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Reexamining the Link between Parental Knowledge and Delinquency: Unpacking the Influence of Adolescents' and their Parents' Perceptions

Parents' and their children's perceptions of how much parents know about the child's activities outside parental presence (parental knowledge) are important for understanding delinquency. Yet, conceptual and methodological deficiencies in prior research may limit this understanding. Reexamining how these perceptions affect delinquency, we find that contrary to conventional wisdom: (1) adolescent and parent perceptions of parental knowledge impact delinquency jointly rather than independently; and (2) the protective effect of adolescent perceptions weakens as parent perceptions increase. Specifically, when parental perceptions are strongest, the delinquency inhibiting effect of adolescent perceptions is offset, which may result from stress of parents' monitoring efforts.

Keywords: parental knowledge, adolescent-parent dyads, interaction, delinquency

Reexamining the Link between Parental Knowledge and Delinquency: Unpacking the Influence of Adolescents' and their Parents' Perceptions

It is difficult to overstate the important role that parental socialization plays in influencing delinquency. Inadequate parenting practices are associated with a range of delinquent and adolescent problem behaviors such as deviance, delinquency, drinking and drug use, school misconduct, and sexually risky behaviors (Gottfredson and Hirschi 1990; Jiang and D'Apolito 2016; Kerr, Stattin, and Burk 2010; Robertson, Baird-Thomas, and Stein 2008; Thaxton and Agnew 2004). A key measurement of the effectiveness of parental socialization is parental monitoring, conceptualized as "an intersection of parental knowledge and action and children's willingness to share information" (Oberlander et al. 2011: 886).[1] Scholars have highlighted the inherent complexity of parental monitoring in that two parties (the parent and the child) are actively involved in the behavior (Kerr et al. 2010; Oberlander et al. 2011). In other words, effective parental monitoring requires participation from both the parent and the child.

While the current research literature emphasizes that understanding each party's perception of parental monitoring is important to assess the relationship between parental monitoring and adolescent delinquency, most studies have exclusively focused on the discrepancy between parent and child perceptions (e.g., De Los Reyes et al. 2010, 2013; Lippold, Greenberg, and Feinberg 2011). The contribution of two parties to ensure effective parenting may result in differing perceptions of theoretically the same behavior, which relates to the type of relationship that exists between parent and child (Korelitz and Garber 2016).

However, it is also possible that the influence of one party's perception of parental monitoring behavior is dependent upon the other's perception (Reynolds et al. 2011). Only recently has research begun to emphasize the conditional impact of parent and adolescent

perceptions on adolescent behaviors (see De Los Reyes et al. 2013; Dimler et al. 2017; Reynolds et al. 2011). This literature, however, has framed interactive effects as indicators or measures of discrepancy (De Los Reyes et al. 2013; Dimler et al. 2017), which does not adequately address the complexity of the parent-child relationship (Cook and Kenny 2005). We extend the literature by examining how adolescent and parent perceptions of parental knowledge, which reflects various practices of parental monitoring (Kerr et al. 2010; Smetana 2008), interact to affect delinquency. Using data from the Gang Resistance Education and Training program (GREAT), we also expand upon the scope of previous studies by examining the perceptions of parents or caregivers (e.g., mothers, fathers, step-parents, other relatives, etc.) and their children in a large, geographically diverse sample (Esbensen 2003).

Our paper is structured as follows: first, we summarize the extant empirical literature on the relationship between adolescent and parent perceptions of parental knowledge and adolescent delinquency. Next, we advance the argument that parent and adolescent perceptions of parental knowledge may produce a conditional or multiplicative effect on delinquency. Using a sample of matched pairs of parents and adolescents, we show that the effect of parental knowledge on delinquency is, in fact, conditional. In other words, the relationship between parental knowledge and delinquency depends *jointly* on parent and adolescent perceptions of knowledge, and not simply on the combined *unique* contributions of these respective perceptions. Specifically, we discover that, depending on the level of parent perceptions of knowledge, adolescent perceptions of knowledge either have a protective effect or no appreciable effect on delinquency.

This finding is contrary to both prior studies of the interactive effects of parent and adolescent perceptions of parental knowledge and our own hypotheses that are informed by that literature; however, the results are supportive of General Strain Theory (GST) (Agnew 2006;

Thaxton and Agnew 2004). Previous research on the interactive nature of parent and adolescent perceptions of monitoring has either explicitly or implicitly adopted a self-control theoretical approach to understanding the impact of parenting practices (including monitoring) on delinquent behavior. Self-control theory places primary importance on the *presence or absence of positive relationships* between parents and children and the impact of those relationships in instilling self-restraint in children. GST, on the other hand, emphasizes the *presence or absence of negative relationships* between parents and children and the impact of those relationships on children's negative emotions (especially anger) which can provide motivation for delinquency (Thaxton and Agnew 2004). Thaxton and Agnew (2004: 785) explain that "positive and negative feelings may be separate dimensions, rather than different poles of a single affective dimension [and] while such feelings are related, it is possible to hold both positive and negative feelings at the same time. Some juveniles, for example, may both like and dislike their parents." This distinction is far from trivial because self-control and general strain theories make different predictions about what aspects of the parent-child relationship are most relevant to understanding delinquent behavior. We conclude by considering the implications of these findings for predicting and reducing delinquency.

PERCEPTIONS OF PARENTING

Examining combinations of knowledge-related behaviors from parents and children is central to understanding the relationship between parental knowledge and delinquency (Lippold, Greenberg, and Collins 2013: 1733). This combined effect is typically measured via indices that capture the extent to which parent and adolescent perceptions converge or diverge (De Los Reyes et al. 2013; Lippold et al. 2011, 2013). Measuring this (dis)similarity in perceptions is important because it is well documented that adolescents and their parents often have different

perceptions of ostensibly the same parenting practices (Fleming et al. 2016; De Los Reyes et al. 2010; Korelitz and Garber 2016; Oberlander et al. 2011; Paulson and Sputa 1996). In fact, parent and adolescent perceptions of parental supervision are minimally correlated (Oberlander et al. 2011). For example, when evaluating parenting, parents perceive that they show more warmth and acceptance than their children perceive (Korelitz and Garber 2016: 1987). Parents also consistently overrate themselves, compared to their children's assessments, on being demanding, responsive, and involved with their children (Fleming et al. 2016; Paulson and Sputa 1996).

These differing perceptions may be due, in part, to the type of relationship that exists between parent and child. Discrepancies may occur as a result of conflict or communication problems, or reflect healthy adolescent development in terms of increased autonomy from the family (Korelitz and Garber 2016). However, differences in perceptions between parent and child tend to be associated with greater problematic behaviors among youths (Abar et al. 2015; De Los Reyes et al. 2010; Dimler et al. 2017; Lippold et al. 2011; Reynolds et al. 2011). De Los Reyes et al. (2010) examined longitudinal data on 335 mother-child dyads to assess how discrepancies in parental monitoring behaviors influence delinquency. They find that when mothers consistently report higher levels of monitoring as compared to their children, the likelihood of adolescent delinquency increases (De Los Reyes et al. 2010). Similarly, Lippold et al. (2011) used a sample of 938 rural adolescents to assess how agreement and/or disagreement between mother-child perceptions of parental knowledge affect delinquency and substance use. In line with De Los Reyes et al. (2010), they find that when mothers overestimate their knowledge (i.e., when there is a greater magnitude of disagreement in perceptions), delinquency and substance use increases. More recently, Dimler et al. (2017) find higher levels of aggressive behaviors among children who view parenting more negatively than do their parents.

