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Knowledge lability: Within-person changes in parental knowledge and their associations with adolescent problem behavior

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Abstract

Higher levels of parental knowledge about youth activities has been associated with lower levels of youth risky behavior. Yet little is known about how parental knowledge fluctuates during early adolescence and how those fluctuations are associated with the development of problem behavior. We use the term lability to describe within-person fluctuations in knowledge over time with higher lability indicating greater fluctuations in knowledge from year-to-year. This longitudinal study of rural adolescents (N = 840) investigated if change in parental knowledge across four waves of data from Grades 6 to 8 is characterized by lability, and if greater lability is associated with higher youth substance use, delinquency, and internalizing problems in Grade 9. Our models indicated that only some of the variance in parental knowledge was accounted for by developmental trends. The remaining residual variance reflects within-person fluctuations around these trends, lability, plus measurement and occasion-specific error. Even controlling for level and developmental trends in knowledge, higher knowledge lability (i.e., more fluctuation) was associated with increased risk for later alcohol and tobacco use, and for girls, higher delinquency and internalizing problems. Our findings suggest that lability in parental knowledge has unique implications for adolescent outcomes. The discussion focuses on mechanisms that may link knowledge lability to substance use. Interventions may be most effective if they teach parents to consistently and predictably decrease knowledge across early adolescence.

Keywords

parental knowledge; substance use; delinquency; parent-child relationships

High levels of parental knowledge about adolescents' activities has been associated with lower levels of youth delinquency, substance use, and depression (Fosco, Stormshak, Dishion, & Winter, 2012; Lippold, Coffman, Greenberg, 2014; Racz & McMahon, 2011). Parents often gain knowledge through youth disclosure (Kerr, Stattin, & Burk, 2010). Youth actively manage the information they share with their parents and make key decisions about which information to share or conceal (Frijns, Keijsers, Branje, & Meeus, 2010; Stattin & Kerr, 2000). Parents' family management strategies such as solicitation of information,

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behavioral control, or supervision may also lead to knowledge, especially in the context of a warm parent-child relationship (Lippold, Greenberg, Graham, & Feinberg, 2014). Parental knowledge has been shown to mediate the relations between both parents' family management strategies and youth disclosure with youth outcomes (Lippold et al., 2014; Vieno et al., 2010), and knowledge has been linked to youth outcomes regardless of how parents obtain it (Lippold et al., 2014), making it a key parenting construct. Many prevention programs target parental knowledge through improving family management strategies and parent-child communication (Greenberg & Lippold, 2013; Lippold & McNamee, 2014).

In this study, we build on prior research to examine year-to-year fluctuation in parental knowledge, or its *lability*, and its implications for youth outcomes. Extant longitudinal studies have focused on long-term (e.g., 3 to 5 years) linear trends in parental knowledge and their relations to youth adjustment, finding that steeper linear decreases on average may be linked to higher levels of problem behavior (Laird, Pettit, Bates, & Dodge, 2003). Yet, some changes in parental knowledge may not be captured by linear trends (Lippold et al., 2015; Marceau, Ram, & Susman, 2014). Rather, some families may experience fluctuating knowledge, with many inconsistent ups and downs in knowledge over time. We use the term *knowledge lability* to describe these within-person fluctuations in parental knowledge over time. Knowledge lability may be an additional type of change that is co-occurring along with long-term developmental trends and may offer unique information about the developmental processes in parental knowledge that may be associated with problem behavior. First, we investigate if changes in knowledge from Grades 6 to 8 could be characterized by lability. Then we test whether knowledge lability explained unique variance in later youth problem behavior, above and beyond knowledge levels and developmental trends, and if these linkages differ by child gender.

Parents may demonstrate high or low knowledge lability independent of the direction and rate of long-term developmental trends. Figure 1 depicts two families with the same knowledge level and linear developmental trend (dotted line) but with different amounts of lability. Panel A depicts a family high in knowledge lability, with extensive, unpredictable fluctuations around their linear trend in knowledge (solid line). Panel B depicts a low-lability family with only small fluctuations around their linear trend in knowledge. In the low-lability family, the linear decline in knowledge unfolds in a smooth, consistent manner. These patterns of within-person fluctuation are typically captured as error variance in traditional growth curve models. However, similar to dynamic systems approaches (Granic et al., 2003), we explore the view that knowledge fluctuations may also have important implications for youth adjustment.

Lability in Knowledge and Youth Outcomes

The manner in which changes in parental knowledge unfold during the early adolescent years may have substantial developmental significance. From a Stage-Environment-Fit Perspective (Eccles et al., 1993), adolescents may thrive in environments that meet their needs for independence and autonomy. At the same time, decision-making skills and impulse control are typically underdeveloped during this developmental period (Steinberg,

2007), calling on parents to balance an adolescent's drive for autonomy with their continued need for structure.

