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EMPIRICAL RESEARCH

Parental Social Support and Sources of Knowledge Interact to Predict Children's Externalizing Behavior Over Time

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Abstract

Parental social support and monitoring are associated with children's externalizing behavior but clarity is needed on how these mechanisms interact to influence youth. This study examined if parental social support magnifies the protective effects of sources of parental knowledge (Parental Control, Parental Solicitation, Child Disclosure) on the development of substance initiation and delinquency across adolescence. Participants were 6–8th graders ($N = 1023$; 52% female; 83% White; 87.8% non-Hispanic) from six (one urban, two rural, three suburban) Rhode Island schools assessed annually for four years. Parental control protected against substance initiation, but only in supportive relationships. All sources of parental knowledge were associated with less delinquency, but only in supportive relationships. Interventions focused on increasing children's perceptions of parental social support may enhance the effectiveness of sources of parental knowledge in buffering against children's externalizing behavior.

Keywords Adolescent Substance Use · Adolescent Delinquency · Parental Social Support · Parental Sources of Knowledge

Introduction

It is widely accepted that authoritative parenting (i.e., highly demanding and responsive) results in the most optimal outcomes for children (Baumrind 1991). Parental monitoring, the tracking of children's behaviors to protect against negative influences (Kerr and Stattin 2000), is one dimension of authoritative parenting that is associated with better adolescent outcomes (Hussong and Smith 2018). For example, high parental monitoring delays alcohol initiation and is linked with lower levels of later use (Ryan et al. 2010). Importantly, parental monitoring does not exist in isolation. Instead, parents monitor their children within the context of their broader parenting style (Darling and Steinberg 1993). Discrete parenting behaviors such as parental monitoring differ from parenting style in that monitoring conveys the parent's attitude toward a given behavior, such as substance use, whereas parenting style conveys the attitude towards the child (Darling and Steinberg 1993). One aspect of parenting style that is associated with better adolescent outcomes is social support (Serafini et al. 2018), which is comprised of dyadic affiliation and attachment, and parental caregiving (Furman and Buhrmester 1985). Parents' general style, including social support, can enhance the effectiveness of a specific parenting practice, such as monitoring, possibly strengthening the effect of the specific practice.

Ultimately, researchers must identify specific and malleable parenting behaviors that may be targeted to protect against risky adolescent behavior. In identifying these behaviors, it is essential to remain aware of the multifaceted nature of parenting: specific parenting behaviors do not occur in isolation and evaluating their influence on children's behavior without considering the influence of parenting style may overlook meaningful interactions that could impact risky behavior (Smetana 2017). To this end, this study investigates the extent to which social support moderates the effects of parental monitoring on the development of two externalizing behaviors across adolescence, substance initiation and delinquency.

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Parental Social Support, Monitoring, and Children's Externalizing Problems

There are normative developmental increases in externalizing problems across adolescence, but these trajectories may be conditional on aspects of parenting. For example, parental support decreases the likelihood of adolescent's substance use (Serafini et al. 2018) and protects against earlier initiation, and accelerated progression of substance use (Stavrinides et al. 2010). In fact, low levels of adolescent's satisfaction with parental social support is a stronger predictor of substance use than friend support (Piko 2000). Additionally, high parental social support protects against youth delinquency (Dong and Krohn 2017).

Parental monitoring refers to a set of discrete behaviors that buffer against adolescent's externalizing. Poorly monitored youth engage in more substance use and are more likely to be delinquent (Nilsson 2016). Parental monitoring protects against maladaptive behavior by discouraging, preventing, and ameliorating drug use (Steinberg et al. 1994). Key parental monitoring behaviors include three sources of parental knowledge (Stattin and Kerr 2000) of adolescent activities. These three sources of knowledge capture *how* parents come to learn information about the behavior of their child (i.e., the "source" of knowledge) rather than *what* parents know about the child's behavior. Sources of knowledge include: *parental control* (parental imposition of rules on activities), *parental solicitation* (garnering of information), and *child disclosure* (unprompted reception of information shared by the child). Child disclosure has been shown to be a more robust predictor of child outcomes than parental control and solicitation (Abar et al. 2015). Evaluating sources of parental knowledge is particularly relevant if the goal of the research question is to identify discrete parenting behaviors that may be targeted through intervention (Anderson and Branstetter 2012). Examining sources of knowledge may inform putative mechanisms or "active ingredients" of monitoring that can be leveraged in prevention and intervention. It remains to be seen if and how these aspects of parenting interact to predict adolescent's externalizing.