While discrepancy studies are useful in highlighting how differing perceptions of parents and children can illuminate characteristics of the parent-child relationship and predict adolescent behavior (De Los Reyes et al. 2013; Korelitz and Garber 2016), they do suffer from several important conceptual limitations (De Los Reyes et al. 2013). Of particular relevance for this study is that discrepancy measures merely reflect the magnitude of the agreement and/or disagreement between adolescent and parent perceptions of parenting behaviors (see, e.g., De Los Reyes et al. 2010; Dimler et al. 2017), yet they neither measure the *actual* effect of each party's perceptions on delinquency, nor whether the direction and magnitude of that effect is stable across levels of the other party's perception of parenting practices.

Parenting is not a unidirectional undertaking, but a bi-directional process wherein children disclose information to their parents and parents attempt to solicit knowledge and monitor the behavior of their children (Stattin and Kerr 2000). In the words of Stattin and Kerr (2000: 1083), the parent-child relationship is one of "reciprocity, cooperation, coordination, and coregulation." This dynamic relationship suggests that, when it comes to explaining the impact of perceptions of parental monitoring on delinquency, the whole may be greater than the sum of its parts (Holmbeck 2002). What is key, then, is not the *comparative* effect of the parent and adolescent perceptions, but their *conditional* effect on delinquency (Cook and Kenny 2005). Ultimately, examining the relationship between parental knowledge and delinquency using parent-child dyads necessitates the examination of the interaction between adolescent and parent perceptions and not merely the convergence or divergence of the two sources of perceptions.

As noted earlier, some scholars have attempted to highlight the importance of the interaction between adolescent and parent perceptions of parental behaviors on delinquency, but this research inappropriately frames interactive effects as discrepancy effects (De Los Reyes et

al. 2013; Dimler et al. 2017; Reynolds et al. 2011), rather than effect heterogeneity. In some cases, this has also resulted in the incorrect operationalization of the conditional effect (e.g., Spilt et al. 2015); whereas in other cases, the interaction term is properly operationalized, but the interpretation of the interactive effect may be unreliable because of the implausible parametric assumptions of the model given the skewed nature of the dependent variable (e.g., Dimler et al. 2017; Reynolds et al. 2011). These conceptual and methodological shortcomings notwithstanding, Reynolds et al. (2011) find that the protective effect of children's perceptions of parental knowledge against risky behaviors increases as mothers' perceptions of parental knowledge increases. This suggests that the association between a child's perceptions of parental knowledge and delinquency should have the strongest protective effect on delinquency when parent reports of knowledge are high.

The aforementioned scholarship highlights the importance of examining the conditional nature of the influence of adolescent and parental perceptions of monitoring on delinquency, but as we have noted, it suffers from certain limitations concerning the operationalization, analysis, and interpretation of the conditional effects that potentially provide misleading answers about the nature of the contingent relationship between parental and adolescent perceptions of monitoring and delinquency. Our study attempts to improve upon this prior research by both employing an appropriate model for analyzing conditional effects in the presence of a skewed outcome variable and highlighting the proper approach to interpreting conditional effects for such models.

We believe both our added conceptual clarity and methodological precision contribute to the existing literature. Namely, the discrepancy measure currently used in many studies misrepresents the underlying causal story of how parent and adolescent perceptions affect delinquency because it ignores the individual contributions of adolescent perceptions and parent

perceptions and the complexity of the parent-child relationship. For reasons detailed below, we frame our analysis and discussion in terms of how the effect of adolescent perceptions of parental knowledge on delinquency is moderated by parent perceptions of knowledge. By employing the appropriate methodological tools and interpretative frameworks for assessing interactive effects for delinquency data, which almost invariably violates the assumptions of the standard linear model, we attempt to provide a more durable and methodologically defensible answer to the question of conditioning effects in this context.

RESEARCH HYPOTHESES

Both parent and child reports of parenting have been associated with various outcomes, and although studies tend to suggest that the relative importance of the different sources of perceptions depends on the outcome under investigation (Fleming et al. 2016: 628), child reports typically have a stronger association (Cottrell et al. 2003; Hoeve et al. 2009; Oberlander et al. 2011; Richards et al. 2004). For instance, parent reports of parental knowledge are associated with outcomes that are more overt and come to the attention of other authority figures (e.g., teachers) who then inform parents, while child reports are probative of both overt and covert delinquent outcomes (Fleming et al. 2016; Richards et al. 2004). Here we focus on a range of overt and covert delinquent behaviors and predict that both parent and child perceptions of knowledge should produce a negative effect on delinquency. However, as most of the behaviors we examine are covert, we hypothesize that adolescent perceptions will have a more pronounced direct impact on delinquency than parental perceptions:

> *H1: Examined individually, adolescent and parent perceptions of knowledge will negatively affect delinquency, with adolescent perceptions having a significant effect on delinquency when both adolescent and parent perceptions are taken into account.*

Consistent with prior research, we predict that adolescent perceptions will have the strongest protective effect against delinquency when parents also perceive effective monitoring or high levels of knowledge; correspondingly, the effect of adolescent perceptions on delinquency should be weaker or non-significant when parent perceptions are low or moderate (Gottfredson and Hirschi 1990; Reynolds et al. 2011). In a departure from previous studies, we do not believe that that interaction captures any discrepancy between parent and adolescent perceptions (see De Los Reyes et al. 2013); rather, the interaction identifies potential *effect heterogeneity*—that is, the contingent nature of the effect of parent and adolescent perceptions of monitoring on delinquency and not the degree of their (dis)agreement:

> *H2: The effect of adolescent perceptions on delinquency will be conditional on parent perceptions such that the impact of adolescents' perceptions of parent knowledge on lowering delinquent behavior strengthens as parents' perceptions of their own knowledge increases.*

DATA AND METHODS

We test these hypotheses using survey data collected from the GREAT program. Specifically, we utilize data gathered from parents and their adolescent children (Esbensen 2003). These data come from six cities: Las Cruces, NM; Lincoln, NE; Omaha, NE; Phoenix, AZ; Philadelphia, PA; and Portland, OR. These sites were selected due to the presence of a viable GREAT program, geographical diversity, and cooperation from the local police and school districts. Data were collected from parents of adolescents who participated in the longitudinal phase of data collection. Approximately 3,500 adolescents were selected. The response rate for parents was 32%, while adolescents had an 87% and 80% completion rate for the pre- and post-tests, respectively. The final reported case numbers consist of 645 parents and a

total of 3,568 adolescents (Esbensen 2003). As our focus is on the relationship between perceptions of knowledge by parents and their adolescents, we matched parents to their own children using a common identifier that was present in both panels of data, resulting in a total of 534 matched pairs (see Table 1 for demographic characteristics). Adolescents range in age from 14 through 17 years (Mean = 15.18; SD = 0.60) (see Table 2 for all descriptive statistics).[2]

[TABLES 1 AND 2 ABOUT HERE]

Measures

Dependent variable. Our dependent variable is a count measure of adolescents' delinquent behavior during the six months prior to data collection. We develop a sixteen-item scale consisting of how many times an adolescent engaged in violent acts (hitting, attacking someone with a weapon, gang fighting, robbery, and shooting a gun at someone else), property crimes (vandalism, theft of items worth more than and less than fifty dollars, motor vehicle theft, and burglary), and drug-related acts (sold weed and drugs, drank alcohol, used weed and drugs, and inhaled paint) ($\alpha = 0.84$). To reduce the undue influence of possible outliers, we recode responses greater than or equal to 12 to 12 (Fox, Lane, and Akers 2013; Nagin and Smith 1990; Peterson, Taylor, and Esbensen 2004). We posit that engaging in 12 or more delinquent acts within a 6-month period represents high-frequency offending (Peterson et al. 2004). Responses to the delinquency questions indicate that few youths, approximately 20 percent, engaged in more than 12 acts of delinquency.