Youth development may be best supported when parents have predictable, gradual decreases in knowledge, with little lability. Knowledge lability may reflect fluctuations in family management strategies, youth disclosure, or the quality of the parent-child relationship. Social development theories (Bandura, 1977; Vygotsky, 1978), posit that youth learn best when they are given adequate scaffolding and presented with challenges they may be able to successfully meet. When parents reduce family management practices and supervision in a gradual, predictable manner, it may create a context that supports youth autonomy and independence. In this family dynamic, decreases in family management strategies and youth disclosure are a reflection of developmentally appropriate differentiation from the family, and may aid youth in developing effective decision-making and problem-solving skills. In addition, the experience of successfully attaining independence may foster a sense of youth self-efficacy and control over their environment, with positive implications for their self-esteem (Bandura, 1977). And, youth with parents who respect and encourage youth privacy and independence may be more likely to maintain a close parent-child relationship (Hawk, Keijsers, Hale, & Meeus, 2009), making them more likely to internalize parental prosocial norms that may be protective against problem behavior (Catalano & Hawkins, 1996). Because gradual, predictable decreases in knowledge may promote youth decision making skills, self-efficacy, and close parent-child relationships, youth who experience low lability in knowledge may be less likely to engage in substance use, delinquency, and to develop internalizing problems.

In contrast, the unpredictable, large fluctuations in parental knowledge in families that exhibit high levels of lability may reflect family difficulty navigating the adolescent transition and would be expected to foreshadow higher levels of youth substance use, delinquency, and internalizing problems. Rapid increases in freedom and low supervision that are later revoked may reflect a pattern of alternating parental disengagement and over-control; both of which are a mismatch for adolescents' developmental needs (Eccles et al., 1993). During periods of parental disengagement, youth may perceive there are few consequences for problem behavior, which may increase their risk for delinquency or substance use (Halgunseth, Perkins, Lippold, & Nix, 2013). During periods of parental over-control, youth may feel their autonomy needs are not being met and may use substances or delinquency as a way to appear more mature (Moffit, 2003). Indeed, both too little and too much parental control—both of which may contribute to high lability -- have been associated with higher delinquency and substance use (Barber & Xia, 2013). High knowledge lability may reflect a family dynamic of mistrust, where parents do not trust that youth are capable of navigating their independence. Ups and downs in family management strategies may hinder youth from developing effective decision-making skills, impulse control, and self-efficacy, thereby increasing youth risk for delinquency, substance use, depression, and anxiety (Bandura, 1977; Steinberg, 2007). Moreover, high levels of lability may also reflect ups and downs in the affective relationship and conflict between parents and youth, which may also be linked to increased risk for substance use, delinquency (Catalano & Hawkins, 1996) and mental health problems (Branje, Hale, Frijns, & Meeus, 2010).

Gender differences

Some studies suggest that the linkages between knowledge lability and youth adjustment may vary by youth gender but findings are inconsistent. Parental relationships with girls tend to be more intimate than with boys (Leaper, 2002). Because girls are socialized to be more relationship-oriented than boys, they may be more strongly affected by fluctuations in parents' family management strategies or warmth (Leaper, 2002). Indeed, a recent study found that the linkages between the quality of the parent-child relationship and adolescent secrecy was stronger among girls than boys (Keijsers, Branje, Frijns, Finkenauer, & Meeus, 2010). Girls were more likely to keep secrets than boys when their relationships with their parents were less warm. However, studies examining gender moderation of links between knowledge and youth outcomes have produced mixed findings. Some studies have found stronger linkages for girls but others have found no evidence of gender moderation (Kerr et al., 2010; Pettit, Keiley, Laird, Bates, & Dodge, 2007). These findings highlight the need to test for gender differences in the linkages between lability and youth outcomes, but do not suggest specific hypotheses.

The Present Study

This study examined lability in parental knowledge across Grades 6 to 8 and its linkages to youth internalizing problems, delinquency, and substance use in Grade 9. First, we investigated if parental knowledge is characterized by lability by partitioning variance in repeated measures of knowledge to linear developmental trends and fluctuations around that trend (lability). As in prior research on lability in parent-child relationships (e.g., Marceau et al., 2014), we expected to find evidence of long-term decreases in knowledge, as well as a substantial amount of year-to-year fluctuation (i.e., lability) around those long-term trends. Second, we examined whether knowledge lability had unique associations with youth outcomes, controlling for developmental trends and level of knowledge. We hypothesized that more knowledge lability will be linked to later youth problem behavior and internalizing problems. We also tested whether these associations differed for boys and girls.