Aspects of parenting style, including supportiveness, warmth, and responsiveness, augment the protective effect of parental monitoring on other developmentally significant adolescent outcomes, including poorer academic outcomes (Lowe and Dotterer 2013), negative reactions to monitoring (LaFleur et al. 2016), and sexual risk taking (Huebner and Howell 2003). As such, characteristics of parenting style may facilitate monitoring of adolescents, whereas parental attempts to obtain information from adolescents within the context of an unsupportive parent-child relationship may be less effective (Stattin and Kerr 2000). Importantly, prior studies focus broadly on parental monitoring rather than evaluating the influence of potentially malleable parental behaviors, such as sources of knowledge.

Current Study

To better understand the mechanisms through which parents influence their children, this study examines the interactions of broad and specific dimensions of parenting on adolescent's externalizing. The primary aim was to explore if relationship quality (i.e., under conditions of low, medium, or high social support) moderates the protective effects of parental knowledge (based on three sources: parental control, parental solicitation, and child disclosure) against the development of externalizing behaviors (substance initiation and delinquency). That is, whether trajectories of adolescent's externalizing behaviors are conditional on aspects of parenting. Participants reported on social support, sources of knowledge, and externalizing behaviors across four years of adolescence, enabling the longitudinal investigation of these relationships. Based on prior research revealing direct effects of relationship quality and sources of knowledge on adolescent's externalizing, as well as research showing interactive effects between these behaviors and other developmentally significant adolescent outcomes, it was anticipated that the protective effects of sources of knowledge on adolescent's substance initiation and delinquency would be strongest within the context of highly supportive relationships. Specifically, it was anticipated that results would demonstrate: (1) development (linear growth) in substance initiation and delinquency (i.e., positive slope of time) across the study period; (2) negative main effects for social support and sources of knowledge (i.e., the independent protective effects of these constructs at baseline); (3) negative two-way interactions between sources of knowledge and time (i.e., interactive protective effects where increased sources of knowledge would be associated with less linear growth – a stronger negative simple main effect of time – in substance initiation and delinquency); (4) negative two-way interaction between source of knowledge and social support such that increased social support would enhance the protective effect of sources of knowledge on externalizing as measured at baseline; and the focal hypothesis (5) negative three-way interactions between sources of knowledge, social support, and time indicating that the protective negative interaction between sources of knowledge and time is greatest at high levels of social support.

Methods

Participants and Procedure

Participants were 6–8th grade adolescents ($N = 1023$) recruited from six (one urban, two rural, three suburban) Rhode Island schools. Data for the current study were drawn from a longitudinal study of the progression through sequential drinking milestones (Jackson et al. 2015).

Participants were enrolled in semi-annual sequential cohorts between 2009–2011 (Baltes and Nesselroade 1979). Data is reported from each cohort's baseline assessment (T1) and three annual follow-up assessments (T2–T4). Adolescents were enrolled at baseline and retention rates were 88% (T2) and 83% (T3–T4). All participants from the parent study were included in analyses. Adolescents whose parents provided consent attended an orientation session where they provided assent prior to T1 data collection. Follow-up assessments were completed online. This study was approved by the Institutional Review Board of Brown University. Informed consent was obtained from all individual participants included in the study

Measures

Social support

Social support was assessed with three items of the Network of Relationships Inventory (Furman and Buhrmester 1985). At each assessment, participants identified their two "most important parental figures" and rated these figures' social support on a Likert scale (e.g., "How often do you turn to this person for support with personal problems"; 1 = "Little or none" to 5 = "The most"). Mean item scores were computed for each parental figure and then across the two figures to obtain an overall mean of parental social support (T1–T4 Cronbach's α range = 0.85–0.89). When participants indicated only one parental figure, that figure's mean item score was used as the overall mean.

Sources of knowledge

Sources of knowledge were assessed using a 15-item Sources of Parental Knowledge questionnaire (Kerr and Stattin 2000; Stattin and Kerr 2000). At each assessment, adolescents reported the proportion of time they experience monitoring strategies on a Likert scale (ranging from 1 = "No, never" to 5 = "Yes, always"). This measure yields three scales, child disclosure, parental solicitation, and parental control. Scale scores were computed by averaging relevant items.

Child disclosure Child disclosure items evaluated children's spontaneous disclosure of information about daily activities (e.g., "If you are out at night, when you get home, do you tell what you have done that evening?"). T1–T4 Cronbach's α range = 0.74–0.77.

Parental solicitation Parental solicitation items evaluated parental garnering of information about their child's behavior (e.g., "In the last month, have your parents talked with the parents of your friends?"). T1–T4 Cronbach's α range = 0.81–0.88.

Parental control Parental control was assessed with 5 items evaluating parental rules and restrictions to control and gain information about their child (e.g., "Do you need to have your parents' permission to stay out late on a weekday evening?"). T1–T4 Cronbach's α range = 0.85–0.92.

Substance initiation

Participants reported if they had ever used alcohol, tobacco, marijuana or other drugs at each assessment. Substance initiation was indexed as a time-varying sum of the categories of substances each participant reported ever using by that time point (ranging from 0 for *none* to 4 for *all*).