Independent variables. Perceptions of parental knowledge are assessed by both parents and adolescents. Parents indicated how well they knew the activities and associations of their children via a two-item scale that ranged from (1) strongly disagree to (5) strongly agree ($\alpha = 0.88$). Adolescents also assessed whether their parents know where they are and who they are

with when they are not at home or at school via this same scale ($\alpha = 0.79$). High scores on this scale reflect high levels of knowledge.[3]

Control Variables. We control for those variables that are most likely to be associated with parental knowledge and delinquency: race, gender, and age of adolescents; parent and adolescent perceptions of a safe neighborhood, adolescent self-control and victimization, adolescent perceptions of parental attachment, school attachment, association with delinquent peers, adolescent arrest history, family structure, and participation in the GREAT program.[4] Prior research underscores the importance of controlling for race, gender, and age because of their influence on delinquency (Steffensmeier and Ulmer 2005) and perceptions of parental monitoring (Rai et al. 2003; Tragesser et al. 2007). Race and gender are dichotomous variables with whites and males serving as the reference categories.[5]

Perceiving greater neighborhood problems may be associated with less effective parental monitoring strategies, lower levels of parental knowledge, and increased delinquency (Byrnes et al. 2011; Lambert et al. 2004). However, perceiving problems in the neighborhood might actually be associated with greater parental monitoring and knowledge and reduced delinquency (Anderson 1999). Parent perceptions of safety are assessed by a two-item scale that asked parents to evaluate the degree to which their children are safe within their school and in their neighborhood ($\alpha = 0.54$). Adolescent perceptions of safety are measured by a two-item scale that asks adolescents to evaluate the degree to which they feel safe in their school and their school's neighborhood ($\alpha = 0.74$).[6] High scores on these variables reflect high levels of safety (1 = strongly disagree; 5 = strongly agree).

We control for self-control because of its association with parenting practices and delinquency (Gottfredson and Hirschi 1990). Self-control is measured by an eight-item scale that

is consistent with Grasmick et al. (1993). High scorers on this scale indicate that they have lower levels of self-control (1 = strongly disagree; 5 = strongly agree) ($\alpha = 0.85$). Moreover, we control for victimization because this variable is associated with delinquency and impacts one's level of self-control (Agnew et al. 2011). Victimization is measured by a four-item scale that indicates how many times an adolescent was victimized (hit, robbed, attacked, or stolen from) over the past six months. To correct for skewness, relevant items were recoded so that responses greater than 12 were coded to 12 ($\alpha = 0.52$). Approximately 15% of adolescent respondents were victimized at least once, 20.6% three or more times, and 3.8% twelve or more times.

We also control for adolescent evaluations of parental attachment. Those parents who are invested in their children will be more likely to actively monitor and know about their behavior than parents who are not attached to their children (Gottfredson and Hirschi 1990; Miller et al. 2009). This scale is composed of 12 items that each range from 1 (none of the time) to 7 (all of the time). Adolescents who are highly attached to their parents indicate that they ask their parents for advice, their parents understand and trust them, they can talk to their parents, and they receive praise when they do well ($\alpha = 0.90$).

Adolescents who are uninvolved in school and those who associate with delinquent peers are also more likely to be delinquent (Elliott, Huizinga, and Ageton 1985). School attachment is measured by a seven-item scale with items ranging from (1) strongly disagree to (5) strongly agree. High scorers on this scale indicate that they highly value education, grades, and homework ($\alpha = 0.81$). Delinquent peer association is assessed by a 16-item scale that contained items ranging from (1) none to (5) all of one's peers committing acts of delinquency. High scores on this scale reflect adolescents whose friends lie and skip school, commit minor acts of violent and property delinquency, and use drugs ($\alpha = 0.94$).

In addition, individuals who have more prior arrests are more likely to reoffend (Durose, Cooper, and Snyder 2014). A dichotomous measure assesses whether adolescents had ever been arrested, with never serving as the reference category (0 = 468; 1 = 55). We also account for family structure because it may influence the level of parental knowledge caregivers have of adolescents' behaviors (Phythian, Keane, and Krull 2008). This variable is a dichotomous variable with two adults (i.e., natural parent, stepparent, or other adult figure) serving as the reference category, in comparison to single-parent households coded "1." Respondents who indicate that they live with "other" are coded as missing. Lastly, we control for participation in GREAT as it is assumed that those who have participated in the program will be less likely to engage in crime (Esbensen and Osgood 1999).[7] This is a dummy variable with the reference category representing those youth who participated in the program (56.18% of the adolescents participated in GREAT).

ANALYTICAL PROCEDURE

Given the non-normal distribution of our delinquency measure, we examine the impact of parent and adolescent perceptions of knowledge on delinquency with a "Tobit" model (Tobin 1958) in order to properly account for the qualitative difference between limit (zero) and non-limit observations. Our delinquency measure has a lower bound at the value of zero (Long 1997) and 41.5% of respondents report no involvement in delinquent behavior. The use of the Tobit framework in the current context is especially important because we focus on the non-additive, or interactive, effect of parent and adolescent perceptions of knowledge on delinquency. Applying standard linear regression models to skewed, limited, or discrete data may improperly indicate the presence of interactive relationships among explanatory variables, but the interaction may not be substantively meaningful, rather it is an artifact of the mismatch between the

additivity assumption of a linear model and the skewed response scale (Osgood, Finken, and McMorris 2002: 321). Tobit models were traditionally used when the dependent variable could theoretically assume values beyond the censoring/truncation point (i.e., values less than 0), but Wooldridge (2002, 2003) demonstrates that Tobit models are appropriate when the outcome variable is bounded and cannot theoretically assume values beyond the censoring point—a common situation in criminology.[8]

We present three models that assess the relationship between perceptions of parental knowledge, by both parents and adolescents, and delinquency. Model 1 examines the effect of parent and adolescent perceptions on delinquency without any control variables; Model 2 includes controls; and Model 3 includes both controls and the interaction term between parent and adolescent perceptions of monitoring.[9]

RESULTS

Table 3 presents our results for the relationship between parent and adolescent perceptions of knowledge and delinquency.[10] Hypothesis 1 receives tentative support from our simplified Model 1: adolescent perceptions (AP) of knowledge has a stronger protective (negative) effect on delinquency than parent perceptions (PP) of knowledge (AP = -0.89, $p \leq 0.001$; PP = -0.37, $p \leq 0.05$); however these effects become non-significant when accounting for controls in Model 2. The addition of the controls also significantly increases the explanatory power of the Model (Model 1 $R^2 = 0.03$; Model 2 $R^2 = 0.18$). This suggests that, independently, perceptions of parental knowledge by adolescents and parents fail to influence adolescent delinquent behavior. The effects of the explanatory variables in Model 2 are also depicted graphically in Figure 1.