Method

Study Design and Participants

This study uses data obtained from a subset (n = 840) of early adolescents who participated in three or more waves of in-home data collection as part of the PROSPER project (Promoting School-Community-University Partnerships to Enhance Resilience), a large scale effectiveness trial of preventive interventions aimed at reducing substance use initiation among rural adolescents in 28 rural communities and small towns in Iowa and Pennsylvania (see Spoth, Greenberg, Bierman, & Redmond, 2004). Students from two successive cohorts of sixth graders completed in-school questionnaires. On average, 88% of all eligible students completed in-school assessments at each wave. In addition, families of students in the second cohort were randomly selected and recruited for participation in an additional in-home assessment that included a family interview, videotaping of a family interaction, and written questionnaires completed independently by the youth, mother, and, if present, father. Of the 2267 families recruited for in-home family assessments, 980 (43%)

completed the in-home assessments. Retention rates were moderate at all waves: W2 = 83%, W3= 82%, W4 = 80%, W5=76%.

To maintain precision in our measurement of lability, analyses were limited to those youth who provided three or more waves of data (86%, n = 840). Youth who provided less than three waves of data had less educated parents (12.05 vs. 13.38 years of education; $p < .001$) and were less likely to be White (77% vs. 88%; $p < .01$) than those who provided three or more waves of data. No differences were found for other demographic variables (income, gender, dual biological marital status, or condition) or the substantive variables or outcomes (i.e., parental knowledge, delinquency, antisocial peers, substance use, and internalizing problems), suggesting that the 3+ occasion sample can be considered fairly representative of the full sample.

The demographics of the in-home sample at Wave 1 are as follows. Youth (53% female) resided in Iowa (61%) and Pennsylvania (39%), and were, on average, 11.3 years old (SD=. 49) at study entry in sixth grade. The mean age of mothers was 38.7 (SD=6.05) and of fathers was 41.2 (SD=7.14). Average household income was $51,000 (in 2003) and 62% of parents had some post-secondary education. The average number of youth per home was three (SD=1.56). Most youth were living in two-parent homes; 80% were living with married parents and 54% were living with both biological parents. Most youth were Caucasian (84%); 6% Hispanic, 3% African American, 2% were Native American/ American Indian, 1% Asian and 4% Other.

Measures

Measures were adapted from the Iowa Youth and Families Project (Conger, 1989; McMahon & Metzler, 1998; Spoth, Redmond, & Shin, 1998) and the National Youth Survey (Elliott, Ageton, & Huizinga, 1982). Because research suggests that youth are more likely to report problem behavior if asked in school rather than at home, we use the in-school assessments of youth outcomes (Redmond, Schainker, Shin, & Spoth, 2007), which were gathered within months of the home visit. This analysis uses four waves of data for parental knowledge (Fall of Grade 6, Spring of Grade 6-8) and one wave of data for our outcome variables (Grade 9).

Parental knowledge of youth activities—Youth perceptions of parental knowledge were measured in the in-home assessments using five items. Youth were asked to rate how often (1 = *never* to 5=*always*) their mothers and fathers (separately) knew where they are, who they are with, and what they did when they are away from home (e.g., if youth did something really well or got in trouble at school or someplace else away from home, did not do things parents asked them to do; average α = .82, mothers, and α = .89, fathers). Similar to Laird et al. (2003), we conceptualized parental knowledge as a family-level variable and used the maximum of the reports about mother's and father's knowledge reported at each wave. Assessing the highest reported level of knowledge allowed us to capture the highest degree of parental knowledge in a household at each wave, regardless of parents' sex. In follow-up analyses (not shown), using the average of the available parental reports as the knowledge score (rather than maximum) provided the same pattern of results.

Alcohol use—A cumulative index of participants' alcohol use initiation and past month use was created using 6 items about various forms of beer, wine, and liquor consumption (e.g., more than just a few sips, ever had a drink, drunkenness). Items were coded to create an index ranging from 0 to 6 with higher scores indicating greater alcohol use (α = .86).

Delinquency—Twelve items assessed youth involvement in deviant behaviors in the past 12 months including questions assessing whether the individual had taken something worth less than $25 or physically fought with someone out of anger. Responses were dichotomized (0 = *never*, 1= *once or more*) and summed to obtain a total delinquency score (α = .90).

Internalizing Problems—Internalizing problems were measured using a 14 item internalizing subscale from the Youth Self Report of the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). Example items include "I am unhappy, sad, or depressed", "I worry a lot". Responses were provided on a 0-2 scale (0 = *not true* to 2= *very true or often true*) and were summed to create a total internalizing problems score (α = .88).

Tobacco use—Two dichotomous items that asked youth if they have ever smoked cigarettes and if they have smoked cigarettes in the past month (0= *no*; 1=*yes*) were summed to create an index of tobacco use (α = .74).

