Published in final edited form as:
Child Dev. 2003 ; 74(3): 752–768.

Parents' Monitoring-Relevant Knowledge and Adolescents' Delinquent Behavior: Evidence of Correlated Developmental Changes and Reciprocal Influences

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Abstract

Links between parental knowledge and adolescent delinquent behavior were tested for correlated rates of developmental change and reciprocal associations. For 4 years beginning at age 14, adolescents ($N = 396$) reported on their delinquent behavior and on their parents' knowledge of their whereabouts and activities. Parents completed measures of their adolescents' delinquent behavior. Knowledge was negatively correlated with delinquent behaviors at baseline, and increases over time in knowledge were negatively correlated with increases in parent-reported delinquent behavior. Reciprocal associations indicate that low levels of parental knowledge predict increases in delinquent behavior and that high levels of delinquent behavior predict decreases in knowledge. Discussion considers both youth-driven and parent-driven processes that may account for the correlated developmental changes and reciprocal associations.

Parents are expected to know their children's whereabouts, activities, and playmates. Most often, parents of young children obtain their knowledge through direct supervision of their children and their children's activities by themselves or other adults (e.g., child-care providers). However, as children grow older and their activities, interests, and playmates change and expand, they begin to spend more time outside of direct adult supervision (Laird, Pettit, Dodge, & Bates, 1998; Patterson & Stouthamer-Loeber, 1984). Yet, good parents still want to know where their children are, what their children are doing, and with whom they are spending time. As children begin to spend more time on their own, parents shift from in-person supervision to more distal forms of monitoring to obtain information.

Parental monitoring efforts may take the form of parent-initiated conversations about the child's activities and friends (see Laird, Pettit, Mize, Brown, & Lindsey, 1994), and parents may impose and enforce a set of rules about where their children may go and with whom they may spend time (Snyder & Patterson, 1987). Although successful monitoring requires a willingness on the part of the child to provide information (Stattin & Kerr, 2001), parents obtain information from a number of sources including shared activities with their children,

conversations with teachers, and contact with other parents (Crouter, Helms-Erikson, Updegraff, & McHale 1999). Because parental knowledge is obtained from multiple sources, Stattin and Kerr (2001) encourage researchers to be explicit about whether they are measuring parental knowledge or parental monitoring efforts.

Despite some disagreement on the importance of specific monitoring practices and sources of information, parental monitoring has become a central component of models of the development and prevention of antisocial behavior (e.g., Hirschi, 1969; Patterson, Reid, & Dishion 1992; see also Dishion & McMahon, 1998). Poor monitoring (i.e., lack of knowledge) is thought to lead to involvement with antisocial and delinquent peers (e.g., Dishion, Capaldi, Spracklen, & Li, 1995; Patterson & Dishion, 1985) or to increased susceptibility to antisocial peer pressure (e.g., Curtner-Smith & MacKinnon-Lewis, 1994; Fridrich & Flannery, 1995), resulting in antisocial and delinquent behavior. Findings consistent with this formulation have been presented in several cross-sectional and longitudinal studies. Specifically, lower levels of parental knowledge (i.e., minimal knowledge of their children's whereabouts, activities, and friends) are associated with greater involvement in antisocial and delinquent behavior (e.g., Cerkovich & Giordano, 1987; Frick, Christian, & Wooton, 1999; for reviews see Dishion & McMahon, 1998; Patterson & Stouthamer-Loeber, 1984), and greater use of tobacco, alcohol, and other drugs (e.g., Barnes, Reifman, Farrell, & Dintcheff, 2000; Dishion et al., 1995; Flannery, Vaszonyi, Torquati, & Fridrich, 1994; Fletcher, Darling, & Steinberg, 1995).

The purpose of the current study was to explore further the association between parental knowledge and delinquent behavior. Specifically, this study focused on two issues related to the nature of the longitudinal association between knowledge and delinquent behavior. The first issue centers on the developmental trajectories of knowledge and delinquent behavior and possible links between the trajectories. Mean levels of knowledge are expected to decrease through adolescence (e.g., Patterson & Stouthamer-Loeber, 1984; Stoolmiller, 1994) and mean levels of delinquent behavior are expected to increase, reach a plateau, and then decrease (e.g., Farrington, 1986; Moffitt, 1994; Windle, 2000). These mean-level developmental trends may reflect linkages between the two constructs, but the specific nature of the linkage is uncertain.

Research and theory have described processes that would lead to positive correlations between changes in knowledge and changes in delinquent behavior. Specifically, from the autonomy-granting perspective (e.g., Steinberg & Silverberg, 1986), reductions in knowledge should be associated with reductions in delinquent behavior as parents reduce monitoring efforts and grant more autonomy to deserving adolescents. Moreover, if parents engage in monitoring in a concerted effort to deal with problem behavior, increases in delinquent behavior will be linked to increases in monitoring, particularly if the initial monitoring efforts are unsuccessful. However, research and theory also have described an abdicating model of parenting that would lead to negative correlations between changes in knowledge and delinquent behavior. Specifically, increases in delinquent behavior should be associated with decreases in knowledge if increases in parents' monitoring efforts are part of an effective intervention and result in increased knowledge and reduced delinquent behavior. Furthermore, if reductions in monitoring provide adolescents with more opportunities to become involved in delinquent behavior, or if reductions in monitoring provide less incentive for adolescents to avoid delinquent behavior, then increases in delinquent behavior would be associated with decreases in knowledge. This pattern also would be expected if parental knowledge results primarily from adolescents' willingness to provide information because adolescents' reluctance to provide such information would be expected to increase as their involvement in delinquent behavior increases (Stattin & Kerr, 2001). Thus, processes have been identified that could account for decreases in knowledge being linked to either increases or decreases in delinquent behavior problems. Therefore, it is important to test the magnitude and direction of correlations

between changes in knowledge and changes in delinquent behavior to help distinguish among the different processes identified as potential links between these two constructs.

The second issue addressed in the current study, assuming there are correlations, concerns the direction of effects or the underlying processes accounting for the correlation between delinquent behavior and low levels of knowledge. The abdicating model of parenting proposes that low levels of monitoring cause or allow adolescents to become involved in delinquent behavior (Hirschi, 1969; Patterson et al, 1992). Furthermore, improving parents' ability to monitor is expected to lead to improvements in the behavior of the adolescents. That is, theory and intervention emphasize the impact of parents' knowledge on delinquent behavior (i.e., a parent effect). However, it is also possible that delinquent behavior has an impact on parents' knowledge (i.e., a child effect). For example, adolescent involvement in delinquent behavior may lead to increases in knowledge if parents increase monitoring in an effort to reduce behavior problems. Alternatively, delinquent behavior problems may lead to reductions in knowledge if adolescents are the primary source of the parents' information or if parents become frustrated and withdraw from their monitoring activities. The possibility that parents' knowledge is influenced by their children's behavior problems has been explicitly examined in only a few studies. Pettit, Laird, Dodge, Bates, and Criss (2001) found that higher levels of parent-reported age 5 externalizing behavior problems predicted less age 14 parent-reported (but not adolescent-reported) knowledge. In more contemporaneous analyses, Aseltine (1995) found that among high-school-age students, self-reported marijuana use negatively predicted parent knowledge 1 year later but that self-reported delinquency was not associated with knowledge. In contrast, Barber (1996) found that self-reported delinquent behavior was negatively associated with knowledge 1 year later. These findings are consistent with child-effects interpretations but are open to alternative explanations because the studies did not control for knowledge at the earlier time point.

