation would be associated with less risk-taking in mid-adolescence, followed by exponentially higher rates of risk-taking in late adolescence; conversely, we predicted that less frequent parental solicitation would be associated with higher rates of risk-taking in mid-adolescence, followed by exponentially lower risk-taking in late adolescence.

## Method

### Procedures

The present study is ancillary to a larger experimental study which examined the social influence of mothers and peers on adolescents' risk-taking behaviors (for further discussion on the experimental design, random assignment to conditions, and primary hypotheses of the larger study, see published dissertation by (Thomas, 2017). The larger study included reports from target adolescents (i.e., youths recruited for their participation in the study), each target adolescent's maternal figure (i.e., the adolescent's mother or maternal guardian), and each target adolescent's close friend. Participants were recruited from southern California via flyer distribution at community locations (e.g., coffee shops or movie theaters) and snowball sampling. Assent was collected from all youths under the age of 18 who participated in the study, parent permission was collected from parents/guardians of all youths under the age of 18 who participated in the study, and informed consent was collected from all mothers/maternal figures who participated in the study. Only the target adolescent sample was used for the purposes of the present study. Participants independently completed a brief—approximately 30-minute—online self-report questionnaire in a lab session with a trained Research Assistant (RA). All participants received a \$15 gift card for their participation at the conclusion of the study. All study procedures were approved by the Institutional Review Board at the home institution.

**Table 1** Participant demographics

Demographic Variable	<i>n</i>	%
Gender		
Female	75	64.1
Male	42	35.9
Race/ethnicity		
American Indian or Alaska Native	3	2.6
Asian	67	57.3
Black or African American	2	1.7
Hispanic or Latino/a/x	17	14.5
Native Hawaiian or Other Pacific Islander	5	4.3
White	48	41.0
Other	4	3.4

## Participants

Adolescents needed to meet the following criteria to be eligible for participation: (a) be between the ages of 13–17 years old, (b) be fluent in English, (c) have a close friend of the same gender and grade level willing to participate, and (d) have a mother or female guardian willing to participate. The final sample consisted of 117 adolescents ( $M_{\text{age}} = 15.21$ ,  $SD = 1.52$ ,  $\text{range} = 13, 17$ ). Descriptive statistics for gender and race/ethnicity are reported in Table 1. The sample was primarily female (64.1%), and the largest racial/ethnic group was Asian (57.3%). For a full breakdown of the racial/ethnic makeup of the sample, see Table 1; participants could self-identify as multi- or bi-racial; therefore, reported percentages will equal greater than 100%.

## Measures

### Age

At the start of the questionnaire, the RA conducting the lab session entered the current date, and adolescents self-reported their birthdate. Both dates were reported in mm/dd/yyyy format. Participant age at the time of the study was measured continuously by subtracting adolescents' birthdates from the date they completed the study and was reported in years (e.g., 14 years old).

### Adolescent risk-taking

Adolescent risk-taking was self-reported using the Risky Behavior Protocol (adapted from Conger & Elder, 1994). This measure asked adolescents to report how often over the past year they had engaged in a variety of 51 different risk-taking behaviors (e.g., driven a car without a seatbelt, fired a gun, etc.). The frequency of engagement was measured as *never* (1), *once or twice* (2), or *more than twice* (3), and

**Table 2** Descriptive statistics and bivariate correlations of main variables

Measure	Descriptive Statistics			Bivariate Correlations			
	Mean	SD	Range	1	2	3	4
1. Adolescent risk behavior	4.47	4.40	00.0–25.0	–	–	–	–
2. Parental knowledge	2.99	0.67	01.2–04.0	–0.30***	–	–	–
3. Parental solicitation	2.88	0.63	01.4–04.0	–0.18***	–0.31*	–	–
4. Age	15.21	1.52	13.0–17.0	–0.21***	–0.41*	0.09	–

\* $p \leq 0.05$ ; \*\*\* $p \leq 0.001$ 

dichotomized for analysis as *never* (0) or *at least once* (1) to indicate whether the youth had engaged in the behavior at all over the past year. Responses were summed to indicate how many risk-taking behaviors the youth had engaged in over the past year, with higher scores indicating greater risk-taking. This measure has demonstrated strong internal consistency and validity (Dallaire et al., 2015; Rudasill et al., 2010), and reliability was between the recommended alpha values of 0.70 and 0.90 (Cronbach's  $\alpha = 0.858$ ; Tavakol & Dennick, 2011).