Control variables—Five additional variables that were associated with youth outcomes in prior literature (Hawkins, Catalano, & Miller, 1992) were used as controls: gender (0=female; 1=male), dual biological parent status (0=not living with biological parents; 1=living with both biological parents), parent education (years in school including secondary education, M =13.19, SD= 2.18); and intervention condition (0=control; 1=intervention condition). We also controlled for the parent-child affective relationship using a six item scale (e.g., "How often in the past month did you let this child know you really care about him/her?" [1=never to 7=always]). Youth reports of both parents were averaged to obtain a total score (α = .81).

Data Analysis Plan

Our first goal was to decompose changes in knowledge across Grades 6-8 into variance attributed to developmental trends and lability. The four waves of parental knowledge were modeled using a linear growth model (McArdle & Nesselroade, 2003), implemented as a 2-level multilevel model in SAS 9.3 (proc mixed). We also investigated if a third level was needed to account for students nested within schools. However, only .006 % of the variance at knowledge was at the school-level, suggesting use of a more parsimonious 2-level model of the form

$$\begin{aligned} Level\quad 1{:}Knowledge_{ti} &= \beta_{0i} + [\beta_{1i}\,(time_{ti})] + [e_{ti}] \\ Level\quad 2{:}\beta_{0i} &= \pi_{00} + u_{0i} \\ \beta_{1i} &= \pi_{10} + u_{1i} \end{aligned}$$

where youth *i*'s reports of parents' knowledge at wave *t* were modeled as a function of a person-specific level (intercept), β_{0i}, a person-specific rate of change (developmental trend)

in knowledge with respect to $time_{ti}$ (time in study coded in months), β_{1i}, and "residual" fluctuations, e_{ti}. Person-specific coefficients were modeled as sample means (π_{00} and π_{10}, sample-level fixed effects) and person-specific deviations around those means (u_{0i} and u_{1i}, random effects). Based on prior literature, both linear and quadratic growth models were tested. The linear model provided a superior fit to our 4-occasion data (linear model AIC = 4794, BIC = 4814; quadratic model AIC = 4807, BIC = 4826) and was used in all subsequent steps.

To quantify the proportions of variance in the repeated measures that could be attributed to developmental trends (variance explained by time) and lability (residual variance) we followed procedures outlined by Snijders & Bosker (1999) wherein the estimates of the residual variance (σ^2_e) from the above model are compared to those obtained from (unconditional means) models without *time* as a predictor (σ^2_{ebase}). Specifically, the proportion of variance attributed to developmental trends was calculated as $\%\quad Long-term\quad Change=\frac{\left(\sigma^2_{e(base)}-\sigma^2_e\right)}{\sigma^2_{e(base)}}$. This decomposition allowed us to discern the percentage of total variance in knowledge that was captured by the long-term linear trends. The leftover residual variance, often considered "error" in the growth modeling context, is conceptualized as lability, formally a combination of meaningful fluctuations around the linear trends, measurement error, and occasion-specific error.

For our second goal, we used Poisson regression models to examine how between-family differences in knowledge lability were related to youth problem behaviors in Grade 9. First, we derived scores for the intercept, developmental trend, and lability for each person in our sample. We obtained the Bayes empirical estimates of β_{0i} and β_{1i} (measures of an individual's *knowledge level* and *developmental trend*) from the linear growth model above (standard output from proc mixed). The residuals, e_{ti} (calculated as the difference between predicted and observed scores) were used to quantify the extent of knowledge lability for each participant. Specifically, *knowledge lability* was quantified as the within-person standard deviation of the e_{ti} scores, $Lability_i=\sqrt{\sigma^2_i}=\sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left(e_{ti}-\bar{e}_i\right)^2}$. Individuals higher in lability had relatively large deviations from their predicted developmental trends in knowledge across waves, while those lower in lability had relatively small deviations from those trends. The three derived scores (each individual's level, slope, and lability score) were then used as predictors within outcome-specific general linear model in the form:

$$ProblemBehavior_i=\alpha_0+\alpha_1 knowledgelevel_i+\alpha_2 devchange_i+\alpha_3 lability_i+\alpha_{4-9} controls_i+r_i$$

where *problembehavior*$_i$ is the level of youth problem behavior in Grade 9 (substance use, antisocial peer associations, delinquency, or internalizing problems) and *controls*$_i$ included gender, dual biological marital status, condition, parent education, parent-child affective quality, and initial levels (Fall Grade 6 scores) of the specific problem behavior being examined.[1] Of particular interest were the unique associations of lability with each outcome,

[1]We also ran our models including race as a covariate and obtained the same pattern of results.

α_3. Lastly, we tested whether the relations between lability and each problem behavior differed for boys and girls through inclusion of $gender_i$ x $lability_i$ interaction variables into the models. Again, we assessed if a two level model was needed with students nested within schools. The school-level variance for the outcome variables ranged from 3% to 10%, the random variance components were not significantly different than 0 and the results were identical for both the one and two level models. Therefore, we present our findings from the more parsimonious one-level model.