[TABLE 3 AND FIGURE 1 ABOUT HERE]

Model 3 includes the interaction effect between AP and PP and reveals that the interaction effect is statistically significant ($b = 0.17$; $p \leq 0.05$). AP and PP were mean-centered prior to creating the interaction term, so the coefficients for AP and PP in the interactive model (respectively, -0.10 and -0.11) can be interpreted as the marginal effects of AP and PP at the mean values of the other component variable. The effect of both variables are statistically insignificant, which means that neither AP nor PP impact an adolescent's delinquency when the other perception variable is at its average value—this is consistent with the results presented in Model 2. The slope coefficient for the interaction term (AP x PP) describes the change in the slope of AP with every one-unit change in PP (alternatively, the interaction coefficient describes the change in the slope of PP for every one-unit change in AP). The conditional effect of AP on delinquency at any particular level of PP is calculated as: $(\beta_{\mathrm{AP}} + \beta_{\mathrm{AP\times PP}} \times \mathrm{PP}) \times \mathrm{AP}$; similarly, the conditional effect of PP is: $(\beta_{\mathrm{PP}} + \beta_{\mathrm{AP\times PP}} \times \mathrm{AP}) \times \mathrm{PP}$. Analysts commonly interpret $\beta_{AP\times PP}$ as the marginal effect of the interaction term. This interpretation is incorrect because only the component terms have true marginal effects (Williams 2012). The effects of the explanatory variables in Model 3 are also depicted graphically in Figure 2.

[FIGURE 2 ABOUT HERE]

The interpretation of the marginal effects of interaction terms is more complicated for nonlinear models. The marginal effect of a change in both interacted variables is not equal to the marginal effect of changing just the interaction term because there is a nonlinear expectation so the magnitude, sign, and significance of the interaction coefficient may not yield reliable information about the true marginal effect (Ai and Norton 2003; Tsai and Gill 2013). Our Tobit models qualify as nonlinear models because of our focus on the non-limit values of the

delinquency variable, and as a result, the marginal effects for the interaction term listed in Model 3 lacks an intuitive interpretation.

The proper calculation of the interaction term reveals a statistically significant effect, but in the opposite direction of Hypothesis 2. Table 4 (Panel A) lists the correct conditional effects from the AP×PP interaction. AP has a strong negative effect on delinquency when PP is low (b = -1.11, $p \leq 0.01$), but that effect weakens when PP is medium (b = -0.53, $p \leq 0.05$) and actually reverses direction to a positive, albeit statistically insignificant, effect on delinquency when PP is high (b = 0.15, $p > 0.10$). Although the impact of AP on delinquency is statistically insignificant when PP is high, this still suggests high levels of PP may undermine the protective influence of knowledge. In statistics parlance, this is a *qualitative* interaction because the effect of AP reverses direction across increasing levels of PP.

Whereas Panel A presents the conditional effects of the AP×PP interaction, Panel B depicts the predictive margins (i.e., expected values) from the interaction effect. These results also show that higher levels of AP decrease delinquency when PP is low or medium, but AP actually results in increased delinquency when PP is high. Figure 3 displays the effect of AP on delinquency in the additive (i.e., non-interactive) model. Under the (incorrect) assumptions of the additive model, increasing levels of AP result in decreasing levels of delinquency and the effects across different levels of PP run parallel (i.e., the marginal effects are the same across the different levels of PP). Figure 4 shows the correct results obtained from the interactive model. The impact of AP on delinquency varies across the different levels of PP. The effect of AP is strongest (i.e., the slope is steepest) when PP is low and the effect of AP is actually positive (i.e., it changes direction) when PP is high.

[FIGURES 3 AND 4 ABOUT HERE]

Figures 3 and 4 are two-dimensional graphs that display the impact of AP at different, pre-selected, levels of PP. These figures are limited, however, in that they cannot display the entire regression surface, so it is impossible to fully capture the interactive effect of AP and PP on delinquency. Figures 5 and 6 provide a three-dimensional representation of the regression surface (often called a surface plot or perspective plot) of the additive and interactive models, respectively. Similar to Figure 3, Figure 5 reveals that the impact of AP on delinquency does not vary across levels of PP (and that the impact of PP does not vary across levels of AP). Figure 6 provides a more accurate (and complete) representation of the interactive effects of AP and PP. The regression surface "curves," thereby showing that the effect of AP decreases and then changes direction at increasing levels of PP.[11]

[FIGURES 5 AND 6 ABOUT HERE]

In a departure from prior research (see Spilt et al. 2015), the focus of our models is not the effect of the direction or magnitude of the discrepancy in perceptions of parental knowledge on delinquency. Nor do we interpret the interactive effect of parental and adolescent perceptions of parental knowledge as a measure of discrepancy (De Los Reyes et al. 2013; Dimler et al. 2017; Reynolds et al. 2011). Contrary to the assertion that the multiplicative term captures "the amount of disagreement [and] also directionality" (Dimler et al. 2017: 1081), we show that the interaction measures the heterogeneous impact of adolescent (parental) perception of parental knowledge contingent on the parent's (adolescent's) level of perceived parental knowledge.[12] And, given that the perception measures from adolescents and parents are only weakly correlated, these perceptions are not merely derivative of one another—they represent different underlying phenomena.

Also, in tension with some earlier studies (e.g., Dimler et al. 2017), we discover that the effect of the *discrepancy* in parent-adolescent perceptions on delinquency, modeled both linearly and curvilinearly, is not statistically significant. The dissimilarities between our findings and some prior research are potentially the result of differences in our methodological approaches. We avoid the problematic assumptions associated with using the traditional linear model to analyze delinquency (and related) outcome measures because of the serious risk the linear model poses for distorting both the additive and interactive effects of explanatory variables. As explained earlier, the use of traditional linear models in criminological research is often unwarranted given the distribution of the commonly analyzed outcome variables; however, we did not examine those other data to determine whether our conjecture was accurate.

In summary, we find that the association between parenting and delinquency is understood better by accounting for adolescent *and* parent perceptions of knowledge. AP and PP interact such that adolescent perceptions of knowledge produce the strongest negative effect on delinquency when parental perceptions are low or moderate, which does not coincide with our predictions. Although the effect is non-significant, adolescent perceptions of parental knowledge are actually associated with higher levels of delinquency when parent perceptions are high.

DISCUSSION

We believe our study advances the literature on the relationship between parental knowledge and delinquency both methodologically and substantively. Methodologically, we add to a recent, but growing, literature that highlights the need for researchers to go beyond discrepancy measures and to consider the conditional effect of adolescent and parent perceptions of parenting on delinquency. In doing so, we correct for methodological issues present in prior works that liken this conditional effect to the (dis)agreement between parent and child

perceptions by properly operationalizing the hypothesized conditional effect *and* correctly testing and interpreting conditional affects in models analyzing skewed crime/delinquency (Dimler et al. 2017; De Los Reyes et al. 2013). The latter methodological intervention—correctly testing and interpreting conditional effects for non-normally distributed data—is especially salient because it is unclear whether the discrepancy effects or the interactive effects reported in prior studies are substantively meaningful results or simply an artifact of model misspecification. When employing the correct analytical approach, we find contrary results: (1) the discrepancy measure has an insignificant effect on delinquency and (2) the interaction effect weakens rather than intensifies the protective effect of adolescent perceptions on delinquency (see discussion below). Whether those earlier findings are robust to the aforementioned model misspecifications should be a focus of future inquiry.