### Maternal monitoring

Maternal monitoring was measured via adolescents' self-reported perceptions. Previous literature suggests that although adolescents and parents may have differing perceptions of family functions, such as parental monitoring (see De Los Reyes & Ohannessian, 2016 for review), youths' perceptions typically have equal or greater consequences for their subsequent behavior compared to parents' perceptions (Wierson et al., 1988; Krohn et al., 1992; Cottrell et al., 2003). Therefore, maternal monitoring behaviors were measured through youths' perceptions of those behaviors.

Youths' perceptions of maternal monitoring were measured through the Parental Monitoring Inventory, which was adapted for the current study to ask only about the youth's self-reported mother or primary maternal guardian (as opposed to their overall primary caregiver; Steinberg et al., 1992). This measure has been associated with adolescent risk-taking behaviors such as gang membership and drug dealing (Little & Steinberg, 2006; Merrin et al., 2020). The two subscales were used independently for this study: Parental Monitoring Effort (independent variable) and Parental Monitoring Knowledge (control variable). The Parental Monitoring Effort subscale consisted of five questions assessing how much the adolescent's mother tries to know about the adolescent's daily activities and whereabouts (e.g., "How much does this person try to know about where you go at night?"). Answers were scored on a 4-point Likert scale ranging from 1 (*doesn't try at all*) to 4 (*tries extremely hard*). A final Parental Monitoring Effort subscale score was obtained by averaging across the five values, with

higher scores indicating greater maternal solicitation efforts. Reliability for this subscale was good (Cronbach's  $\alpha = 0.807$ ; Tavakol & Dennick, 2011). The Parental Monitoring Knowledge subscale consisted of five questions assessing how much the adolescent's mother actually knows about the adolescent's daily activities and whereabouts (e.g., "How much does your mother really know about where you go at night?"). Answers were scored on a 4-point Likert scale ranging from 1 (*doesn't know at all*) to 4 (*knows everything*). A final Parental Monitoring Knowledge subscale score was obtained by averaging across the five values, with higher scores indicating greater maternal knowledge. Reliability for this subscale was good (Cronbach's  $\alpha = 0.853$ ; Tavakol & Dennick, 2011).

### Analytic Strategy

The present study aimed to examine how the association between parental solicitation and risk-taking behavior might operate differently among younger and older teens. Parental monitoring knowledge was controlled for in all analyses to allow us to measure the association of interest above and beyond the effects of parents' passive knowledge of youths' behaviors. Analyses were conducted in R version 4.0.3 (R Core Team, 2020). Across all analyses,  $p$ -levels of less than or equal to 0.05 were interpreted as statistically significant.

First, descriptive statistics were computed to identify the average age of participants, the extent of risk-taking within the sample, and participants' perceptions of their maternal figures' knowledge—and efforts to solicit information—about their whereabouts and activities. The hypothesized moderation model was then analyzed using multiple linear regression to test for the significance of the interaction between age and parental monitoring effort in predicting adolescent risk-taking, with age being represented as a quadratic polynomial ( $\text{age}^2$ ). The variables used to create the interaction term were centered at the mean. In Step 1 of the model, parental monitoring knowledge was entered as a control. In Step 2 of the model, parental solicitation, age, and  $\text{age}^2$  were entered as predictors of adolescent risk-taking. In Step 3, the interaction between parental monitoring effort and linear age was entered as a predictor of adolescent risk-taking; additionally, the interaction between