Evidence suggests that links between parental knowledge and delinquent behavior may be bidirectional and raises the possibility of reciprocal effects (i.e., knowledge at Time 1 predicts delinquent behavior at Time 2, and delinquent behavior at Time 1 predicts knowledge at Time 2). Three studies have explicitly tested reciprocal relations between knowledge and behavior problems using cross-lag correlations. Kandel and Wu (1995) found that higher levels of conduct problems among 3- to 9-year-olds predicted lower levels of knowledge 6 years later (a child effect) but that lower levels of knowledge did not predict higher levels of conduct problems. In contrast, Jang and Smith (1997) found evidence of reciprocal relations between parental knowledge and delinquency in a sample of 13- to 16-year-olds over an 18-month period: Knowledge at Time 1 predicted delinquency at Time 2 controlling for delinquency at Time 1, and delinquency at Time 1 predicted knowledge at Time 2 controlling for knowledge at Time 1. Paternoster (1988) also found reported reciprocal associations between delinquent behavior (drug use and petty theft) and parental supervision in a sample of high school students, but in Paternoster's analyses, retrospective reports of delinquent behavior were modeled as prospective predictors of supervision although the adolescents completed the supervision and delinquent behavior measures at the same time.

The studies that have explicitly tested for bidirectional and reciprocal effects have focused on different age groups, tested different time lags, and provided inconsistent evidence of reciprocal influences. Thus, the second purpose of the study was to model explicitly bidirectional associations between knowledge and delinquent behavior problems over an extended period. Specifically, from a parent-effects perspective, low levels of knowledge are expected to be associated with higher levels of delinquent behavior at the next time point. From a child-effects perspective, high levels of delinquent behavior may be associated with lower or higher levels of knowledge at the next time point, depending on whether one holds the abdicating or the autonomy-adjusting parenting model. However, past research indicates that delinquent

behavior is more likely to predict reductions in knowledge than to predict increases in knowledge. Reciprocal influences would provide findings consistent with both the child-effects and the parents-effects perspectives. Most important, reciprocal influences would indicate that the negative association between knowledge and delinquent behavior identified in cross-sectional studies reflects a dynamic set of parent-driven and child-driven processes.

When addressing both correlated developmental changes and reciprocal associations, attention was given to possible gender differences in the links between knowledge and delinquent behavior problems. Mean-level gender differences in knowledge and delinquent behavior have been identified, with boys engaging in more delinquent behavior than girls (e.g., Windle, 2000; see also Coie & Dodge, 1998; Gottfredson & Hirschi, 1990), and parents of girls possessing more monitoring-relevant knowledge than parents of boys (Chilcoat, Breslau, & Anthony, 1996; Flannery et al., 1994; Stattin & Kerr, 2001). However, such mean-level differences do not necessarily imply that boys and girls differ in the processes linking knowledge and delinquent behavior. Jacobson and Crockett (2000) found that parental knowledge was more strongly related to delinquent behavior for boys than for girls, but other investigators have failed to find that parenting or family factors predicted delinquent behavior problems differently for boys and girls (Dornbusch, Erickson, Laird, & Wong, 2001; Scaramella, Conger, & Simons, 1999). However, because girls are often excluded from studies of the development of antisocial behavior (e.g., Henry, Tolan, & Gorman-Smith, 2001; Vitaro, Brendgen, & Tremblay, 2001), it remains unclear how widespread and reliable gender differences are in links between parenting and delinquency. In the current study, multigroup modeling procedures were used to determine whether the pattern of associations generalized to boys and girls.

The purpose of the present study was to address the role of parental knowledge in the development and maintenance of delinquent behavior during the high school years. Correlations between knowledge and delinquent behavior problem trajectories were examined to determine whether decreases in knowledge over time are associated with increases in delinquent behavior. Cross-lag associations between knowledge and delinquent behavior were modeled to determine the sequence of events leading to delinquent behavior and low levels of knowledge. Tests of gender differences were systematically included in all analyses to determine whether findings generalized to both boys and girls.

Method

Participants

Participating adolescents and their parents were drawn from the ongoing Child Development Project (CDP), a multisite, longitudinal study of children's and adolescents' adjustment from kindergarten through high school (see Dodge, Bates, & Pettit, 1990; Pettit et al., 2001). Two cohorts totaling 585 families were initially recruited from three geographical areas (Nashville and Knoxville, Tennessee, and Bloomington, Indiana) during kindergarten preregistration for the 1987–1988 and 1988–1989 school years. Of the parents who were asked to participate in the study, 75% chose to do so. Data used in the current study were collected over a 4-year period beginning the summer before the adolescents began ninth grade (M age = 14 years, 4 months, SD = 4 months).

As in many longitudinal studies, data were missing at different time points for different adolescents. Analyses were conducted using the AMOS 4.0 software package (Arbuckle, 1999), which handles missing data using a maximum likelihood approach offering advantages over more traditional listwise and pairwise deletion approaches (Arbuckle, 1996). Nonetheless, procedures were employed to limit the amount of missing data in the analysis. Specifically, only adolescents with data for at least three time points (out of four) on each variable of interest

were included in the analysis sample. This requirement limited the final sample to 396 adolescents. These 396 participants who provided sufficient data were compared with the remaining 189 CDP participants in terms of Year 1 demographic characteristics and behavior problems. In terms of family demographic background, participants included in the final sample were less likely to be boys (48%) than were participants with incomplete data (59%), $\chi^2(1) = 5.95, p < .05$, and participants in the final sample came from slightly higher socioeconomic status homes ($M = 40.4, SD = 14.2$) than did participants with incomplete data ($M = 37.4, SD = 13.4$), $t(568) = 2.11, p < .05$. Participants in the final sample did not differ from participants with incomplete data in terms of ethnicity (17.4% and 21.2% non-White, respectively), $\chi^2(1) = 1.4, p > .20$, or in terms of prekindergarten parent-reported externalizing behavior problems ($M_s = 11.6$ and $11.4, SD_s = 6.9$ and 7.2 , respectively), $t(565) = 0.26, p > .70$.