Delinquency

Delinquency was assessed with six items from the delinquent behavior factor of the Problem Behavior Frequency Scale (Farrell et al. 1992; Farrell et al. 2000). At each wave, participants reported the frequency with which they engaged in delinquent behaviors over the past 30 days (e.g., "Skipped school"; 1 = "Never", 2 = "1–2 times", 3 = "3–5 times", 4 = "6–9 times", 5 = "10–19 times"; 6 = "20 or more times"). Due to the infrequency of delinquent behaviors, items were dichotomized (i.e., *never* vs. *ever* in past 30 days) and a sum of delinquent behaviors at each assessment computed (T1–T4 Cronbach's α range = 0.78–0.83).

Covariates

Demographic factors Participants self-reported sex, age, race, and ethnicity.

Parent and other family drinking problems Complex biopsychosocial processes influence the development of problematic substance use. Thus, incorporating family history of substance use is vital to characterizing the progression of use. Parents of participants self-reported *parent* and *other family drinking problems* (not Alcohol Use Disorder) by responding to a set of six face-valid items ("Please indicate if any of the following relatives have/had a drinking problem") with one of three responses: "Yes", "No", or "Don't Know". The six items queried familial drinking problems among both biological parents and all four biological grandparents. Drinking problems were indexed on a binary scale (i.e., *yes* vs. *no*), such that affirmative responses to either parent item or any of the four grandparent items

indicated history of drinking problems in parents or other family, respectively.

Statistical Approach

To predict changes in adolescent's delinquency and substance initiation over time, data was structured such that each observation included the focal outcome variables at each wave, subject-level covariates, and time-varying predictors. Sources of knowledge and social support were mean centered at each time point. Consequently, differences in these variables over time represent normed scores relative to others in the sample at that assessment. This approach yielded 4092 observations across all assessments and participants. Missing data for covariates included: ethnicity (0.3%), parent drinking problems (10.1%) and family drinking problems (10.3%). Missing data for time-varying predictors and the delinquency outcome ranged from 12.2% for child disclosure to 12.9% for delinquency. Multiple imputation using chained equations (Azur et al. 2011) was used to impute missing data in ten datasets over ten iterations, including covariates and the outcome variables in the imputation model. As the substance initiation outcome measures lifetime ever-use of multiple substances, we first cleaned the raw substance data by recoding leading, trailing, and book-ended missing values when appropriate (e.g., trailing missing data on ever-use was recoded to *yes* if previously endorsed). The substance initiation composite score was then computed and included as a predictor in each iteration, but was excluded from informing the imputation of underlying substance ever-use to avoid circularity (van Buuren and Groothuis-Oudshoorn 2011). Imputed values for delinquent behavior were bounded at 0 and 6 at each iteration to reflect the measure's range. Plots of imputed means, standard deviations, and distributional densities were examined to ensure adequate convergence across iterations and appropriateness of imputed data. Pooled parameter estimates are reported in all analytic models (Rubin 1987).

A series of linear mixed effects models (LMEM) with continuous outcomes and unstructured covariance matrices (Hedeker 2005) were estimated to test the prediction that social support moderates the protective effect of parental sources of knowledge against adolescent's externalizing over time. Externalizing (i.e., substance initiation or delinquency) was regressed onto all covariates, focal time-varying predictors, and an index of time (number of months following baseline) in a series of LMEMs. Random intercepts and calculated intra-class correlations (ICCs) were estimated for observations clustered within participants. Time, and two- and three-way interaction terms between time, social support, and source of knowledge were included to: (1) examine linear growth in externalizing behaviors; (2) examine if social support or source of knowledge moderate linear growth in externalizing; and (3) examine if the hypothesized protective effects of the each of three sources of knowledge are moderated by social support. In models with significant three-way interactions, the regions of significance were investigated for the two-way interaction between source of knowledge and time by progressively re-centering social support and identifying the point at which parameter estimates for the two-way interaction became significant or non-significant.

Results

Descriptive statistics are presented in Table 1. Participants were predominantly female (52.2%), White (83.0%), and non-Hispanic (87.8%). Parent and family drinking problems were endorsed by approximately one third and two thirds of the sample, respectively. Consistent increases in rates of alcohol, tobacco, and marijuana initiation were observed over time. Alcohol was the most commonly endorsed substance at each time point; self-reported use of other drugs was low. Across participants, delinquency remained relatively stable over time, with a significant increase observed from T3–T4 ($p = 0.002$). Although social support, sources of knowledge, and delinquency appear stable across time according to means presented in Table 1, this does not reflect individual stability, but rather indicates stable group means over time that aggregate individual changes and justify the use of time-varying predictors. Correlations within constructs over time were generally moderate while cross-construct correlations were low, supporting the observed intra-individual variability of these data and discriminant validity of constructs.