Our substantive contribution to the extant literature pertains to the unique importance of looking beyond individual perceptions of monitoring and their impact on delinquency, and paying closer attention to the *multiplicative* impact of these perceptions—in particular, how adolescent outcomes depend on the dynamic that exists between parents and their children (De Los Reyes et al. 2013). In contrast to Dimler et al. (2017), we find a statistically significant interaction effect; contrary to Reynolds et al. (2011) and De Los Reyes et al. (2013), the interaction between parent and adolescent perceptions of knowledge indicates that the protective effect of adolescent perceptions on delinquency increases when parent perceptions are low or moderate, but not high. This finding corroborates existing literature, which suggests that parents' increased attempts at attaining knowledge through other parenting activities may serve as an aggravating factor for the relationship between parenting practices and delinquency (e.g., De Los Reyes et al. 2010, Dimler et al. 2017; Lippold et al. 2011; Racz and McMahon 2011). While

parental knowledge protects initially against delinquency, as adolescent perceptions of knowledge increases, adolescents may then respond to this "intrusion" with increased delinquency (Kerr and Stattin 2000; Keijsers et al. 2016; Stattin and Kerr 2000).

Overly soliciting adolescents for information of their whereabouts and associates may reflect a *strained* parent-child relationship, which can possibly foster delinquent coping among this latter group (Agnew 2006; Thaxton and Agnew 2004). GST suggests that the protective effect of adolescent perceptions of parental knowledge on reducing delinquency may be neutralized when parents report high levels of knowledge. Namely, too much parental knowledge may reflect a source of strain for both parents and adolescents, with parents responding to a negative relationship with excessive solicitation and control, which then burden youth (Agnew 2006). Thaxton and Agnew (2004: 768) explain that "this strain generates a range of negative emotions [that] motivate delinquency as adolescents seek to reduce or escape their strain…and alleviate the negative emotions associated with their strain." This is consistent with research finding higher levels of aggressive behavior among children who view parenting practices more negatively than their parents (Dimler et al. 2017).

Ultimately, parental knowledge appears to be most effective when children perceive they are being well-monitored by their parents, but the parent does not perceive this monitoring to be excessive. In particular, there appears to be a threshold to parental monitoring for adolescents, and exceeding that threshold creates a type of "negative attachment" to their children: "juveniles hate or dislike parents because they believe that these others have mistreated them [and] it is stressful to interact with people you hate or dislike" (Thaxton and Agnew 2004: 768). Our models control for adolescents' perceptions of attachment to parents, as well as their levels of self-control, so the interactive effect of perceptions of monitoring is consistent with a strain

theory explanation rather than a self-control theory explanation. According to Thaxton and Agnew (2004), the greatest differences in delinquency should occur between those with negative attachments to parents and those with neutral attachments to parents, whereas the differences between those with neutral attachments and those with positive attachments should be of lesser magnitude. The conditional effects described in Table 4 reveal this very dynamic: the strongest protective effect of adolescent perceptions is when parental perceptions are low or medium, but the protective effect is statistically insignificant when parental perceptions are high. In other words, the reductions in delinquency are most prominent for adolescents who perceive increasingly stronger parental monitoring when parents' perceptions are low or medium, but not when they are high. In fact, when parental perceptions are high, adolescents' increasing perceptions become a risk factor for delinquency (albeit statistically insignificant).

Future studies should build on this research in order to better clarify the association between parental knowledge and delinquency. This study does not distinguish among the various parenting activities that allow parents to derive their knowledge of their adolescents' behaviors, such as child disclosure, parental solicitation, or parental control (Racz and McMahon 2011; Stattin and Kerr 2000). Of these sources, child disclosure has emerged as a key indicator of parental knowledge (Kerr et al. 2010) and as the strongest predictor of conduct problems among adolescents, with higher levels of child disclosure being associated with greater levels of parental knowledge and lower levels of conduct problems (Racz and McMahon 2011). Future research is needed to understand how the reciprocal processes inherent in parenting affect perceptions parents and adolescents have of the various ways parental knowledge is gained, i.e., via active monitoring attempts or willful child disclosure as these perceptions can interact to affect the likelihood of various types of delinquent acts (Abar et al. 2015; Smetana 2008). The manner in

which parents acquire information from their children, independent of the quantity and quality of that information, may have relevance for understanding the relationship between parental monitoring and delinquent behavior (Thaxton and Agnew 2004).

Our study assessed how perceptions of parental knowledge by both parents and adolescents were associated with *prior* engagement in various types of delinquency. While the findings indicate that perceptions of parental knowledge are still important to consider when understanding involvement in delinquency, the cross-sectional design of the study precludes determination of the causal direction of this relationship. Are children who perceive lower levels of parental monitoring more likely to engage in delinquency? Or are children who already engage in delinquency more likely to perceive poor monitoring by parents (Richards et al. 2004)? Parents of delinquent children may either increase their parenting efforts in order to curb further criminal behavior or they may simply remove or distance themselves from the situation and, in a sense, quit attempting to monitor and gain knowledge about their child. Ideally, the question of causal order could be addressed with longitudinal data and a "lagged" or "cross-lagged" approach. These approaches rely on having measures of delinquency and parents' and adolescents' perceptions of monitoring at multiple time points and then assessing the relationship between the change in delinquency and the change in perceptions of monitoring across time. The dataset we use for our analysis has a longitudinal component, but the dyadic data (i.e., pairings of parents and the juveniles) we use to answer our research questions are cross-sectional.

In the absence of the longitudinal data, we control for several proxy variables for prior delinquency that allow us to get some perspective on the causal ordering question. The model controls for prior victimization, prior arrest, and delinquency of peers. All of these variables are highly correlated with prior delinquency (Agnew et al. 2011; Durose et al. 2014; Elliott et al.

1985), so the inclusion of all three in our model suggests, but in no way confirms, that perceptions of parental knowledge may have a causal effect on delinquency and not solely that delinquency causes increases in parental knowledge. As stated earlier, the effects of perceptions of parental knowledge and delinquency are likely to be reciprocal, so this does not rule out that there is a feedback loop. The emphasis of our study, however, is on one aspect of that loop and future research should attempt to more fully examine the entire loop.

It is also worth noting that the main effects ("simple effects") of parent and adolescent perceptions of knowledge were statistically insignificant in the additive model; only the interaction term was statistically significant. This finding would be unusual if "reverse causality" was driving the relationship between monitoring and delinquency because the two types of monitoring we measure (and that comprise the interaction effect) are only weakly correlated (r = .23). The reverse causality perspective strongly implies that those two variables would be highly correlated. Prior studies examining the impact of parental monitoring on subsequent offending using longitudinal data also supports our causal interpretation (Johnson et al. 2011; Reynolds et al. 2011). For example, research shows that well-monitored youth are less likely to engage in criminal/delinquent behavior at later time points, even after controlling for prior delinquency and association with delinquent peers (Johnson et al. 2011).