Results

Characterizing Change

Our first goal was to assess if the changes in knowledge during early adolescence reflected lability. Growth models revealed that on average, there was a small, gradual linear decline over early adolescence (π_{10} = −0.003 per month or −0.036 per year, $p < .001$), with substantial between-person differences in the rate of change in knowledge (random effects for time, σ^2_{u1} = .001). The proportion of variance accounted for by $time_{ti}$ was obtained through comparison of residual variances from the unconditional means model (σ^2_{ebase} = .1765) and the linear growth model (σ^2_e = .1497). Specifically, 15% = [(.1765 −.1497)/.1765] of the year-to-year variance in knowledge was characterized by linear developmental trends, with the remaining 85% being residual variance that contains meaningful fluctuations (lability) and non-meaningful fluctuations (measurement error, occasion-specific error, the sources of which may not be known). This variance decomposition suggests that changes in knowledge may be driven by both developmental trends, lability, and other processes.

Relations to Youth Outcomes

Our second goal was to examine whether the *knowledge lability* was uniquely associated with Grade 9 levels of problem behavior, controlling for developmental trends and level of knowledge. Descriptive statistics for our study variables are shown in Table 1. Parents who had greater lability in knowledge had lower levels of knowledge (r = −.74) and steeper linear decreases in knowledge (r = −.47). Given such high correlations, additional analyses were run to investigate the potential role of multicollinearity. Conceptually, our concern focused on the overlap between knowledge level and lability. Across models, the Variance Inflation Factor (VIF), which assesses how much the standard error of model estimates are inflated due to multicollinearity, ranged from 2.51 to 2.56, in all cases below the recommended cut off value of 10 (see Hair, Anderson, Tatham, & Black, 1995). Model results were also similar when knowledge level was removed as a predictor. Thus multicollinearity was not likely to have biased our estimates. The lability scores had an average value of 0.27 (SD = .26) and ranged in value from 0.004 to 1.39, suggesting there was extensive between-person differences in lability.

Results from the Poisson regression models wherein individuals' level, slope, and lability scores were examined as predictors of youth outcomes are shown in Table 2. Knowledge lability was uniquely associated with all of our youth outcomes, even when controlling for knowledge level and linear trends. As hypothesized, greater lability was associated with

higher Grade 9 tobacco use (a_3 = 1.02), alcohol use (a_3 = .39), delinquency (a_3 = .61), and internalizing problems (a_3 = .29). Steeper linear developmental trends (a_2) were also associated with more alcohol use and delinquency. Importantly, some of these findings differed for boys and girls. Gender moderated the associations between lability and delinquency and internalizing problems (lability x gender interaction term for delinquency, a = −1.65, *SE* = .33, $p < .001$; for internalizing problems a = −.51, *SE* = .19, $p < .01$). Follow-up tests of the simple slope revealed that these associations were significant for girls but not boys (for delinquency, girls, a_3 =1.26, *SE* = .27, $p <.001$, and boys a_3 = −.39, *SE* = .32, $p > .05$; for internalizing problems, girls, a_3 =.42, *SE* = .14, $p < .01$ and boys a_3 = −.09, *SE* = .19, $p > .05$).

Discussion

As families navigate the adolescent transition, it may be normative for parents to experience changes in knowledge. Prior studies, using latent growth curve models have found linkages between the degree to which parent knowledge declines over time and adolescent outcomes. These studies have modeled smooth, linear developmental trends in knowledge using growth curves (Laird et al., 2003). Yet, in addition to these linear trends, families may also experience differences in the extent of fluctuation of knowledge. Some families may experience many unpredictable fluctuations from year-to-year around their developmental trend, which we term lability. The goals of this paper were a) to explore the degree that changes in knowledge during early adolescence reflected lability and b) whether lability was linked to later youth problem behavior, above and beyond knowledge levels and developmental trends.

Changes in knowledge from Grades 6-8 were characterized by both lability and developmental trends, confirming our first hypothesis. Consistent with previous studies (Laird et al., 2003), we found normative, gradual linear declines in parents' knowledge about adolescents' activities. As adolescents became older, parents, on average, knew less about their activities. These developmental trends in knowledge had important implications for youth adjustment, and steeper linear trends were linked to higher alcohol use and delinquency. Linear trends captured only some of the variance in knowledge. There was substantial residual variance in knowledge, which reflects lability, within-person fluctuations in knowledge, as well as error, the sources of which may be known and unknown. These findings suggest that many families experienced fluctuations in knowledge across early adolescence, with many unpredictable ups and downs in knowledge, and they are consistent with recent work reporting evidence of substantial lability in parent-youth closeness and conflict during the early adolescent transition (Marceau et al., 2014). The findings also support a dynamic systems perspective, which posits that there may be many fluctuations in parent-child behaviors during early adolescence as a family adjusts to a more egalitarian parent-youth relationship (Granic et al., 2003). Including lability in studies, in addition to linear trends, may expand our understanding of changes in knowledge during early adolescence and suggest new directions for preventive interventions.