Substance Initiation

Results from the LMEMs predicting substance initiation from each source of knowledge are presented in Table 2. ICCs for subject-level clustering in substance initiation ranged from 0.72–0.73 across models. Baseline age and parent drinking problems were associated with greater substance initiation across models. The effects of sex, race, ethnicity, and family drinking problems were non-significant. The effect of time was significant and positive in all models, indicating increased substance initiation over time at mean social support and sources of knowledge. Neither the main effects for social support nor source of knowledge at baseline (T1) were associated with substance initiation. The two-way interaction between these effects was also non-significant at baseline. Social support was associated with more initiation over time (i.e., two-way interaction between social support and time at mean child

Table 1 Sample Characteristics

Variable	*M* (SD) or %			
	T1	T2	T3	T4
Sex (female)	52.2%			
Race (White)	83.0%			
Ethnicity (non-Hispanic)	87.8%			
Age	12.47 (0.95)			
Parent drinking problems	32.7%			
Family drinking problems	67.3%			
Social support	2.83 (0.86)	2.59 (0.87)	2.45 (0.86)	2.44 (0.84)
Source of knowledge				
Child disclosure	3.85 (0.92)	3.70 (0.92)	3.64 (0.92)	3.64 (0.90)
Parental solicitation	3.22 (1.06)	3.12 (1.14)	3.02 (1.15)	3.08 (1.10)
Parental control	4.29 (0.94)	4.22 (1.02)	4.02 (1.12)	4.02 (1.11)
Substance initiation	0.58 (0.77)	0.78 (0.86)	0.91 (0.92)	1.05 (0.99)
Alcohol	41.9%	55.0%	64.7%	73.2%
Tobacco	8.8%	14.6%	21.0%	25.5%
Marijuana	6.4%	14.2%	21.0%	29.8%
Other drugs	0.8%	1.9%	3.2%	4.4%
Delinquency Count	0.50 (1.00)	0.43 (0.96)	0.49 (1.08)	0.58 (1.14)

Substance initiation indexed as count of categories of substances with lifetime use. All substances indexed as percent of sample reporting lifetime use at that time point

T1 0 months (i.e., baseline assessment), *T2* 12 months, *T3* 24 months, *T4* 36 months

Table 2 Parameter estimates of LMEMs predicting linear growth in substance initiation

Variable	Sources of Knowledge								
	Child disclosure			*Parental solicitation*			*Parental control*		
	Est	SE	*p*	Est	SE	*p*	Est	SE	*p*
Intercept	*−2.31*	*0.35*	–	*−2.44*	*0.36*	–	*−2.31*	*0.35*	–
Sex (ref: male)	0.025	0.053	0.63	0.034	0.054	0.52	0.042	0.053	0.42
Race (ref: White)	0.10	0.081	0.20	0.13	0.083	0.12	0.13	0.081	0.11
Ethnicity (ref: non-Hispanic)	−0.078	0.091	0.39	−0.073	0.092	0.43	−0.052	0.092	0.57
Baseline age	**0.22**	**0.028**	**<0.001**	**0.23**	**0.028**	**<0.001**	**0.22**	**0.028**	**<0.001**
Parent drinking problems	**0.27**	**0.065**	**<0.001**	**0.29**	**0.066**	**<0.001**	**0.29**	**0.064**	**<0.001**
Family drinking problems	0.044	0.063	0.49	0.046	0.065	0.47	0.047	0.064	0.46
Social support	−0.034	0.027	0.21	−0.022	0.024	0.35	−0.030	0.022	0.17
Source of knowledge (SOK)	−0.0060	0.028	0.83	−0.0071	0.019	0.70	0.0066	0.020	0.75
Time (months)	**0.021**	**0.00092**	**<0.001**	**0.021**	**0.00082**	**<0.001**	**0.021**	**0.00087**	**<0.001**
Social support × time	**0.0027**	**0.0011**	0.012	0.00	0.001	0.99	0.00041	.00088	0.64
SOK x time	**−0.0072**	**0.0011**	**<0.001**	−0.0021	0.0011	0.057	**−0.0044**	**0.00082**	**<0.001**
Social support × *SOK*	0.028	0.021	0.17	0.018	0.018	0.29	0.017	0.025	0.49
Social support × *SOK* × time	−0.0011	0.00099	0.26	−0.0012	0.00079	0.13	**−0.0026**	**.00098**	**0.007**

Linear growth in substance initiation (i.e., estimate for time) is reported in months following baseline assessment