**Table 3** Parental solicitation as a moderator for age<sup>2</sup> and adolescent risk-taking variety

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	$\beta$	<i>SE</i>	<i>B</i>	$\beta$	<i>SE</i>	<i>B</i>	$\beta$	<i>SE</i>
Constant	4.47***		0.39	4.47***		0.38	4.40***		0.36
Parental knowledge	-1.95**	-0.30	0.58	-2.48***	-0.38	0.67	-2.21***	-0.34	0.64
Parental solicitation				2.08**	0.30	0.65	1.97**	0.28	0.63
Age				1.37	0.03	4.61	1.55	0.03	4.43
Age <sup>2</sup>				-0.29	-0.01	4.08	-1.91	-0.04	3.94
Age*Parental solicitation							17.27*	0.22	6.60
Age <sup>2</sup> *Parental solicitation							12.84*	0.17	6.46
<i>R</i> <sup>2</sup>	0.09			0.17			0.26		
$\Delta R^2$				0.08*			0.09**		

*N* = 117. In Model 1, we entered parental knowledge as a control. In Model 2, we added parental solicitation, age, and age<sup>2</sup> as predictors for adolescent risk-taking variety. In Model 3, we entered the age<sup>2</sup> \*parental solicitation interaction as a predictor for adolescent risk-taking variety. All independent variables were centered at the mean

\**p* ≤ 0.05; \*\**p* ≤ 0.01; \*\*\**p* ≤ 0.001

parental monitoring effort and age<sup>2</sup> was entered as a predictor of adolescent risk-taking.

## Results

### Descriptive Statistics

Descriptive statistics and bivariate correlations of the main variables included in the study analyses are presented in Table 2. On average, participants were 15.21 years old (*SD* = 1.52) and rated parental monitoring effort at 2.88 (*SD* = 0.63, *range* = 1.4, 4.0) and parental monitoring knowledge at 2.99 (*SD* = 0.67, *range* = 1.2, 4.0). Participants engaged in an average of 4.47 (*SD* = 4.40) different risky behaviors over the span of one year out of the total 51 behaviors listed in the Risky Behavior Protocol, reflecting the low-risk nature of the community sample. None of the variables in the analyses had a Cook's distance greater than 1, therefore extreme values of the main variables were determined to be a natural part of the sample and were retained for the study's analyses.

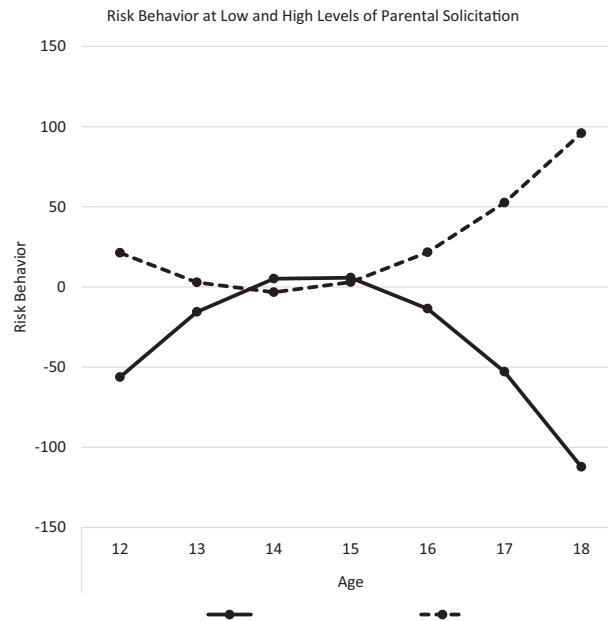
### Parental Solicitation as a Moderator for Age<sup>2</sup> and Adolescent Risk Behavior

To measure the main effect of parental solicitation on adolescent risk behavior, adolescent risk-taking variety was regressed on parental solicitation while controlling for parental knowledge, age, and age<sup>2</sup>. All results are reported in Table 3. Parental knowledge was negatively related to risky behavior, such that youths who reported that their parents knew more about their whereabouts, friends, and activities also reported less risk-taking (*b* = -1.95,