As expected, higher levels of knowledge lability were associated with greater youth alcohol and tobacco use. Even when controlling for the level and linear trends in knowledge, youth

with parents who had more knowledge lability were more likely report cigarette and tobacco use in Grade 9. We also found that parents with lower levels of knowledge were more likely to experience high lability in knowledge. Even with high correlations between lability and mean levels of knowledge, lability explained unique variance in youth substance use. Given that early use of substances has been linked to higher alcohol dependence in adulthood (Grant & Dawson, 1997), knowledge lability during early adolescence may have important linkages to health over the life course.

We cannot discern the direction of effects underlying the association between lability in knowledge and substance use nor the underlying processes. Fluctuations in knowledge likely reflect a combination of processes including inconsistency in child disclosure of information, children's concealment of information, the parent-child affective relationship, and family management strategies (Racz & McMahon, 2011). It is possible that ups and downs in family management strategies and the parent-child affective relationship increase the risk for youth substance use. Controlling for initial levels of outcome variables increases our confidence that these results are not fully explainable by preexisting problem behavior. Yet, shifts in problem behavior may also lead to knowledge lability – representing a child-driven perspective. There may also be reciprocal relationships between knowledge lability and substance use (Laird et al., 2003). Thus, we discuss all of these possibilities when interpreting our findings.

From a parent-driven perspective, knowledge lability may create gaps in supervision and parental control that may increase the risk for youth substance use. Perhaps parents high in knowledge lability are inconsistently engaged with their children, with intermittent periods during which parents withdraw from their children, and other periods when they engage in too much control. Intermittent periods of disengagement may influence youth perceptions of sanctions related to using substances, such that they think it will be unlikely they will get caught for engaging in substances (Halgunseth et al., 2013). Youth may turn to substances as a way to assert their autonomy (Moffitt, 2003) or in an effort to exert control over an unpredictable environment (Bandura, 1977). From a socialization perspective, inconsistency in the relationship may make it less likely that youth will internalize prosocial norms from their parents (Catalano & Hawkins, 1996), which may pose additional risks for substance use.

From a child- driven perspective, youth who are engaging in substance use may disclose information to their parents in an inconsistent manner, leading to more knowledge lability. Youth disclosure may be dependent on parental reactions to information and their affective relationship. If youth disclose substance use to their parents, and their parents have a negative reaction, they may be less likely to share information again in the future (Tilton-Weaver et al., 2010). Thus youth who engage in substance use may intermittently disclose information to their parents depending on the quality of their relationship and parental reactions to information, resulting in lability in knowledge. Youth substance use may also strain the parent-child relationship, leading parents to sporadically withdraw from their children. There is some evidence that parents may “give up” when encountering youth problem behavior - it is possible that for some families this withdrawal may be intermittent and lead to knowledge lability (Glatz, Stattin, & Kerr, 2011).

Greater lability in knowledge was linked to higher levels of delinquency and internalizing problems only for girls (but not boys). Girls may be socialized to be more relationship oriented and therefore may be more sensitive to underlying shifts in communication processes than boys (Leaper, 2002). Thus, girls may be less likely to disclose information and more likely to conceal information when they experience shifts in the parent-child affective relationship (Keijsers et al, 2010). Given their increased emotional dependence on their parents, keeping secrets may come at a stronger emotional cost to girls' relationships with their parents than for boys (Keijsers et al., 2010). Given the higher rates of depression for girls, lability may also have a stronger impact given girls' increased susceptibility (Cole et al., 2002).

Intervention Implications

These results suggest that family-based interventions may be most effective if they focus on teaching parents to *gradually and predictably* decrease parental knowledge during adolescence. Parents may be advised to avoid large, unpredictable shifts in rules and independence. Rather, parents may need to scaffold youth as they progress by gradually and predictably granting them more independence and unsupervised time. Further, although small declines in knowledge may be normative, parents should be encouraged to maintain close relationships that allow for youth to have healthy, gradual increases in privacy. Such gradual independence and allowing youth gradual increases in privacy may promote youth self-efficacy and decision-making skills. A positive parent-child relationship may also promote more consistent child disclosure. Decreases in youth disclosure, even if they are only temporary, may lead to lability, and therefore increase risk for negative youth outcomes. Family-based interventions currently focus on the importance of parenting consistency, parent-child communication, and monitoring (Dishion et al., 2003; Kumpfer, Molgaard, & Spoth, 1996), as well as autonomy (Haggerty et al., 2007). Yet, interventions do not explicitly address the importance of gradual, predictable, shifts in parenting across the adolescent transition. Family based-interventions may need to explicitly address the need for predictable, gradual changes in knowledge across adolescence. Our findings also suggest that interventions may add additional longer-term booster sessions; quick shifts in parenting immediately following interventions that are not sustained may create lability, and increase risk for more problem behavior.