Procedure and Measures

Each year, parents and adolescents were contacted and asked to participate in an interview session or to complete questionnaires. During the summers before Grades 9 and 12, the parents and adolescents were interviewed separately in their homes by trained graduate student interviewers and asked to complete a questionnaire battery following the interview. Knowledge measures were derived from interview items and delinquent behavior problem measures were derived from questionnaire items for Grades 9 and 12. During the summer before Grades 10 and 11, the parents and adolescents were mailed questionnaires. The parents and adolescents were instructed to complete the questionnaires separately and to return them in separate envelopes. All measures were derived from questionnaire items for Grades 10 and 11.

Knowledge—Adolescent reports of parental knowledge were used in the primary analyses for three reasons. First, adolescent reports may be more accurate because adolescents are a primary source of parents' knowledge (Stattin & Kerr, 2001). Second, adolescents' behavior may be more influenced by their own perceptions of how much their parents know than by their parents' perceptions or by objective levels of knowledge. Third, knowledge items were not included on the parent questionnaires in Grades 10 and 11. However, parent reports of knowledge in Grades 9 and 12 were used in supplementary analyses to test the potential generalizability of reciprocal associations across informants.

Items assessing adolescents' perceptions of parental knowledge of the adolescents' whereabouts, companions, and activities were adapted from Brown, Mounts, Lamborn, and Steinberg (1993) and Dishion, Patterson, Stoolmiller, and Skinner (1991). This measure of knowledge is often labeled *monitoring* or *supervision*. However, Stattin and Kerr (2001) argued that the term *monitoring* implies a parent-driven process and that studies of parental knowledge should use more accurate terminology. The term *parental knowledge* is used in this study because the study is focused on the extent to which parents are aware of the whereabouts and activities of their adolescents.

The same five knowledge items (e.g., "How much do your parents know about who your friends really are?" "How much do your parents really know about where you are most afternoons after school?") and the same 3-point response scale (1 = don't know, 2 = know a little, 3 = know a lot) were used in the adolescent interviews and questionnaires. However, different stems were used in the questionnaires and interviews. Specifically, one set of items (worded *parents*) appeared in the questionnaires. In the interviews, adolescents responded to each item twice when appropriate, once in reference to their mother and once in reference to their father. When adolescents responded to both the mother and father items ($n_s = 352$ to 370), they tended to respond in a consistent manner ($r_s = .42$ to $.68, M r = .56$, all $p_s < .001$). Based on the assumption that it is only necessary for one parent to have knowledge of the adolescents'

activities (and that one parent may assume primary responsibility for obtaining knowledge) and therefore that knowledge may be underestimated by averaging across parents, the higher score was used for each item when adolescents responded to the mother and father statements. A single adolescent-reported knowledge score was computed each year by summing across the five items. Means, standard deviations, and Cronbach's alphas are presented in Table 1. Inspection of the distributions revealed that although the mean values were at the high end of the range, skewness and kurtosis were not problematic for the knowledge scores.

In Grades 9 and 12, parents responded to three items ("How difficult is it to know where your adolescent is and what he is doing?" "How often do you think your adolescent goes to places that you ask her not to go?" "When your adolescent is at a friend's house, how often do you think that a parent or other adult is there?") that assessed their ability to monitor the behavior of their adolescent. Parents responded to each item using a 5-point scale (1 = *not at all or never*, 5 = *extremely or always*). After reverse scoring the first two items, responses were summed to create parent-reported knowledge scores for Grades 9 and 12.

Delinquent behavior problems—Both adolescent- and parent-reported delinquent behavior problems were of interest. The Youth Self-Report Form (YSR; Achenbach, 1991b) was completed by adolescents in questionnaire form following the Grades 9 and 12 in-home interviews and was included in the questionnaire package completed by the adolescents in Grades 10 and 11. Likewise, parents completed the Child Behavior Checklist (CBC; Achenbach, 1991a) in all 4 years. Scores from the delinquency subscales were used in this study. The YSR delinquency subscale contains 11 items and the CBC delinquency subscale contains 13 items. Each item (e.g., steals, uses alcohol or drugs, lying or cheating) is scored on a 3-point scale (0 = not true, 1 = somewhat true, 2 = very often true). Adolescent- and parent-reported delinquent behavior scores were created for each year by summing across the items. See Table 1 for means, standard deviations, and reliability information. Inspection of the distributions revealed that the scores were highly skewed (values > 2.0) toward the negative end of the scales. Therefore, the scores were transformed by adding 1 and taking the natural logarithm before further analysis (Tabachnick & Fidell, 1996).

Analysis Overview

Analyses were guided by Willett and Sayer's (1994, 1996) procedure for fitting latent growth curve (LGC) models in a structural equation modeling framework and by Curran and Bollen's (2001) procedure for combining cross-lag correlation and LGC models. Combining cross-lag and LGC models provides a means to disentangle associations between time-specific measures and associations between developmental trajectories. To the extent that the LGC parameters do a better job of modeling variability over time than do autoregressive paths (i.e., time X measures are regressed on time X-1 measures of the same variable), the model that combines LGC models with cross-lag paths will provide a better fitting model and more accurate estimates of cross-lag associations (Curran & Bollen, 2001). This method is particularly well suited to evaluate both correlated rates of change and the possibility of reciprocal influences. Consistent with Curran and Bollen's framework, the LGC portion of the model focuses on linear or curvilinear change (i.e., growth) in knowledge and delinquent behavior problems over the 4-year period. For example, the LGC portion of the model tests whether changes in knowledge during the high school years are associated with changes in delinquent behavior problems over the same period. The cross-lag portion of the model provides a means to test reciprocal associations between knowledge and delinquent behavior problems. Specifically, the cross-lag portion of the model tests whether knowledge in one year predicts delinquent behavior problems in the next year while controlling for the stable components of growth over time in delinquent behavior, and whether delinquent behavior in one year predicts knowledge in the next year while controlling for the stable components of growth in knowledge.

Analyses were conducted in four steps. In the first step, developmental trajectories were identified and univariate models were fit for the three variables of interest (i.e., adolescent-reported knowledge, parent-reported delinquent behavior, and adolescent-reported delinquent behavior). Fitting the univariate LGC models determines the shape of the trajectory (e.g., linear, quadratic) and provides information on changes over time in the construct of interest. In the second step, two bivariate models were fit. The two bivariate models combined the knowledge and parent-reported and adolescent-reported delinquent behavior trajectory models, respectively. Covariances added to the bivariate models tested the associations between the knowledge and delinquent behavior developmental trajectories. In the third step, cross-lag paths were added to test reciprocal associations among the measures at specific time points. In each step of the analysis, models were fit for the entire sample and the analysis was repeated employing multigroup modeling procedures to test for gender differences. In the fourth step, simple cross-lag models were fit to determine whether the results obtained using adolescent reports of knowledge could be replicated using parent reports.

Results

Means and Intercorrelations

Adolescent-reported knowledge, parent-reported delinquent behavior, and adolescent-reported delinquent behavior were measured at four time points, and parent-reported knowledge was measured at two time points, as shown in Table 1. The sample mean for adolescent-reported knowledge decreased slightly from Grade 9 to Grade 12 for boys but remained stable for girls. In contrast, both parent and adolescent reports of delinquent behavior appear to increase across years for both boys and girls, suggesting that a linear trajectory may best describe the developmental changes. However, group means and individual growth curves may have different forms (Bryk & Raudenbush, 1987).