*t*(115) = -3.36, *p* = 0.001). Parental solicitation was positively related to risky behavior (*b* = 2.08, *t*(112) = 3.19, *p* = 0.002), such that adolescents who reported higher rates of parental effort to solicit information about their whereabouts, friends, and activities also reported greater risk-taking. This model explained 17% of adolescents' risk-taking variety (*R*<sup>2</sup> = 0.17). However, results revealed age was not significantly related to adolescent risk-taking when parental knowledge, parental solicitation, and age<sup>2</sup> were taken into account (*b* = 1.37, *t*(112) = 0.30, *p* = 0.77). Further, age<sup>2</sup> itself was not a significant predictor of risk-taking variety when parental knowledge, parental solicitation, and age were included in the model (*b* = -0.29, *t*(112) = -0.07, *p* = 0.94).

Next, the interaction between parental solicitation and age<sup>2</sup> was added to the model to examine age<sup>2</sup> as a moderator for the association between parental solicitation and adolescent risk-taking. As predicted, results indicated that the magnitude of the association between parental solicitation and adolescent risk behavior varied based on the participant's age (*F*(6, 110) = 6.30, *p* < 0.001, *R*<sup>2</sup> = 0.26). That is, greater parental supervisory efforts were associated with lower rates of risk-taking in mid-adolescence and exponentially higher rates of risk-taking in late adolescence; lower rates of parental supervisory efforts were instead associated with higher rates of risk-taking in mid-adolescence and exponentially lower rates of risk-taking in late adolescence (*b* = 12.8351, *t*(110) = 1.99, *p* = 0.05). The final model predicted 26% of the variance in adolescents' risk-taking behaviors (*R*<sup>2</sup> = 0.26), with the interaction between parental solicitation and age<sup>2</sup> explaining an additional 9% of variability in risk-taking beyond parental solicitation alone ( $\Delta R^2$  = 0.09, *p* < 0.01). For a graphical representation of these results, see Fig. 1.

**Fig. 1** Age differences in association between parental solicitation and adolescent risk behavior. We regressed variety of risk-taking on the interaction between parental solicitation and age<sup>2</sup>. The solid line represents parental solicitation at one standard deviation below the mean, and the dashed line represents parental solicitation at one standard deviation above the mean. Among frequently monitored youths, rates of risk-taking were lowest in mid-adolescence and highest in late adolescence. Among less frequently monitored youths, rates of risk-taking were highest in mid-adolescence and lowest in late adolescence. Although age<sup>2</sup> was assessed as a moderator for the association between parental solicitation and adolescent risk behavior, the graphical representation of the results includes age<sup>2</sup> on the y-axis for ease of interpretability



## Discussion

The present study aimed to identify how the association between perceived parental solicitation and adolescent risk-taking behavior operates differently depending on adolescent age. The findings suggest that, among teens whose parents frequently engage in supervisory efforts, risk-taking is lower in early adolescence and higher in late adolescence. More specifically, among older teens, higher rates of parental supervisory effort are related to higher rates of teen risk-taking, with risk-taking being exponentially higher at ages following mid-adolescence. Conversely, among teens whose parents infrequently engage in supervisory efforts, risk-taking is greatest around mid-adolescence and is exponentially lower at ages following mid-adolescence.

Notably, our findings fall in line with developmental literature. Particularly, our findings support Otto & Atkinson's, (1997) prediction that parental solicitation might operate differently for teens depending on age-related developmental changes. Indeed, teens experience developmentally normative changes in risk-taking behavior as they progress through adolescence (Steinberg, 2010), including a peak in sensation-seeking in mid-adolescence and a general linear decline in impulsivity throughout adolescence (Steinberg et al., 2008). Further, as youths mature from early to late adolescence, their need for autonomy increases (Eccles et al., 1993), and their perceptions of parents' authority as legitimate decreases (Darling et al., 2007). Teens who view parental authority as less

legitimate also characterize their parents' behaviors as more restrictive and psychologically controlling (Smetana et al., 2005). Taken together, these developmental changes suggest younger teens may find more frequent parental solicitation to be more reasonable, while older teens may find such behavior to be more intrusive. Our results additionally fit with findings from Kerr et al., (2010), who reported that greater parental solicitation is (weakly) associated with adolescents' increased delinquency. In the context of present literature, we interpret our findings to suggest that parents' efforts to solicit information may not be enough to deter youths from engaging in risk-taking behavior, and we suggest parents take into consideration youths' developmental stages when developing their supervisory strategies.