LMEM linear mixed effects model, *Est.* estimate, *SOK* source of knowledge

Bolded estimates are significant at $p < 0.05$

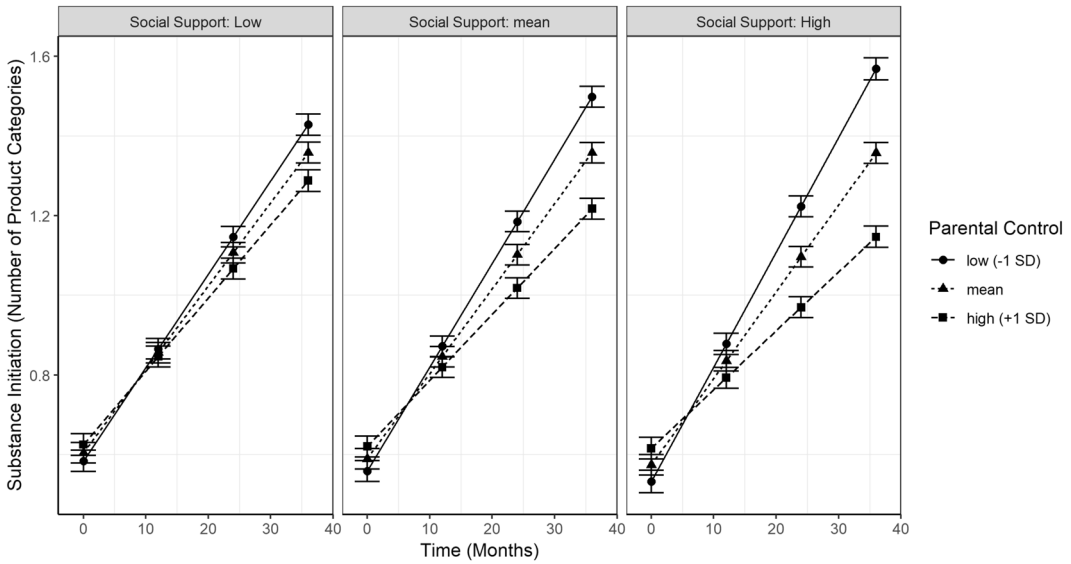

Fig. 1 Relationship between time and substance initiation for levels of parental control, grouped by social support

disclosure), but this interaction was non-significant in every other model, urging caution in its interpretation. Additionally, two-way interactions between source of knowledge and time indicated that increased child disclosure and parental control (but not parental solicitation) were associated with lower substance initiation over time. The protective effect (i.e., two-way interaction between source of knowledge and time) of parental control was qualified by a significant three-way interaction such that this effect was stronger at higher levels of social support (see Fig. 1). Examination of the regions of significance indicated that the protective effect of parental control against increased substance initiation over time became non-significant when social support was 1.06 SD below the mean or less.

Delinquency

Results from the LMEMs predicting delinquency from each source of knowledge are presented in Table 3. ICCs for subject-level clustering in delinquency ranged from 0.28–0.31 across models. Baseline age, non-White race, and parent drinking problems were associated with greater delinquency in all models. The effects of sex, ethnicity, and family drinking problems were non-significant. The effect of time was significant and positive in all models, indicating increased delinquency over time at mean social support and sources of knowledge. The main effects for social support indicated that social support was associated with lower delinquency at baseline and mean levels of parental solicitation or parental control (the effect of social support in the model including child disclosure was non-significant). The main effects for child disclosure and parental control (but not parental solicitation) were significant, with higher levels associated with lower delinquency at baseline and mean levels of social support. The two-way interactions between sources of knowledge and social support were also significant and positive across all models, indicating that at baseline the protective effect of sources of knowledge was most prominent in the context of low social support. Two-way interactions (between social support and time, and sources of knowledge and time, respectively) indicated that neither social support nor sources of knowledge protected against delinquency over time at mean levels of the other effect. However, these effects were qualified by significant three-way interactions such that all sources of knowledge were more protective against increased delinquency over time with greater level of social support (see Fig. 2). Examination of the regions of significance showed that the protective effect of sources of knowledge against delinquency over time became significant when social support was 0.21 SD (child disclosure), 0.81 SD (parental solicitation), or 1.57 SD (parental control) above the mean or greater.

Sensitivity Analyses

Focal analyses examined how parenting behaviors (i.e., social support and sources of knowledge) protect against children's externalizing behavior over time, but it is important to bear in mind that these relationships could be transactional insofar as parental social support and the strategies parents use to monitor their children may be reactive to a child's behavior—that is, there may be bi-directional influences (Pinquart 2017). To identify possible transactional interactions over time, the longitudinal data were leveraged to conduct a series of autoregressive, cross-