Also shown in Table 1 are the intercorrelations among the 14 measures based on pairwise deletion of missing data. All measures are significantly correlated with one another. As is typical, the measures appear to be slightly less correlated as the time lag between measures increases. As expected, the knowledge measures are negatively correlated with the delinquent behavior measures. The parent-reported and adolescent-reported delinquent behavior scores are modestly correlated, as are the parent-reported and adolescent-reported knowledge measures.

Univariate Model-Fitting Procedure

Because the same model-fitting procedures were used for adolescent-reported knowledge and the two delinquent behavior variables, the univariate model-fitting process is described once followed by a description of the final growth model for each variable. Indexes of model fit for all models and relevant model comparisons are shown in Table 2. According to Hu and Bentler (1999), models that provide a good fit to the data have nonsignificant ($p > .05$) chi-square values, comparative fit indexes (CFIs) greater than .95, and root mean square errors of approximation (RMSEAs) less than .06. Akaike's information criteria (AIC) can also be used to compare different models for the same data, with lower AIC values indicating a better fitting model.

We began by determining the individual growth model that best represents change in adolescent-reported knowledge and the two delinquent behavior variables. Initially, a two-factor latent growth curve model was fit to model linear change over time. A random intercept factor was included to represent Grade 9 levels of knowledge and delinquent behavior and a random slope factor was included to account for linear change over time (i.e., factor loadings fixed to 0, 1, 2, and 3 for Grades 9, 10, 11, and 12, respectively). The intercept and slope factors were allowed to covary. The two-factor latent growth curve models provided an acceptable fit

to the data, but there was evidence that the model fit could be improved. Two additions were made to improve the model fit. First, to account for methodological variations (i.e., face-to-face, in-home interviews in Grades 9 and 12, and mailed questionnaires in Grades 10 and 11), covariances were added between error terms for the Grades 9 and 12 measures and between error terms for the Grades 10 and 11 measures. For all three variables, the addition of the two covariances significantly improved the fit of the model. Second, a simple quadratic slope factor (i.e., the linear slope factor loadings were squared) was added to the model to account for acceleration or deceleration in change over time. Problems fitting the three-factor model indicated that the quadratic factor should be modeled as a fixed factor (i.e., variance constrained to zero). Modeling the quadratic factor as a fixed factor requires the rate of quadratic change to be estimated as a single value shared by every individual in the sample. The addition of the fixed quadratic factor provided a substantial improvement in model fit over the two-factor models for both delinquent behavior variables. The addition of the fixed quadratic factor was not a significant improvement over the two-factor model for knowledge; therefore, the quadratic growth factor was removed and growth in knowledge was modeled as linear change over time.

The next step was to test for gender differences in the latent growth curve models for the three variables. Multigroup modeling procedures were used to fit the latent growth curve models for boys and girls and to test group differences by imposing constraints on model parameters. Up to four parameter constraints were imposed. First, the intercept mean was constrained to be equal for boys and girls to test whether boys and girls differed in Grade 9 values. Next, in separate models, the linear and quadratic slope means were constrained to be equal for boys and girls to test whether there were gender differences in the rates of change over time. Finally, the covariances between the slopes and intercepts were constrained to determine whether the correlation between Grade 9 values and rates of change differed for boys and girls. A final multigroup model was fit including all constraints that did not significantly worsen the fit of the model. Interpretation of gender difference is based on the final multigroup model.

Univariate Model Results

Adolescent-reported knowledge—An LGC model with intercept and linear slope terms was the best fitting model for knowledge. The observed knowledge scores at the four time points were influenced by an intercept factor reflecting knowledge at Grade 9 and a slope factor representing the linear rate of change per year. Developmental change in knowledge is illustrated in Figure 1. Boys and girls did not differ in Grade 9 levels of knowledge. However, parental knowledge decreased over time for boys (slope $M = -.12$, $SD = .33$, $p < .05$) while remaining stable for girls (slope $M = .06$, $SD = .00$, ns). Change over time in knowledge was not significantly related to Grade 9 levels of knowledge ($r = .17$, ns).

Parent-reported delinquent behavior—LGC models with intercept and linear and quadratic slope terms provided the best fit to the data for parent-reported and adolescent-reported delinquent behavior. For the delinquent behavior variables, the observed scores at the four time points were influenced by three factors: an intercept factor reflecting delinquent behavior levels at Grade 9, a slope factor representing the instantaneous rate of change at the intercept, and a fixed rate of quadratic change per year. No gender differences were identified for parent-reported delinquent behavior. As shown in Figure 2, parent-reported delinquent behavior declined from Grades 9 to 10 (linear slope $M = -.08$, $SD = .18$, $p < .05$) before showing an increase from Grades 10 to 12 (quadratic slope $M = .04$, SD fixed at 0, $p < .05$). Grade 9 levels of parent-reported delinquent behavior were negatively correlated with increases in delinquent behavior ($r = -.31$, $p < .05$), indicating that adolescents engaging in more delinquent behavior in Grade 9 showed greater decrease in delinquent behavior problems over time than adolescents engaging in less delinquent behavior in Grade 9.

Adolescent-reported delinquent behavior—Developmental change in adolescent-reported delinquent behavior is also shown in Figure 2. There was a significant linear increase in adolescent-reported delinquent behavior over time (linear slope $M = .22$, $SD = .16$, $p < .05$), but there was a deceleration over time in the increase (quadratic slope $M = -.03$, SD fixed at 0, $p < .05$). Grade 9 levels of adolescent-reported delinquent behavior were negatively correlated with increases in delinquent behavior for girls ($r = -.51$, $p < .05$) but not for boys ($r = .02$, ns), indicating that girls engaging in more delinquent behavior in Grade 9 reported smaller increases in delinquent behavior over time than did girls engaging in less delinquent behavior in Grade 9.

Testing for Correlated Rates of Change

In the next set of analyses, adolescent-reported knowledge was paired with adolescent-reported and parent-reported delinquent behavior in two different sets of models. For each set, initially, the single-sample LGC models were combined into a single bivariate model. Error terms were allowed to covary within measurement period (e.g., the error term for the Grade 10 knowledge indicator was allowed to covary with the error term for the Grade 10 antisocial peers indicator). Covariances were added between the two intercept factors and between the two linear slope factors. The covariances test whether the Grade 9 levels and rates of change in knowledge and delinquent behaviors problems are correlated. Next, the multisample LGC models were combined into a single bivariate model to test for gender differences. Gender equality constraints were imposed on all factor means and covariances not found to differ by gender in the univariate analyses. Constraints placed on the Grade 9 covariances and the linear slope covariances were tested individually to identify gender differences in the association between knowledge and delinquent behavior at Grade 9, and in the association between changes in knowledge and changes in delinquent behavior. Model fit indexes and model contrasts are presented in Table 3.