Further, methodological differences may explain the discrepancies between our results and the results of several prior studies that suggest parental monitoring is generally protective against risk-taking among adolescents. For example, one study found less parental monitoring to be related to greater engagement in health-related risk behaviors (e.g., not using a condom at last sexual intercourse, using drugs and alcohol; DiClemente et al., 2001). However, the study's sample was restricted to female teens from high-risk backgrounds (i.e., low SES, living in neighborhoods characterized by high rates of substance use and violence). In contrast, our sample included both male and female community adolescents, suggesting our results are more generally applicable to low-risk teens. Moreover, while Wang & colleagues, (2015) found parental

monitoring to be predictive of adolescent sexual risk-taking in a sample of male and female teens, their study measured parental monitoring across three domains: parental knowledge, youth disclosure, and parental control. Our findings, therefore, may differ from those reported by Wang & colleagues, (2015), as our study focused solely on parental solicitation—a measure omitted from their research design. Notably, the methodological differences detailed above also represent the strengths of our study—specifically the generalizability of findings to low-risk teens and the focus on parental solicitation as an important component to parental monitoring effort.

The present study also has some conditions which limit the generalizability of its results; thus, the findings should be interpreted with caution. First, our study utilized a cross-sectional design; therefore, causal effects cannot be interpreted. That is, the present findings cannot be used as evidence of directional effects. Indeed, it is possible that increased risk-taking is predictive of the extent to which parents monitor their children. Likewise, it is possible that other factors such as deviant peers, increased impulsivity, difficulties at school, and parents' more general concerns about youth safety impact both parental monitoring effort and adolescent risk-taking. As such, longitudinal data are needed to determine the temporal association between changes in parents' monitoring efforts and changes in youths' risk-taking behaviors. Moreover, experimental or quasi-experimental studies are needed to determine cause and effect, and such studies should account for known correlates of monitoring effort and peer risk-taking, such as youth–parent relationship quality (Klevins & Hall, 2014) and youths' associations with deviant peers (Brendgen et al., 2001). Nonetheless, the study's results add to the current understanding of the way in which parental solicitation operates with respect to normative age-related changes throughout adolescence. Importantly, the present study examined youths' perceptions of parental solicitation—a component of parental monitoring which has largely been overlooked as a predictor of adolescents' risk-taking behaviors. Therefore, such cross-sectional research is an important first step in examining the association between teens' perceptions of parents' efforts to monitor their behaviors and teens' engagement in risk-taking. Future causal designs might explore whether greater parental solicitation causes teens' engagement in risky behaviors and, if so, how teens' perceptions of autonomy might mediate this causal association. Such future designs may yield important findings given existing literature which suggests youths and parents may differ on perceptions of legitimacy when it comes to certain monitoring behaviors (e.g., snooping; Hawk et al., 2015) and youths who feel overcontrolled by their parents respond less positively to

increased monitoring behaviors (Tilton-Weaver et al., 2013).

Second, our study focused on maternal solicitation and did not include reports of fathers' attempts to solicit information from their children, nor did our analyses employ the use of maternal reports of parental monitoring effort. Notably, literature suggests that mothers tend to take on the primary caregiver role within the family (Sasaki et al., 2010). Thus, maternal solicitation may be a particularly important component in the context of youth's perceptions of parents' monitoring efforts. Though maternal reports were included in the larger study, only 51 participants had an accompanying maternal report, thereby limiting the analyses that could be performed due to the risk of low power to detect an effect. Future studies may seek to explore potential differences in youths' perceptions of mothers' and fathers' solicitation efforts and how such perceptions relate to youths' risk-taking behaviors, as well as how mothers' and fathers' own reports of monitoring efforts might relate to youths' risk-taking while simultaneously accounting for youths' reports.