Limitations and Future Directions

These findings should also be considered in light of the study's limitations. It is unclear from this analysis if lability is a function of parent-driven family management behaviors, adolescent disclosure, or other aspects of the parent-youth relationship (Racz & McMahon, 2011). More studies are also needed that unpack the mechanisms that may explain how lability in knowledge may be linked to youth outcomes. Like all non-experimental studies, it is possible that these associations may be explained by an omitted third variable, such as secrecy or lying (Frijns et al., 2010). Our variance decomposition of parental knowledge did not account for error, including measurement error inherent in this scale, as well as occasion-specific error, the source of which may not be known. The PROSPER sample is representative of a population of primarily Caucasian rural adolescents. More studies are needed to understand if our results generalize to other cultural groups or youth living in

urban settings. Further, PROSPER was an intervention study (Spoth et al, 2007). Although we controlled for intervention condition, future studies are needed to understand intervention effects on lability. Additionally, our results were based on youth reports of the highest level of parental knowledge; it is possible that lability of mothers' and fathers' knowledge have different implications for problem behavior. We relied on youth report of parental knowledge and common method variance may underlie some of our findings. We explored changes in knowledge during early adolescence, a period when parents generally still have high knowledge of youth behavior. Thus, ceiling effects in our data may have limited our ability to fully capture lability. Lastly, given the original study design, we assessed lability using a small set of repeated measured obtained at (primarily) yearly intervals. More closely spaced measures and more frequent observations (e.g., using experience sampling methods) may capture additional aspects of lability (Granic, Hollenstein, Dishion, & Patterson, 2003; Lippold et al., 2014). Studies on intraindividual variability in other areas suggests that measurement of parent-child relationships across multiple time scales (e.g., measurement bursts) will provide a rich understanding of how lability in knowledge and other aspects of parenting change across days, weeks, months, years (Ram & Diehl, 2015).

Despite these limitations, including measures of lability into studies may allow us to gain a deeper understanding of changes in the parent-child relationship during early adolescence and their associations with youth problem behavior. Highly labile, inconsistent knowledge from year-to-year may have important linkages to youth risky behavior, especially for girls.

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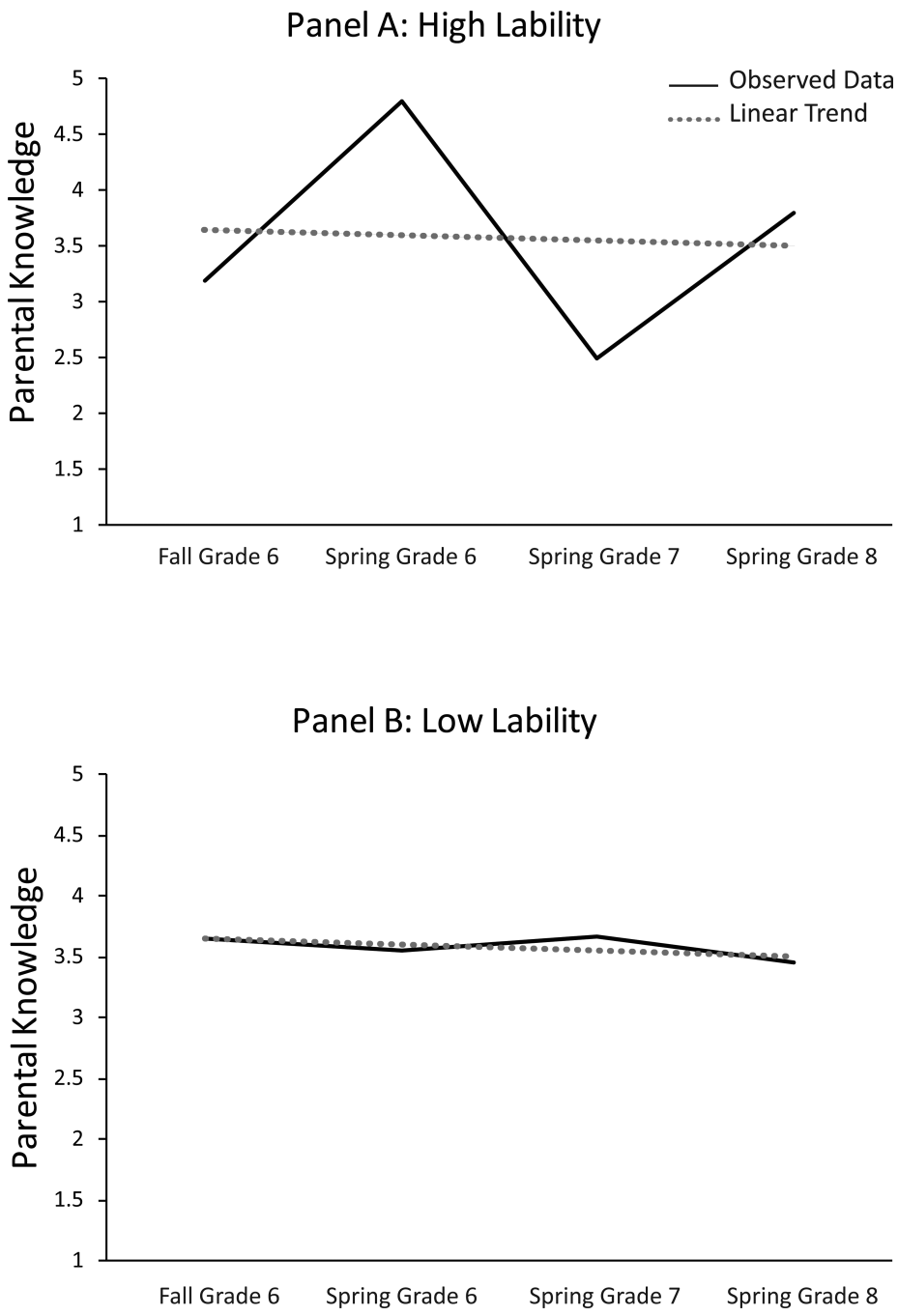