Adolescent-reported knowledge and parent-reported delinquent behavior—In the single-sample model, there was a negative correlation between the knowledge intercept and the parent-reported delinquent behavior intercept factors ($r = -.41$, $p < .001$), indicating that lower levels of Grade 9 knowledge were associated with higher levels of Grade 9 parent-reported delinquent behavior. There also was a negative correlation between the two slope factors ($r = -.76$, $p < .001$), indicating that decreases in knowledge over time were associated with increases in parent-reported delinquent behavior. No significant gender differences were identified in the multisample models.

Adolescent-reported knowledge and adolescent-reported delinquent behavior—In the single-sample model, there was a negative correlation between the knowledge intercept and the delinquent behavior intercept factors ($r = -.65$, $p < .001$), indicating that lower levels of Grade 9 knowledge were associated with higher levels of Grade 9 adolescent-reported delinquent behavior. However, the correlation between the two slopes was not significant ($r = -.41$, ns), indicating that decreases over time in knowledge are not significantly associated with increases over time in adolescent-reported delinquent behavior. No gender differences were identified in the multisample models.

Testing for Reciprocal Associations

To test reciprocal time-specific associations, cross-lag paths were added to the bivariate models. As in previous analyses, the two single-sample models (i.e., adolescent-reported knowledge and adolescent-reported delinquent behavior, and adolescent-reported knowledge and parent-reported delinquent behavior) were tested first. Cross-lag paths were added between the measures of knowledge and delinquent behavior. The paths from knowledge to delinquent behavior test the parent effect of knowledge on delinquent behavior, and the paths from

delinquent behavior to knowledge test the child effect of delinquent behavior on knowledge. In the same manner, cross-lag paths were added to the multi-sample models. Two sets of constraints were imposed to determine whether gender moderated the links between knowledge and delinquent behavior. One set of constraints set the paths from knowledge to delinquent behavior to be equal for boys and girls. The other set of constraints set the paths from delinquent behavior to knowledge to be equal for boys and girls.

Adolescent-reported knowledge and parent-reported delinquent behavior—The addition of the cross-lag paths did not significantly improve the fit of the model for parent-reported delinquent behavior. However, once the cross-lag paths were added to the model, removing the covariance between the linear slope factors did not worsen the fit of the model. These model comparisons indicate that the longitudinal associations between knowledge and parent-reported delinquent behavior can be modeled as either negatively correlated rates of change or reciprocal associations. As shown in Figure 3, five of the six cross-lag paths linking knowledge and parent-reported delinquent behavior were significant when added to the model. The pattern of cross-lag associations is consistent with reciprocal effects. Specifically, more delinquent behavior in Grades 10, 11, and 12 was predicted by lower levels of parental knowledge 1 year earlier. Likewise, less parental knowledge in Grades 11 and 12 was predicted by more delinquent behavior 1 year earlier. Gender differences were identified in the paths from delinquent behavior to knowledge, with high levels of delinquent behavior more strongly predicting lower future levels of knowledge among boys than among girls (values are shown in parentheses in Figure 3). The correlation between the two intercept factors remained significant after adding the cross-lag paths. However, because of limited variance in the linear slopes when including the cross-lag paths, the correlation between the two slopes was estimated as a large positive correlation (with a large standard error resulting in a lack of statistical significance).

Adolescent-reported knowledge and adolescent-reported delinquent behavior—The fitted cross-lag model for knowledge and adolescent-reported delinquent behavior is shown in Figure 4. The addition of the cross-lag paths significantly improved the fit of the model, indicating that the cross-lag paths do a better job of replicating the longitudinal associations between knowledge and delinquent behavior than do the correlations between the developmental trajectories. Five of the six cross-lag paths were significant. The cross-lag paths show a pattern consistent with reciprocal effects. More delinquent behavior in Grades 10 and 11 was predicted by lower levels of parental knowledge 1 year earlier. Likewise, less parental knowledge in Grades 10, 11, and 12 was predicted by more delinquent behavior problems 1 year earlier. No gender differences were identified in the associations between knowledge and adolescent-reported delinquent behavior. The correlation between the two intercept factors remained significant after adding the cross-lag paths, and the correlation between the two slope factors remained nonsignificant.

Replication With Parent-Reported Knowledge

To determine whether the reciprocal links between knowledge and delinquent behavior could be replicated using parent reports of knowledge, two additional cross-lag models were fit. In the first model, the cross-lag associations between parent-reported knowledge in Grades 9 and 12 and parent-reported delinquent behavior in Grades 9 and 12 were tested. Autoregressive paths from knowledge in Grade 9 to knowledge in Grade 12 and from delinquent behavior in Grade 9 to delinquent behavior in Grade 12 were included. Path estimates indicate reciprocal associations, with a significant path from Grade 9 knowledge to Grade 12 delinquent behaviors (standard path = .13, $p < .05$) and a significant path from Grade 9 delinquent behavior to Grade 12 knowledge (standard path = .15, $p < .05$). In the second model, the cross-lag associations between parent-reported knowledge in Grades 9 and 12 and adolescent-reported delinquent

behavior in Grades 9 and 12 were tested controlling for the autoregressive associations. Again, path estimates indicate reciprocal associations, with a significant path from Grade 9 knowledge to Grade 12 adolescent-reported delinquent behavior (standard path = .16, $p < .01$) and a significant path from Grade 9 adolescent-reported delinquent behavior to Grade 12 parent-reported knowledge (standard path = .11, $p < .05$).

Discussion

Results from this study shed new light on the longitudinal associations among adolescents' ratings of how much their parents know about their activities and the extent to which adolescents engage in delinquent behavior during the high school years. Results provide information on three issues. First, patterns of change in knowledge and delinquent behavior based on the mean values of individual-level developmental trajectories were identified. Delinquent behavior increased over time, with adolescents reporting greater increases than parents. Boys, but not girls, reported decreases over time in parental knowledge. Second, results provided evidence of negatively correlated rates of developmental change. Decreases in knowledge were associated with increases in parent-reported delinquent behavior problems. Third, cross-lag correlations provided evidence that reciprocal associations underlie the correlated rates of change. Parental knowledge appears to inhibit adolescents' future involvement in delinquent behavior. However, the findings provide no evidence that parents increase monitoring efforts in an effort to curtail escalating delinquent behavior problems. In fact, escalating delinquent behavior problems were linked to reductions in knowledge, suggesting that parents may be withdrawing from monitoring activities or that parents have more difficulty obtaining information from adolescents who are engaged in delinquent behavior.