Table 3 Parameter estimates of LMEMs predicting linear growth in delinquency

Variable	Sources of Knowledge								
	Child disclosure			*Parental solicitation*			*Parental control*		
	Est	SE	*p*	Est	SE	*p*	Est	SE	*p*
Intercept	*−1.17*	*0.33*	–	*−1.50*	*0.34*	–	*−1.31*	*0.33*	–
Sex (ref: male)	0.044	0.049	0.37	0.055	0.052	0.28	0.070	0.051	0.17
Race (ref: White)	**0.23**	**0.072**	**0.002**	**0.29**	**0.076**	**<0.001**	**0.30**	**0.075**	**<0.001**
Ethnicity (ref: non-Hispanic)	−0.035	0.085	0.68	−0.019	0.092	0.84	0.0012	0.086	0.99
Baseline age	**0.12**	**0.026**	**<0.001**	**0.14**	**0.027**	**<0.001**	**0.13**	**0.026**	**<0.001**
Parent drinking problems	**0.16**	**0.065**	**0.015**	**0.22**	**0.067**	**0.0013**	**0.20**	**0.064**	**0.0013**
Family drinking problems	0.043	0.055	0.43	0.051	0.058	0.38	0.053	0.056	0.35
Social support	−0.056	0.043	0.20	**−0.13**	**0.039**	**<0.001**	**−0.12**	**0.036**	**<0.001**
Source of knowledge (SOK)	**−0.23**	**0.045**	**<0.001**	−0.056	0.033	0.090	**−0.12**	**0.035**	**<0.001**
Time (months)	**0.0071**	**0.0016**	**<0.001**	**0.0062**	**0.0016**	**<0.001**	**0.0060**	**0.0017**	**<0.001**
Social support ×time	0.0035	0.0020	0.080	0.0019	0.0016	0.24	0.0015	0.0016	0.35
SOK × time	−0.0040	0.0026	0.12	−0.0013	0.0013	0.32	−0.00054	0.0015	0.72
Social support × *SOK*	**0.13**	**0.038**	**<0.001**	**0.061**	**0.030**	**0.045**	**0.088**	**0.037**	**0.019**
Social support × *SOK* × time	**−0.0057**	**0.0018**	**0.0014**	**−0.0026**	**0.0013**	**0.049**	**−0.0042**	**0.0017**	**0.012**

Linear growth in substance initiation (i.e., estimate for time) is measured in months following baseline assessment

LMEM linear mixed effects model, *Est.* Estimate, *SOK* source of knowledge

Bolded estimates are significant at $p < 0.05$

lagged panel analyses. Eight total models were fit examining the relationship between: (a) the three monitoring constructs or social support as one panel variable; and (b) substance initiation or delinquency as the other panel variable at each time point. All cross-lagged and autoregressive effects were examined and each path controlled for the covariates that were included in the LMEMs. Results from LMEMs were generally replicated as expected. Child-driven effects were inconsistent and limited, observed in only one cross-lagged path for two monitoring constructs when modeling substance initiation, and only child disclosure in all cross-lagged paths when modeling delinquency. There were no significant child-driven effects observed for social support.

Participants who report using other drugs may be a qualitatively different class of substance users. Thus, to evaluate the robustness of the findings, additional sensitivity analyses were conducted to investigate potential differences in severity between initiating the use of other drugs versus the remaining substances. The LMEMs were refit excluding participants who reported using other drugs at any time point. Other drug use was very low ($n = 35$; 3.4% of the sample). Refitting the LMEMs did not change the direction or significance of any parameter in any LMEM suggesting that the reported effects were not biased by including these adolescents.

Discussion

Previous work has demonstrated that parental social support and monitoring are key factors influencing adolescent's externalizing but there is a need to better understand how these behaviors interact to influence children (Smetana 2017). Aspects of parenting style, including supportiveness, warmth, and responsiveness, augment the protective effect of parental monitoring on academic outcomes (Lowe and Dotterer 2013), negative reactions to monitoring (LaFleur et al. 2016), and sexual risk taking (Huebner and Howell 2003). This study aimed to extend existing research by evaluating the interactive influence of potentially malleable parental behaviors on adolescent's externalizing. That is, if parental social support moderates the longitudinal relationships between sources of knowledge (child disclosure,