Figure 1.

Differences in lability of parental knowledge. Panel A and B represent families who have the same linear slope (developmental trend) in knowledge across early adolescence but different levels of lability. Panel A represents a family who is high in lability (e.g., has many within-person fluctuations) and Panel B represents a family low in lability. Solid lines indicate raw data values for a particular individual at each time point. Dotted lines represent the linear slope or mean developmental trends in knowledge from Grades 6-8.

Table 1

Means, Standard Deviations, and Correlations of Study Variables

	Total Sample		Girls		Boys								
	Mean	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
1. Parental knowledge level	4.63	.32	4.67	.29	4.58	.35	1.00						
2. Parental knowledge developmental trend	−.003	.01	−.002	.01	−.004	.01	.71***	1.00					
3. Parental knowledge lability	.27	.26	.25	.25	.29	.26	−.74***	−.47***	1.00				
4. Delinquency	.93	1.99	.80	1.73	1.08	2.26	−.21***	−.23***	.19***	1.00			
5. Tobacco use	.42	.71	.45	.73	.36	.69	−.21***	−.16***	.23***	.44***	1.00		
6. Alcohol use	2.07	2.03	2.15	2.06	1.97	2.00	−.17***	−.19***	.17***	.40***	.59***	1.00	
7. Internalizing problems	3.50	4.41	4.68	4.92	2.16	3.29	−.08*	−.03	.09**	.14**	.12**	.11**	1.00

Note.

* $p < .05$

** $p < .01$

*** $p < .001$. Means are presented for Wave 5 for outcome variables. Statistics are presented for the subsample of youth who provided three or more waves of data (n=840).

Table 2

Developmental Trends and Lability of Parental Knowledge (Grades 6 to 8) as Predictors of Youth Problem Behavior (Grade 9) using Poisson Regression Models

	Tobacco Use		Alcohol Use		Delinquency		Internalizing Problems	
	Est	**SE**	**Est**	**SE**	**Est**	**SE**	**Est**	**SE**
Knowledge level (α_1)	−.21	.39	.17	.19	−.21	.22	−.05	.12
Knowledge developmental change (α_2)	−.73	10.10	−14.35**	5.39	−22.71***	6.59	−5.52	3.56
Knowledge lability (α_3)	1.02**	.36	.39*	0.18	.61*	.24	.29*	.12
Grade 6 Levels of outcome (α_4)	.79***	.12	.29***	.03	.26***	.02	.06***	.00
Gender (α_5)	−.31*	.14	−.14**	.06	.05	.09	−.73***	.05
Parent Education (α_6)	−.15***	.03	−.03*	.02	.00	.02	.01	.01
Parent dual-bio marital status (α_7)	−.58***	.14	−.27***	.06	−.51***	.09	−.08*	.04
Parent-child affective quality (α_8)	−.06	.10	−.03	.04	.12	.07	−.03	.03
Condition (α_9)	−.19	.14	−.06	.06	−.02	.09	.10*	.04

[z] p = .06. The sample was limited to youth who provided three or more waves of data (n = 840). All estimates are unstandardized. All variables were centered for our analysis. Gender was coded as 0 = *female*, 1 = *male*.

* $p < .05$

** $p < .01$

*** $p < .001$