Despite the limitations associated with our inability to distinguish among the different types of activities parents use to acquire information about children's activities and the cross-sectional nature of our data, this study attempts to carefully disentangle how parents' and adolescents' perceptions of parental knowledge are associated with delinquency. We show that the association between parent and adolescent evaluations of knowledge and delinquency depends on the interaction of these perceptions. And, importantly, this interaction indicates that

parental knowledge serves as a protective factor in preventing delinquency to a certain extent. The protective effect of adolescent perceptions of parental knowledge on delinquency is neutralized when parent perceptions of knowledge are "excessive." This finding stands in stark contrast with the limited number of prior studies that have examined the interactive effect, but it remains unclear whether the differences in the results are substantively meaningful or merely an artifact of the modeling choices in those studies that are inappropriate given the non-normality of the dependent variable. Hopefully our study encourages researchers to resolve this ambiguity.

ENDNOTES

[1] Parental attachment is another key factor of effective parental socialization. Parents who care about their children will monitor their behavior (Gottfredson and Hirschi 1990).

[2] Data on the age of parents is unavailable.

[3] A two-sample mean comparison test reveals that parents believe they have higher levels of knowledge than what their children actually perceive ($p \leq .001$) (e.g., De Los Reyes et al. 2010).

[4] Although data limitations preclude controlling for parent's self-control, the level of self-control instilled within adolescents should reflect that of their parents (Gottfredson and Hirschi 1990).

[5] Parents' race is not controlled for due to its high correlation with adolescents' race ($r = 0.85$). Gender of parents is also not controlled for as the data only contain the relationship that exists between parents and adolescents, i.e., mother, father, stepparent, or other relative (see Table 1).

[6] Although this measure does not directly assess adolescent perceptions of the safety of their neighborhoods, these perceptions should still influence their involvement in delinquency (Lambert et al. 2004) as children traverse the neighborhood as they travel to and from school.

[7] GREAT is an educational program designed to reduce gang membership with participation entailing instruction, primarily from uniformed law enforcement officers, regarding "crime and its effect on victims, cultural diversity, conflict resolution skills, meeting basic needs (without a gang), responsibility, and goal setting" (Esbensen et al. 2012: 129).

[8] Wooldridge (2002, 2003) refers to this type of outcome variable as a "corner solution outcome" and the resulting model a "corner solution model." The primary interest of the model is the features of the conditional distribution of the outcome variable given the explanatory variables, rather than the hypothetical value of the variable if it was observed. The censoring and corner

solution motivations for the Tobit model give rise to the same maximum likelihood estimator and post-estimation techniques (Baum 2006).

Count-based models, e.g., Poisson and negative binomial (specifically, their zero-inflated variants), are inappropriate because of the important distinction between "structural zeros" and "sampling zeros." Structural zeroes occur when some subjects are not at risk for the behavior of interest (e.g., delinquency); whereas sampling zeros are responses that *can* be greater than zero, but are zero due to sampling variability (i.e., zero observations happened by chance). The zeros in our data are likely to be *all* structural zeros, so the zero observations can come from only one structural source: the non-delinquents (Lachenbruch 2002).

[9] The interaction term was created by multiplying together parent and adolescent perceptions of knowledge after these variables were mean centered to avoid issues with collinearity (Jaccard, Wan, and Turrisi 1990). Multicollinearity is present when the VIF is between four and 10 (O'Brien 2007). The largest VIF for the variables included in our models is 1.75.

[10] We do not report correlations as the relationships between our variables of interest are adjusted by our regression analysis and the dependent variable is censored.

[11] The Tobit model is sensitive to the distributional assumptions of the error terms: normality and homoscedasticity. Testing these assumptions, we find support for our use of the Tobit model. We fail to reject the null hypothesis that the error terms are normally distributed ($\chi^2(2) = 1.59$, $p > .10$) and that that the error terms are homoscedastic ($\chi^2(2) = 5.01$, $p > .05$). For a description of the specific tests, see Cameron and Trivedi (2005) and Drukker (2002).

We examined the robustness of our results with a generalization of the ordinal threshold model (e.g., generalized ordered logit/probit) (Williams 2010). The model accommodates both

the "clumping" of responses at zero and the positive skewed distribution of our delinquency measure. The model assumes that the observed variable is a function of an underlying latent variable, and the value of the observed variable depends on whether or not a particular threshold of the latent variable has been crossed. Given the discrete nature of the responses (counts) and the relatively small number of categories (0-12), we use the natural metric of our dependent variable, avoiding the need to further collapse our delinquency measure. Unlike the results from the Tobit model, the parameter estimates from the ordinal model summarize the overall effects of the explanatory variables, rather than effects conditional on the response being positive. The results from the ordinal logit model (available upon request) are similar to the results from the Tobit model. Specifically, AP and PP do not have statistically significant independent effects on delinquency (b = -.10, p > .10 and b = -.10, p > .10), but the interaction effect is statistically significant and in the same direction as reported from the Tobit model. AP has a significant negative effect on delinquency when PP is low (b = -.89, $p \leq .05$) and moderate (b = -.40, $p \leq .05$), but the effect is positive (albeit statistically insignificant) when PP is high (b = .09, p > .10).

[12] Dimler et al. (2017) purportedly implement the approach utilized by Spilt et al. (2015) when creating their interactive discrepancy index, yet Dimler et al.'s method differs in important ways from Spilt et al. Dimler et al. do not capture the effect of the disjunction between parental and adolescent perceptions of parental knowledge. The interaction term used by Spilt et al. is the product of the size of the disagreement in perceptions and a dummy variable indicating whether there was either an overestimation or underestimation from the perspective of the adolescent (p. 913-914). This interaction effect captures whether the effect of the discrepancy depends on the direction of the disagreement, but it does not capture the potential heterogeneous effect of

adolescent (parental) perceptions of parental knowledge on delinquency. As a robustness check, we analyzed the type of interaction specified by Spilt et al. and discover that neither the direct effects of the direction and magnitude of the discrepancy, nor their interaction, are statistically significant.

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Table 1. Demographic Characteristics of Sample

Parents*		Adolescents	
Gender		Gender	
Mothers (*N* = 421)	78.84%	Female (*N* = 300)	56.18%
Fathers (*N* = 80)	14.98%	Male (*N* = 234)	43.82%
Race		Race	
White (*N* = 371)	70.13%	White (*N* = 357)	66.85%
Non-White (*N* = 158)	29.87%	Non-White (*N* = 177)	33.15%

*Step parents and other relatives correspondingly make up 0.75% (n = 4) and 5.43% (n = 29) of the sample.