Developmental Trajectories and Associations Between Parental Knowledge and Delinquent Behavior

In the current study, the mean scores for adolescent-reported knowledge decreased from one grade to the next, but an intraindividual decrease was only detected in the latent growth-curve analyses for boys. Girls and boys did not differ in terms of parental knowledge at Grade 9, and knowledge remained relatively stable across the 4 years for girls. This complex pattern is generally consistent with findings described in the literature. First, the decrease in sample means from one year to the next is consistent with earlier studies' documented decreases in knowledge over time through cross-sectional (Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Frick et al., 1999) or longitudinal (Patterson & Stouthamer-Loeber, 1984; Stoolmiller, 1994) analyses. These earlier studies did not examine gender differences in knowledge trajectories. The lack of gender differences at Grade 9 is consistent with studies that have failed to find gender differences in knowledge (e.g., Bogenschneider et al., 1998; Crouter, MacDermid, McHale, & Perry-Jenkins, 1990; Otto & Atkinson, 1997), whereas the difference in developmental trajectories resulting in more substantial differences by Grade 12 is consistent with studies that have found gender differences in knowledge (e.g., Chilcoat et al., 1996; Flannery et al., 1994; Stattin & Kerr, 2001). However, there is no consistent link in the literature between age and gender differences in knowledge. Overall, differences in how parents monitor their sons and daughters appear to be modest, making the detection of such differences difficult. If monitoring functions similarly for boys and girls, and the results of this study indicate that it generally does, the modest gender differences in monitoring knowledge are not likely to account for gender differences in behavior problems. Gender differences in other domains, such as involvement with antisocial peers (e.g., Agnew & Brezina, 1997; Erickson, Crosnoe, & Dornbusch, 2000), may account for more of the gender differences in delinquent behavior.

The curvilinear shape of the delinquent behavior trajectories is consistent with prior studies (e.g., Elliott, Huizinga, & Menard, 1989; Farrington, 1986; Moffitt, 1994; Windle, 2000), suggesting a peak in late adolescence followed by a reduction in delinquent behavior. This pattern of change is consistent with Moffitt's (1993) adolescent-limited trajectory of antisocial behavior in which individuals gradually cease involvement in delinquent behavior from late adolescence through early adulthood. However, the leveling off of delinquent behavior problems was much more apparent in the parent reports than in the adolescent reports. The increasing discrepancy between adolescent and parent reports provides further evidence that parents become less aware of their adolescents' delinquent behavior with each passing year. Although this pattern mirrors the reduction in parents' monitoring knowledge reported by the adolescents, the difference between the parents and adolescent delinquent behavior reports may indicate that parents are less knowledgeable than the adolescents believe them to be.

Past research has consistently identified links between knowledge and delinquent behavior, but the longitudinal studies have typically predicted change in delinquent behavior from earlier levels of knowledge. The current study focused on understanding change in both constructs as they relate to one another. Specifically, findings indicate strong associations between knowledge and delinquent behavior both in terms of Grade 9 levels and in terms of developmental changes. Adolescents who reported the greatest decreases in knowledge over time had parents who reported the greatest increases in delinquent behavior problems. The pattern was evident, but not statistically reliable, for adolescent-reported delinquent behavior. Significant cross-lag associations indicate that the correlated rates of change result from reciprocal associations and transactional processes. Reciprocal associations appear to be robust, as they were replicated across parent reports and adolescent reports of knowledge and delinquent behavior. Evidence of reciprocal influences indicates that lower levels of knowledge in one year predicted greater delinquent behavior in the following year and that lower levels of delinquent behavior in one year predicted higher levels of parental knowledge in the next year. Through this transactional process, knowledge levels decrease as delinquent behavior problems increase.

Only one gender difference was identified among the links between knowledge and delinquent behavior, with stronger paths from delinquent behavior to knowledge for boys than for girls. This pattern indicates delinquent behavior problems are linked to a greater reduction in parental knowledge among boys than among girls. This may indicate that parents are less likely to solicit information from delinquent boys or that delinquent boys are less likely to provide information than are similarly delinquent girls. However, this pattern was found only between adolescent-reported monitoring and parent-reported delinquent behavior. The gender difference was not replicated using other informant combinations.

Processes Linking Knowledge and Delinquent Behavior

The correlations we found between the knowledge and delinquent behavior trajectories, as well as the reciprocal associations, are consistent with both parent-effects and child-effects interpretations. From a parent-effects perspective, increases in parental knowledge may be linked to decreases in delinquent behavior because adolescents curtail their involvement in delinquent behavior in response to parental actions, because adolescents with knowledgeable parents have fewer opportunities to engage in delinquent behavior, or because greater parental knowledge is an indicator of high-quality parent-child relationships or high levels of positive parent-child interaction and involvement (Crouter et al., 1999; Dishion & McMahon, 1998; Patterson & Stouthamer-Loeber, 1984). Indeed, intervention studies have shown that parents can improve their parenting skills and monitoring, and that these improvements can lead to improvements in adolescents' behavior (Lochman & van den Steehoven, 2002; Vitaro et al., 2001).

However, it is counterintuitive that increases in delinquent behavior problems predict decreases in knowledge. If knowledge is the product of a parenting strategy to prevent and intervene in response to problem behavior, monitoring, and therefore knowledge, should increase following increases in delinquent behavior. Other analyses with this data set suggest that a subset of parents may in fact increase monitoring efforts in response to behavior problems. Specifically, a subset of parents who responded proactively to the early childhood behavior problems using a prevention-oriented approach to misbehavior were found to have higher levels of knowledge as their children entered adolescence, whereas parents who did not respond proactively to early behavior problems had lower levels of knowledge (Pettit & Laird, 2002). It is possible that the proactive approach to parenting with younger children also set the stage for a more positive parent-child relationship and frequent parent-child conversations as the children became adolescents (see also Kerns, Aspelmeier, Gentzler, & Grabill, 2001). Moreover, it may be more challenging to begin or increase monitoring activities effectively once an adolescent is involved in delinquent behavior, particularly if the adolescents' contribution to the monitoring process is considered.

As described earlier, Stattin and Kerr (2001; Kerr & Stattin, 2000) demonstrated that parents' knowledge was better explained by their adolescents' willingness to provide information than by activities or practices engaged in by the parents. This child-driven process may largely account for the decreases in knowledge that follow increases in antisocial behavior. Stoolmiller (1994) proposed that as adolescents become more delinquent they attempt to undermine parental attempts to supervise their activities. In this manner, adolescents are likely to provide less information or less accurate information to their parents as they become more involved in delinquent behavior. The behavior of the adolescents may also make parental monitoring attempts more difficult. For example, Patterson (1993) noted that unsupervised wandering predicted growth in antisocial behavior. In this case, unsupervised wandering makes it more difficult for parents to track adolescents' activities and shifts the focus of parental knowledge acquisition to adolescents' willingness to provide information on their whereabouts and activities.