Third, the present findings are based on a relatively small sample size and a single method of data collection. As such, it is important to take caution when interpreting the results due to the threat of monomethod bias—a bias introduced into a given analysis if the single method used to measure the main variables does not accurately measure the intended constructs of interest. Future research may benefit from a larger sample and more varied methods of data collection (e.g., including collateral reports from parents and close others, including observational measures or daily reports).

Fourth, analyses for the present study did not account for cultural differences among adolescents. That is, adolescents' expectations for the extent to which their parents should know about their whereabouts and activities may vary across cultures. For example, teens from cultures that place an emphasis on family cohesion and obedience to caregivers may believe more strongly in the legitimacy of their caregivers' authority and may, therefore, be more likely or willing to disclose information about their whereabouts and activities. Thus, future studies may wish to examine how parental solicitation efforts and youth risk-taking operate differently across cultures and across ethnicities.

Last, the present study utilized a relatively low-risk sample of adolescents. This allows us to better generalize our findings to community youths. Though we cannot generalize our findings to a more high-risk sample of adolescents, the risky behaviors of community youths are also important to study. Indeed, non-criminal risky behaviors such as having unprotected sex, skipping school without permission, and running away from home may lead to consequences that are detrimental to the youth's physical



and psychological well-being—even if these behaviors are classified as low-risk relative to criminal offending.

## Conclusion

The present study adds to extant literature by addressing how parental solicitation efforts are disparately associated with adolescent risk-taking among younger and older teens. We found that parents' increased monitoring efforts are associated with lower risk-taking among younger adolescents. Conversely, we also found that parents' increased monitoring efforts are associated with higher rates of risk-taking among older adolescents. These findings are supported by developmental literature which reports a variety of age-related changes throughout adolescence.

Findings from the present study suggest parents who rely on monitoring practices in an attempt to limit their teens' engagement in risky behaviors should consider developmental changes throughout adolescence before increasing their efforts to solicit information. Parents of younger teens might be effective in curbing their children's risk-taking through increased parental monitoring, but parents of older teens might instead exercise caution to avoid inadvertently limiting their teens' autonomy. That is, parents of older teens might opt to balance their monitoring behaviors by allowing teens the freedom to make independent choices about the activities in which they engage. It is also important to note, however, that the present study did not assess adolescents' individual characteristics such as impulsivity and temperament, which may be stronger predictors of risky behavior (Fernie et al., 2013; Youssef et al., 2016). As such, parents should consider both their child's developmental stage and their child's risk proclivities when building a parental monitoring strategy.

Further, as this study was cross-sectional in nature, the inverse of the identified association may also be true—parents of teens who engage in greater risk-taking may react to teens' risky behaviors by increasing their efforts to solicit information. Nevertheless, our results more broadly suggest that parents cannot rely solely on their solicitation efforts to curb teens' risk-taking. Instead, parents should consider how normative changes throughout adolescence (i.e., increase in risk-taking, increased need for autonomy) might impact the effectiveness of their parental monitoring efforts and adjust their efforts to solicit information from their children accordingly.

## Data Availability

The data that support the findings of this study are not currently publicly available in a repository. However, data

are available from the authors upon reasonable request and with permission.

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**Author Contributions** A.D.D. conceived of the present study, participated in the interpretation of the data, performed the statistical analysis, and drafted the manuscript; I.M.C. participated in drafting the manuscript and provided feedback on the final manuscript; A.G.T. conceptualized and carried out data collection for the original study from which the secondary data analysis was run, consulted in the design and coordination of the present study, participated in the interpretation of the data, and reviewed and provided feedback on the manuscript. All authors read and approved the final manuscript.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare no competing interests.

**Ethics Approval** Ethics approval for research involving human participants was obtained from the Institutional Review Board of the University of California, Irvine.

**Informed Consent** Informed consent was obtained from parents or legal guardians. Assent was obtained from youths.

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