Table 2. Descriptive Statistics

	Obs.	*Mean*	*S.D.*	*Minimum*	*Maximum*
Dependent Variables					
Prior Delinquency (Count)	506	3.73	4.67	0	12
Independent Variables					
Parent Perceptions (PP) of Knowledge	534	8.48	1.22	2	10
Adolescent Perceptions (AP) of Knowledge	534	7.51	1.63	2	10
Control Variables					
Non-white Adolescents	534	0.33	0.47	0	1
Female Adolescents	534	0.56	0.50	0	1
Adolescent Age	532	15.18	0.60	14	17
Parent Perceptions of Safety	525	7.18	1.42	2	10
Adolescent Perceptions of Safety	534	7.50	1.57	2	10
Adolescent Low Self-Control	531	21.44	5.75	8	40
Prior Adolescent Victimization (Count)	520	1.88	3.63	0	29
Attachment to Parents	495	57.18	14.35	12	84
Attachment to School	527	25.91	4.56	9	35
Delinquent Peers	515	26.66	10.45	16	80
Prior Arrest	523	0.11	0.31	0	1
Single Parent	529	0.20	0.40	0	1
G.R.E.A.T. Program	534	0.44	0.50	0	1

Table 3. Tobit Regressions of Parent and Adolescent Perceptions of Parental Knowledge on Delinquency [a]

	Model 1		Model 2		Model 3	
Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
PP	– 0.37*	0.17	– 0.08	0.13	– 0.11	0.13
AP	– 0.89***	0.12	– 0.11	0.11	– 0.10	0.11
PP x AP					0.17*	0.08
Non-whites			0.08	0.33	0.01	0.33
Females			0.14	0.31	0.18	0.31
Age			– 0.36	0.25	– 0.41^{+}	0.25
Safety (Parent)			– 0.04	0.10	– 0.05	0.10
Safety (Adolescent)			0.26**	0.10	0.28**	0.10
Low Self-Control			0.10**	0.03	0.10**	0.03
Prior Victimization			0.18***	0.04	0.17***	0.04
Attachment to Parents			0.00	0.01	0.00	0.01
Attachment to School			– 0.11**	0.04	– 0.11**	0.04
Delinquent Peers			0.21***	0.02	0.21***	0.02
Prior Arrest			1.46**	0.53	1.36*	0.54
Single Parent			– 0.99*	0.41	– 0.93*	0.41
G.R.E.A.T. Program			0.18	0.30	0.23	0.29
Constant	4.03***	0.23	3.74***	0.22	3.78***	0.22
Observations	431		431		431	
Log likelihood	– 829.86		– 700.71		– 698.43	
LR χ^2 (df)	58.08(2)***		316.38(15)***		320.94(16)***	
Pseudo R^2	0.03		0.18		0.19	

*$+p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (two-tailed)*

[a] Coefficients reflect marginal effects. Reported standard errors were computed via the delta method.

Table 4: Marginal Effects and Predictive Margins of Interaction of Parent and Adolescent Perceptions of Knowledge on Delinquency

Panel A: The Marginal Effect of Adolescent Perceptions of Parental Knowledge on Delinquency at Low, Average, and High Levels of Parental Perceptions of Parental Knowledge

Parent Perceptions

	Low	Medium	High
Adolescent Perceptions	-1.11** (.38)	-.53* (.21)	.15 (.16)

Panel B: The Predictive Margins of the Interaction between Adolescent Perceptions of Parental Knowledge and Parent Perceptions of Parental Knowledge

Parent Perceptions

	Low	Medium	High
Adolescent Perceptions			
Low	11.33	7.77	3.02
Medium	6.98	5.16	3.55
High	2.05	2.97	4.15

*+p≤.10, * p ≤.05, **p ≤.01, ***p≤.001 (two-tailed)*

Figure 1. Marginal Effects of Independent Variables on Delinquency (Additive Model)

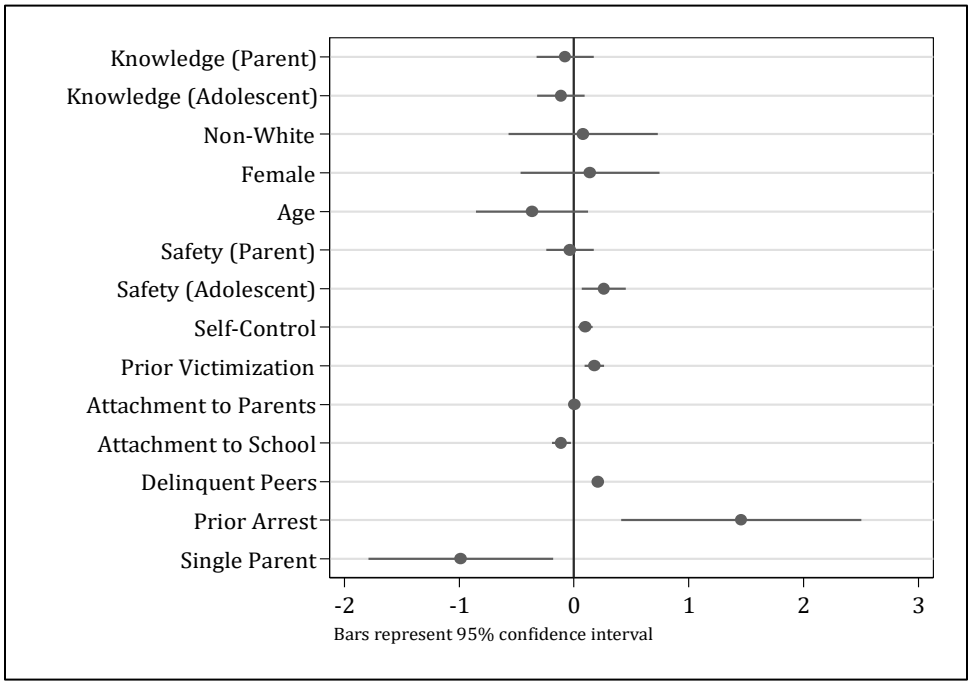

Figure 2. Marginal Effects of Independent Variables on Delinquency (Interactive Model)