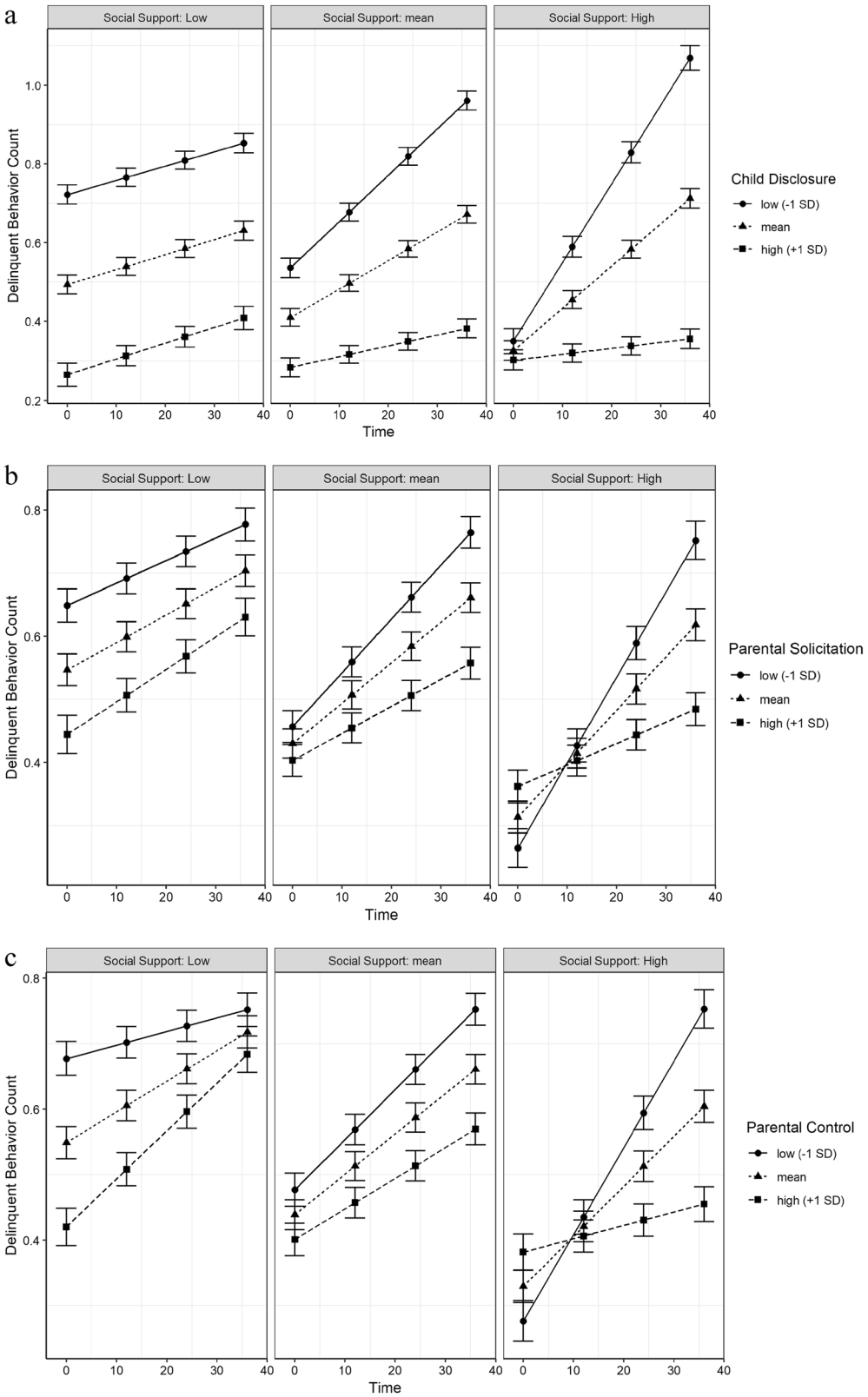

Fig. 2 Relationship between time and delinquency for levels of: **(a) Child Disclosure; (b) Parental Solicitation;** and **(c) Parental Control**, grouped by social support

parental control, and parental solicitation) and two aspects of adolescent's externalizing behavior; substance initiation and delinquency. Parental control protected against substance initiation, but only in highly supportive relationships. Greater child disclosure, parental solicitation, and parental control were associated with a less pronounced increase in delinquent behavior over time, but only in the context of highly supportive relationships.

Adolescents who perceive greater attachment, affiliation, and caregiving within the parent-child dyad are also more likely to perceive their parents as valuing their relationship and jointly making decisions within the relationship (Branstetter et al. 2009). It is plausible that in the context of supportive parent-child relationships, adolescents are less likely to perceive parental attempts at gathering information through control as a violation of autonomy (Branstetter et al. 2009). As such, supportive relationships may facilitate positive interpretations of discrete parenting behaviors, such as parental control, parental solicitation, and child disclosure, thereby increasing their protective effects against adolescent's substance use and delinquency.

One consideration in interpreting these findings is that the peer group has a robust influence on the initiation and maintenance of adolescent's substance use (Piko 2000). Parental monitoring indirectly protects against adolescent's externalizing, possibly by discouraging interactions with risky peers (Nilsson 2016). The link between parental monitoring and externalizing behavior may result from ineffective monitoring which leads to increased socialization with deviant peers, and involvement in delinquent behavior (Nilsson 2016). Future research may consider investigating if peer relationships mediate the moderated influence of social support on the link between sources of knowledge and adolescent's externalizing.