Of course, other processes combining child and parent effects are also likely. For example, adolescents' involvement in delinquent behavior may lead to frequent negative parent-child exchanges, and in response, parents may decrease their monitoring activities to avoid negative interactions with their adolescents. Furthermore, parents may avoid other sources of information such as teachers and other parents because of frustration or embarrassment. Stated differently, parents may disengage from their parenting activities to minimize negative interactions. In terms of monitoring, instead of arguing with their adolescents, parents may stop asking the adolescents where they are going and whom they will be with and may stop enforcing monitoring-relevant household rules. This process may be even more likely or accelerated when adolescents become reluctant, or even refuse, to reveal information about their friends and activities or when violent or antisocial behavior is directed toward the parents.

Another related possibility is that the adolescents' delinquent behavior may negatively influence parents' feelings toward their adolescents. Parents and adolescents who develop negative feelings toward one another may avoid contact, and thus, over time, there will be a decrease in the parents' knowledge of the adolescents' whereabouts, friends, and activities. Earlier analyses using a portion of the data presented in this study found that the development of negative feelings by parents, but not disengagement from parenting responsibilities, mediated between delinquent behavior and reduced knowledge (Laird & Pettit, 2001). Consistent with this pattern, Kerns et al. (2001) found that a secure parent-child attachment was linked to more parental knowledge and to greater child disclosure. However, there is much to be gained by a more comprehensive examination of the parent-adolescent relationship and the monitoring process.

For the most part, associations between adolescent-reported knowledge and delinquent behavior did not differ substantially when relying on parent or adolescent reports of delinquent behavior. The links between knowledge and parent-reported delinquent behavior were explained equally well by correlated rates of change and reciprocal associations. In contrast, reciprocal associations provided a better explanation for longitudinal links between knowledge and adolescent-reported delinquent behavior than did correlated rates of change. Because adolescents provided measures of both knowledge and delinquent behavior at each time point, this pattern may indicate that informant bias has a greater influence on cross-lag paths than on correlated developmental trajectories. Alternatively, it may be that parents are less sensitive to year-to-year changes in delinquent behaviors, and thus, parents' perceptions are not as temporally linked to potential causes or consequences. However, the reciprocal associations between knowledge and delinquent behavior are robust and were found using adolescent and parent reports of knowledge and delinquent behavior problems.

The ability to test the generalizability of results across parent and adolescent reports is one of the strengths of this study. On the other hand, the findings are limited by the combination of in-home interviews and mailed questionnaires. Developmental changes in knowledge as well as in delinquent behavior may have been under- or overestimated by combining the two data-gathering procedures. Moreover, developmental changes may have been underestimated by focusing on the high school years. More rapid change in knowledge and delinquent behavior may have been found during late childhood and early adolescence. It is also possible that the associations between knowledge and delinquent behavior may be unidirectional in earlier developmental periods but become bidirectional over time. Finally, cross-lag correlations provide only limited information regarding the ordering of effects. Rogosa (1980) identified numerous limitations of cross-lag correlations in yielding firm conclusions about the ordering of effects.

In summary, this study provided further empirical support for associations between parental knowledge and delinquent behavior. Developmental changes in knowledge corresponded to developmental changes in delinquent behaviors, with evidence that underlying reciprocal associations were responsible for linking the two sets of developmental trajectories. The results of this study provide a strong reminder of the bidirectional nature of parent-child influences and reinforce the need for further inquiry into the specific processes through which parents' knowledge and adolescents' involvement in delinquent behavior influence one another over time.

Acknowledgments

This research was supported by grants from the National Institute of Mental Health (MH 42498, MH 56961, MH 57024, MH 57095) and the National Institute of Child Health and Human Development (HD 30572) to G. S. Pettit, K. A. Dodge, and J. E. Bates. Appreciation is expressed to Laura Scaramella, Karen McCurdy, and Mark Wood for comments on drafts of this manuscript. We are grateful to the Child Development Project families for their participation. Manuscript approved for publication by the Director of the Louisiana Agricultural Experiment Station as manuscript number 02-36-0794.

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Figure 1.
Adolescent-reported knowledge sample mean latent growth-curve trajectory for boys and girls.

Figure 2.
Delinquent behavior sample mean latent growth-curve trajectories.

Figure 3.

Monitoring and parent-reported delinquent behavior bivariate latent growth-curve model with cross-lag paths. Standardized estimates are shown. Means, variances, error terms, and error covariances are omitted from the figure. Values in parentheses are for male and females, respectively, for paths found to differ significantly by gender. * $p<.05$. ** $p<.01$. *** $p<.001$.

Figure 4.

Monitoring and adolescent-reported delinquent behavior bivariate latent growth-curve model with cross-lag paths. Standardized estimates are shown. Means, variances, error terms, and error covariances are omitted from the figure. $*p < .05$. $**p < .01$. $***p < .001$.

Table 1

Means, (Standard Deviations), Reliability, and Correlations for all Variables

Grade	n	M (SD)		Correlations													
		Boys	Girls	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Adolescent-reported knowledge																	
1. Grade 9	375	13.16 (1.65)	13.28 (1.70)	.65													
2. Grade 10	382	13.04 (1.91)	13.42 (1.70)	.41	.72												
3. Grade 11	377	13.10 (2.06)	13.24 (2.01)	.35	.60	.78											
4. Grade 12	388	12.76 (2.05)	13.45 (1.88)	.34	.47	.43	.75										
Parent-reported knowledge																	
5. Grade 9	438	13.07 (1.79)	13.48 (1.72)	.26	.23	.24	.26	.58									
6. Grade 12	469	12.29 (2.22)	12.51 (2.03)	.19	.29	.33	.35	.49	.71								
Parent-reported delinquent behavior																	
7. Grade 9	369	1.74 (1.76)	1.68 (2.11)	-.25	-.17	-.16	-.31	-.44	-.32	.65							
8. Grade 10	375	1.88 (2.54)	1.89 (2.80)	-.22	-.26	-.30	-.33	-.37	-.33	.62	.79						
9. Grade 11	379	1.87 (2.66)	1.89 (2.84)	-.22	-.26	-.35	-.35	-.31	-.35	.55	.64	.82					
10. Grade 12	384	2.06 (2.25)	2.15 (2.81)	-.17	-.25	-.30	-.32	-.35	-.45	.58	.57	.68	.76				
Adolescent-reported delinquent behavior																	
11. Grade 9	357	2.65 (2.49)	2.15 (2.08)	-.34	-.25	-.24	-.23	-.21	-.17	.26	.27	.28	.19	.69			
12. Grade 10	377	3.07 (2.44)	2.99 (2.88)	-.34	-.45	-.45	-.38	-.23	-.25	.28	.40	.37	.31	.50	.73		
13. Grade 11	375	3.37 (2.60)	3.58 (2.95)	-.30	-.39	-.48	-.38	-.25	-.36	.26	.34	.39	.37	.35	.63	.73	
14. Grade 12	383	3.70 (2.66)	3.64 (2.80)	-.25	-.29	-.32	-.48	-.22	-.32	.34	.38	.37	.38	.36	.57	.63	.73

Note. Pairwise deletion, Cronbach's alphas appear on diagonal, bivariate correlations appear below diagonal. All *ps* < .001, one-tailed.