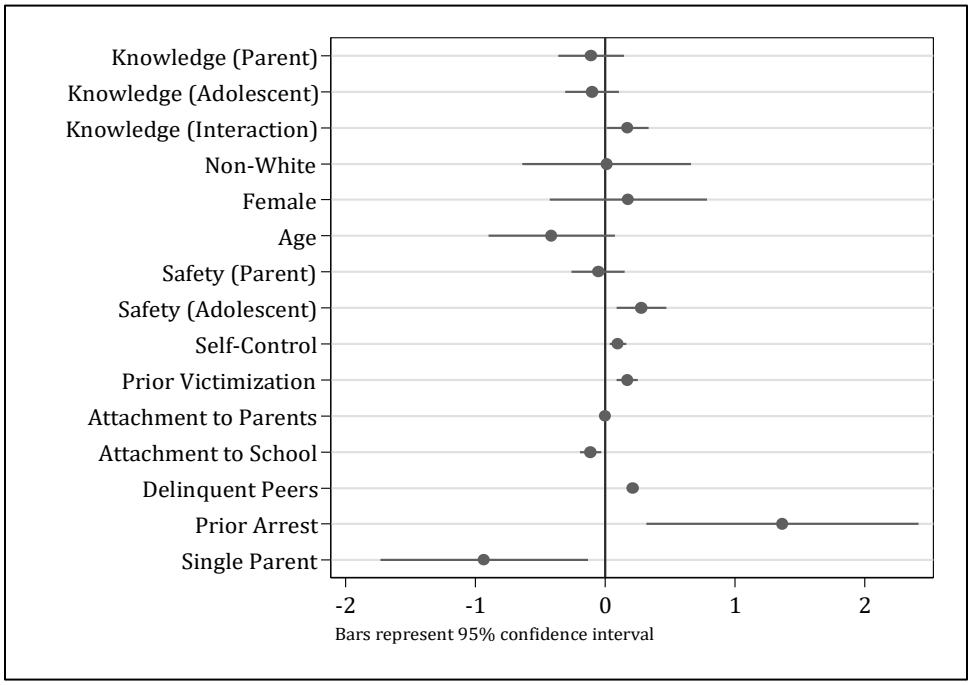

Figure 3. Additive Effect of Parent and Adolescent Perceptions of Knowledge

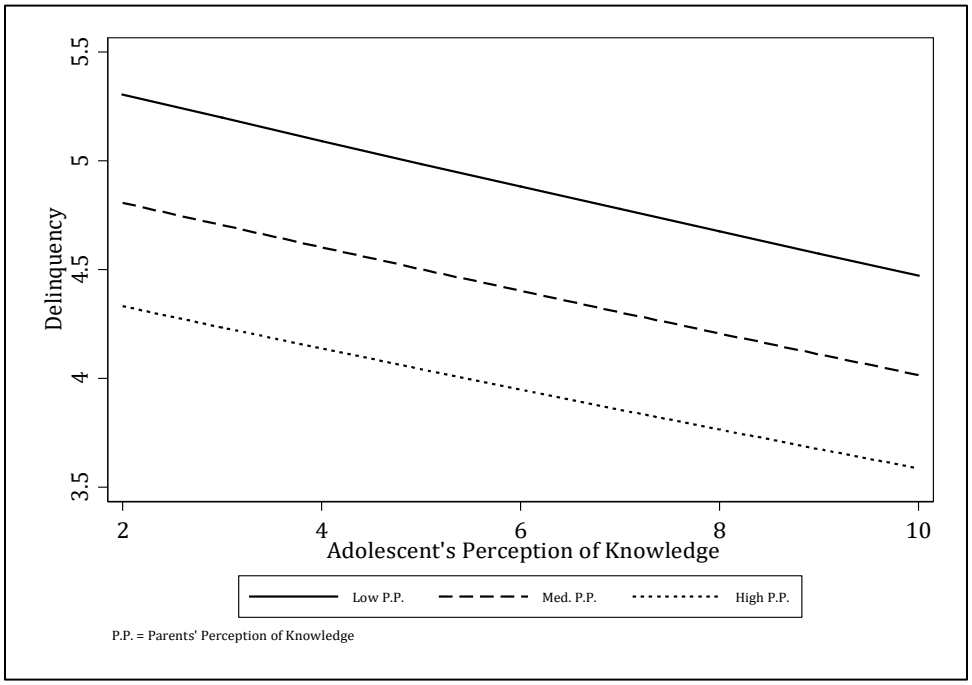

Figure 4. Interactive Effect of Parent and Adolescent Perceptions of Knowledge

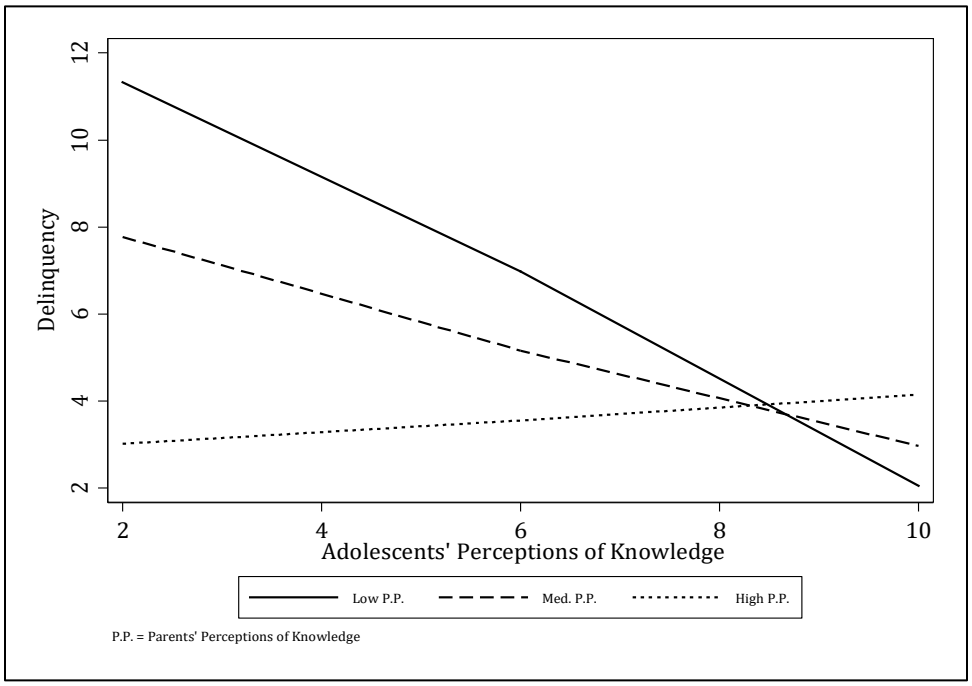

Figure 5. Additive Effect of Parent and Adolescent Perceptions of Knowledge (Surface Plot)

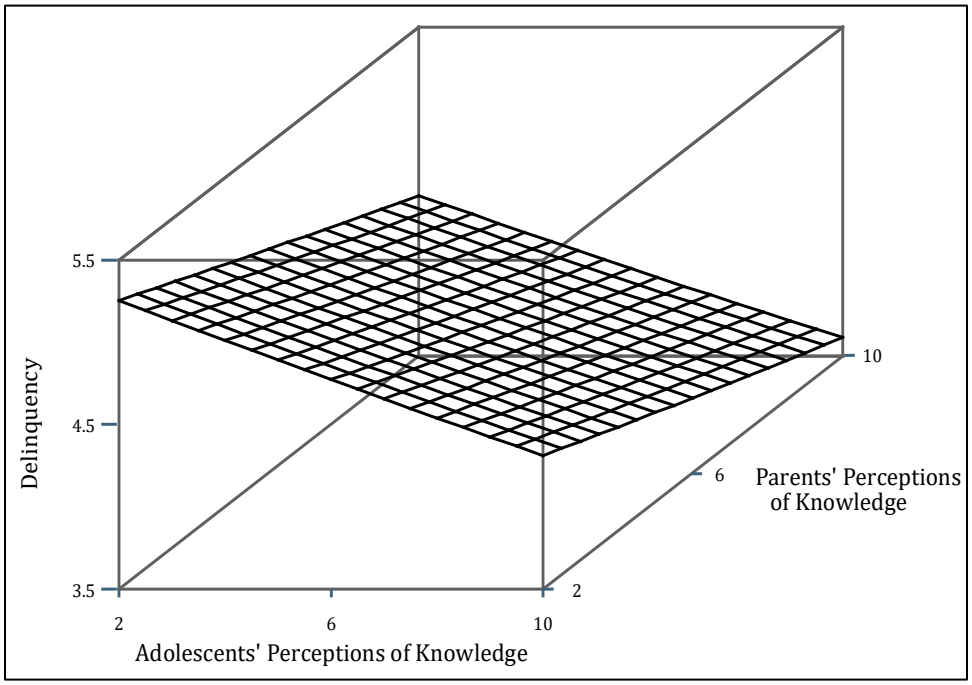

Figure 6. Interactive Effect of Parent and Adolescent Perceptions of Knowledge (Surface Plot)