One additional consideration is the possibility that parent sources of knowledge are *reactive* to externalizing behavior. For example, substance use at T1 may alter parental monitoring at T2, which may, in turn, influence the adolescents' substance use at T3. While such transactional relationships could shift both parenting behaviors and externalizing trajectories, they do not qualify the findings of this study—that the perception of discrete parenting behaviors, such as sources of knowledge, are related to adolescent's externalizing behavior and parenting styles impact these perceptions. Although sensitivity analyses revealed little reactivity for sources of knowledge in response to externalizing and no reactivity for social support, this does not exclude the possibility that other salient parenting behaviors interact transactionally with adolescent's externalizing. While a full investigation of reactivity is beyond the scope of this paper, future research should continue to explore possible transactional relationships between adolescent and parent behavior to extend the findings reported herein. There is evidence that such transactional relationships exist, as previous work found bi-directional relations between perceived parental knowledge and heavy episodic drinking or delinquency (Abar et al. 2014).

Interventions seeking to prevent adolescent's substance initiation and delinquency may consider targeting not only discrete parenting behaviors, but also focus on improving the parenting style that serves as the context within which parents implement these strategies. The distinction between parent vs. child report of parenting behaviors is particularly relevant when considering intervention strategies that may be effective in reducing externalizing. These results, coupled with existing findings of the utility of adolescent's reports of parent behaviors in the prediction of child outcomes (Abar et al. 2015), suggest that interventions may consider targeting "perceived" rather than "received" parenting. That is, interventions on parent's behavior without acknowledging adolescent's perceptions of those behaviors may not be effective. Evidence-based family interventions including sessions for fostering familial social support in conjunction with improving discrete monitoring behaviors may be most effective in protecting against adolescent's externalizing. For example, Guiding Good Choices and Parenting Wisely skills training programs target these aspects of parenting (see UNODC 2009 for more detailed information about evidence-based prevention programs that incorporate families). There may also be opportunities for preventative interventions that are proactive, rather than reactive to externalizing. In particular, contacts with trained professionals such as teachers or physicians may provide opportunities for delivering preventative, evidence-based, family oriented skills training.

A strength of this study is the repeated assessment of parent-child constructs and externalizing across adolescence. Longitudinal approaches are required to understand influences on the development of adolescent behavior, particularly spanning the developmental transition to adolescence, a critical period for the development of substance use and delinquency. Furthermore, this study benefits from a large sample with high retention, which reduced the likelihood of bias in observations. Finally, the inclusion of sensitivity analyses confirmed the robustness of study findings.

The results should be interpreted in light of the following limitations. First, as measured in the study, the effect of time collapses across different age groups in each sequential cohort. While this aggregation spans two years at most, as previously noted, these two years might include distinct age-based patterns in the development of externalizing. As such, it is important to note that the growth curves described in this study indicate change across adolescence rather than change at any particular age. Second, the substance initiation outcome– a continuous count of substances used—

implicitly gives equal weight to different substances. Therefore, transitioning from alcohol to alcohol plus tobacco is treated equally severely in analyses as a transitioning from alcohol to alcohol plus heroin. It is plausible that there could be a critical threshold of substance use at which different mechanisms begin to influence substance initiation. However, results from sensitivity analyses suggest that the inclusion of the few adolescents in the sample who used other drugs had limited effects on the findings. The goal of this study was not to exhaustively characterize all plausible processes or to show that these transitions are equivalent, but rather to show that these two processes interact to influence risk. Nevertheless, future research should continue to broadly investigate mechanisms of initiation across substances and specifically how parenting style and discrete parenting behaviors relate to different substance use transitions. Finally, perceptions of relationship quality indices were a mean of ratings of primary maternal and paternal caregivers. This approach gives equal weight to each parents' evaluation that may not reflect the differential contribution of any specific parent to the reported quality of the relationship. However, one benefit of this approach is that it does capture the breadth of the parenting experiences of a given child, which may be more consistent with that child's reality than relying on his or her report about each parent in isolation.

Conclusion

Parental social support and monitoring influence trajectories of externalizing across adolescence, yet there is a need to evaluate how these aspects of parenting interrelate in their prediction of these outcomes. This study examined the longitudinal effects of social support and sources of knowledge on adolescent's substance initiation and delinquency. Findings demonstrated that supportive parent-child relationships can enhance the effectiveness of child disclosure, parental solicitation, and parental control in protecting against adolescent's externalizing. Interventions focused on increasing adolescent's perception of parental social support may enhance the effectiveness of sources of parental knowledge in buffering against the normative increases in children's externalizing behavior.

Authors' contributions L.M. and A.W.S. conceived of the current manuscript, performed statistical analysis, and drafted the manuscript. T.J. participated in the drafting of the manuscript. K.M.J. conceived of the larger parent study, participated in its design and coordination, and participated in the drafting of the current manuscript. All authors read and approved the final manuscript.

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Data sharing and declaration The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standard.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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