Table 2

Univariate Model Fit Indexes and Comparisons

Model	Indexes of model fit					Model comparison				
	df	χ^2	p	CFI	RMSEA	AIC	Models compared	Δdf	$\Delta\chi^2$	p(d)
Adolescent-reported knowledge: single-sample models										
1. Two-factor LGC	5	29.09	<.001	0.996	.11	47.09				
2. Error covariances added to Model 1	3	1.07	.79	1.00	<.01	23.07	1 vs. 2	2	28.02	<.001
Adolescent-reported knowledge: multisample models										
1. Multisample version of single-sample Model 2	6	6.63	.36	1.00	.02	50.63				
2. Intercept mean constraint added to Model 1	7	7.60	.37	1.00	.02	49.60	2 vs. 1	1	0.97	ns
3. Slope mean constraint added to Model 1	7	11.18	.13	0.99	.04	53.18	3 vs. 1	1	4.55	<.05
4. Intercept, slope covariance constraint added to Model 1	7	6.65	.47	1.00	.00	48.65	4 vs. 1	1	0.03	ns
5. Constraints from Models 2 and 4	8	7.63	.47	1.00	.00	47.63	5 vs. 1	2	1.00	ns
Parent-reported delinquent behavior: single-sample models										
1. Two-factor LGC	5	25.15	<.001	0.989	.101	43.15				
2. Error covariances added to Model 1	3	10.01	.02	0.996	.080	32.01	2 vs. 1	2	15.14	<.001
Parent-reported delinquent behavior: multisample models										
1. Multisample version of single-sample Model 4	4	1.50	.83	1.00	.00	49.50				
2. Intercept mean constraint added to Model 1	5	2.88	.72	1.00	.00	48.88	2 vs. 1	1	1.38	ns
3. Slope mean constraint added to Model 1	5	1.59	.90	1.00	.00	47.59	3 vs. 1	1	0.09	ns
4. Quadratic mean constraint added to model 1	5	1.51	.91	1.00	.00	47.52	4 vs. 1	1	0.01	ns
5. Intercept, slope covariance constraint added to Model 1	5	1.93	.86	1.00	.00	47.93	5 vs. 1	1	0.43	ns
6. Constraints from Models 2 through 5	8	3.36	.91	1.00	.00	43.36	6 vs. 1	4	1.86	ns
Adolescent-reported delinquent behavior: single-sample models										
1. Two-factor LGC	5	28.87	<.001	0.991	.11	46.87				
2. Error covariances added to Model 1	3	13.00	.005	0.996	.09	35.00	2 vs. 1	2	15.87	<.001
Adolescent-reported delinquent behavior: multisample models										
1. Multisample version of single-sample Model 4	4	7.17	.127	0.999	.05	55.17				
2. Intercept mean constraint added to Model 1	5	10.91	.053	0.998	.06	56.91	2 vs. 1	1	3.78	<.10
3. Linear slope mean constraint added to Model 1	5	10.29	.068	0.998	.05	56.29	3 vs. 1	1	3.12	<.10

Model	Indexes of model fit					Model comparison			
	<i>df</i>	χ^2	<i>p</i>	CFI	RMSEA	AIC	Models compared	Δdf	$\Delta\chi^2$ <i>p(d)</i>
4. Quadratic slope mean constraint added to Model 1	5	9.06	.107	0.998	.05	55.06	4 vs. 1	1	1.88 >.10
5. Intercept, slope covariance constraint added to Model 1	5	11.18	.048	0.998	.06	57.18	5 vs. 1	1	4.01 <.05
6. Constraints from Models 2, 3, and 4	7	12.00	.10	0.998	.04	54.00	6 vs. 1	3	4.83 <i>ns</i>

Note. *df* = degrees of freedom; $p = \chi^2$ probability value; CFI = comparative fit index; RMSEA = root mean square error of approximation; AIC = Akaike's information criterion; Δdf = difference in *df*; $\Delta\chi^2$ = difference in likelihood ratio tests; *p(d)* = probability of the difference tests; LGC = latent growth curve. Dashes in columns indicate the figures could not be estimated.

Table 3

Bivariate Model Fit Indexes and Comparisons

Model	Indexes of model fit					Model comparison				
	df	χ^2	p	CFI	RMSEA	AIC	Models compared	Δdf	$\Delta\chi^2$	p(d)
Knowledge and parent-reported delinquent behavior: single-sample models										
1. Single-sample model with correlated intercept and slope factors	15	24.30	.06	0.999	.04	82.30				
2. Cross-lag paths added to Model 1	9	16.12	.06	0.999	.05	86.12	2 vs. 1	6	8.18	ns
3. Covariance between slope factors removed	10	16.63	.08	0.999	.04	84.66	3 vs. 2	1	0.51	ns
Knowledge and parent-reported delinquent behavior: multisample models										
1. Multisample model with correlated intercept and slope factors	36	43.94	.18	0.999	.04	147.49				
2. Model 1 with covariance between intercept factors constrained	37	43.86	.20	0.999	.04	145.86	2 vs. 1	1	0.08	ns
3. Model 1 with covariance between slope factors constrained	37	43.59	.21	0.999	.04	145.59	3 vs. 1	1	0.35	ns
4. Model 1 with cross-lag paths added	24	23.80	.47	1.00	.00	151.80				
5. Model 4 with paths from knowledge to delinquent behavior constrained	27	24.60	.60	1.00	.00	146.60	5 vs. 4	3	0.80	ns
6. Model 4 with paths from delinquent behavior to knowledge constrained	27	33.82	.17	0.999	.03	155.82	6 vs. 4	3	10.02	<.05
Knowledge and adolescent-reported delinquent behavior: single-sample models										
1. Single-sample model with correlated intercept and slope factors	15	33.82	.004	0.998	.06	91.82				
2. Cross-lag paths added to Model 1	9	17.03	.05	0.999	.05	87.03	2 vs. 1	6	16.79	<.05
Knowledge and adolescent-reported delinquent behavior: multisample models										
1. Multisample model with correlated intercept and slope factors	33	49.81	.05	0.998	.04	159.81				
2. Model 1 with covariance between intercept factors constrained	34	50.86	.03	0.998	.04	158.86	2 vs. 1	1	1.05	ns
3. Model 1 with covariance between slope factors constrained	34	51.18	.03	0.998	.04	159.18	3 vs. 1	1	1.37	ns
4. Model 1 with cross-lag paths added	21	27.07	.17	0.999	.03	161.07				
5. Model 4 with paths from knowledge to delinquent behavior constrained	24	30.00	.19	0.999	.03	158.00	5 vs. 4	3	2.93	ns
6. Model 4 with paths from delinquent behavior to knowledge constrained	24	31.06	.15	0.999	.03	159.06	6 vs. 4	3	3.99	ns