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Reciprocal Associations between Parental Monitoring Knowledge and Impaired Driving in Adolescent Novice Drivers

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Abstract

Objective—Adolescent driving while alcohol/drug impaired (DWI) and parental monitoring knowledge may have notable interplay. However, the magnitude and direction of causality are unclear. This study examined possible reciprocal associations among adolescents between DWI and parental monitoring knowledge.

Methods—The data were from waves 1, 2 and 3 (W1, W2 and W3) of the NEXT Generation Health Study, with longitudinal assessment of a nationally representative sample of 10th graders starting in 2009-2010 (n = 2,525 at W1) and analyzed in 2014. Those who had obtained an independent/unsupervised driving license were included for the analysis. Autoregressive cross-lagged path analysis was used to examine potential reciprocal associations between DWI and parental monitoring knowledge of both mothers and fathers, controlling for potential confounders.

Results—Stability of fathers' and mothers' monitoring knowledge across three consecutive interview waves was identified. W1 monitoring knowledge of both fathers and mothers was prospectively associated with DWI at W2, but not for W2 with W3. A significant negative association between adolescent DWI at W2 and mother's monitoring knowledge at W3 was found, but not between W1 and W2. None of the associations between DWI and father's monitoring knowledge from W1 to W2, and from W2 to W3 were significant.

Conclusions—Early (10th grade) parental monitoring knowledge may predict lower adolescent self-reported DWI in 11th grade. More notably, adolescent DWI did not seem to increase parental monitoring knowledge. Future interventions are needed to improve parental monitoring knowledge and enhance awareness of the DWI risk in their adolescent novice drivers.

Keywords

adolescents; impaired driving; parental monitoring knowledge; novice driver

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Introduction

Teenage driving while impaired (DWI) caused by alcohol (Blomberg et al. 2009), drugs (Elvik 2013; Li et al. 2012), or by alcohol and drugs used in combination (Kuypers et al. 2012) is a major cause of injury and death (National highway Traffic Safety Administration 2012; National highway Traffic Safety Administration 2013). Although many factors are associated with teenage DWI including male sex, previous DWI (Copeland et al. 1996), heavy episodic drinking (Li et al. 2014), risky driving (Li et al. 2014), and poor family relationships (Dols et al. 2010), parental monitoring may play an important role in attenuating its magnitude and prevalence, particularly because a consistent pattern has been identified between risky behaviors and less perceived parental monitoring (DiClemente et al. 2001). Parental monitoring has been defined as parental monitoring knowledge (Laird et al. 2003; Laird et al. 2008) when it was measured with the knowledge parents have of adolescent use of free time (Hayes and Matthews 2003).

Previous findings from cross-sectional and longitudinal studies have indicated that higher parental monitoring discourages teenage DWI. For example, it was shown in a large national cross-sectional sample of 9th to 11th grade students that authoritative parenting (including monitoring) was related to 71% less DWI compared to those with uninvolved parents (Ginsburg et al. 2009). In a longitudinal study using US adolescents, Li and colleagues (Li et al. 2014) found that father's monitoring knowledge when students were in 10th grade predicted lower DWI prevalence in 11th grade. However, this predictive effect was observed only in two adjacent years, from 10th to 11th grade students. From a developmental perspective, more waves of data may be needed to clearly depict the relationship dynamics between parenting and child behavior during adolescence (Stice and Barrera 1995) throughout the spectrum of the high-school years, particularly because drinking and DWI increase during late high school.

In addition to the viewpoint that parenting practices influence child development and behavior outcomes, a reciprocal process has been reported. As proposed by Bell (1968) bidirectional effects are likely between parenting and child development. More specifically, "parenting affects child development and child behavior influences parenting practices (pp. 322)" (Stice and Barrera 1995).

This bidirectional point of view has been included in a number of theories (Rueter and Conger 1998) and research practices. In one study, it was found that lower parental monitoring knowledge predicted increased adolescent delinquent behavior, and increased adolescent delinquent behavior predicted lower parental monitoring knowledge (Laird et al. 2003). In another study, Stice and colleagues' longitudinal findings indicated full reciprocal association between adolescent substance use and parental support and control. Specifically, prior parental support (and control) was negatively related to consequent adolescent substance use; and vice versa (Stice and Barrera 1995). However, the reciprocal association may not occur in all cases. For example, in the same study (Stice and Barrera 1995), although adolescent externalizing symptoms predicted parental support and control, the reverse was not found to be the true (Stice and Barrera 1995) in contrast with the substance

use behavior. Parental monitoring knowledge may be closely related to parental control, measures of which have been used to study monitoring knowledge (Kerr and Stattin 2000).

In summary, DWI and parental monitoring knowledge may have notable interplay during adolescent development. However, the direction and magnitude of the relationships in this context is unclear. The logical association between greater parental monitoring knowledge and discouragement of teenage drinking and DWI has been previously demonstrated (Beck et al. 2004; Li et al. 2014). It may also be the case that parental monitoring knowledge increases when adolescents begin drinking and their risk of DWI increases, at least to the extent parents are aware that their teenage children have started drinking. Parent monitoring knowledge appears to be a reasonable and logical measure of the parents' awareness of their teenager's substance use and transportation behavior. However, we have been unable to find published studies that have examined either prospective association from teenage DWI to parental monitoring knowledge or bidirectional association between teenage DWI and parental monitoring knowledge. The purpose of our study was to examine potential reciprocal prospective associations among US high school students between DWI and parental monitoring knowledge using autoregressive cross-lagged path analysis. We hypothesized that heightened parental monitoring knowledge would be prospectively associated with decreased risk of teenage DWI and increases with age in DWI prevalence would be associated with decrease in parental monitoring knowledge.

Methods

Sampling

The NEXT Generation Health Study recruited a longitudinal, nationally-representative sample of U.S. 10th graders during the 2009-10 school year (W1). Annual data (W1-3) were collected through the last year of high school. Sampling strategy has been reported and published elsewhere (Li et al. 2014). In 10th grade, 2619 students were recruited for this study at W1. A total of 2,525 students completed the survey at W1. A total of 2,423 completed the survey at W2, and 2,408 at W3. The students who had obtained an independent/unsupervised driving license by each of 3 waves were used for the analysis (n=402 for W1, 880 for W2, and 1217 for W3). African-American participants were oversampled to provide more accurate population estimates. Parental consent or student's consent was obtained in all waves. The study protocol was reviewed and approved by the Institutional Review Board of the National Institute of Child Health and Human Development.

Measures

Driving while alcohol/drug impaired (DWI)—DWI at W1, W2 and W3 was measured using one question derived from the Youth Risk Behavior Survey (YRBS) questionnaire (Eaton et al. 2010) by asking participants on how many days in the last 30 days they drove after drinking alcohol or using illegal drugs. Due to severe floor effect and non-normal distribution of the data (the same reason for the dichotomous variables below), the DWI score was coded as a dichotomous variable: 1=one day or more and 0=no days.

Parenting practices—Parenting practices include mother and father's monitoring knowledge at W1, W2, and W3. Parental monitoring knowledge was measured using questions adapted from a validated 5-item scale (Brown et al. 1993). Adolescents reported their perceptions of their mother's and (on separate items) their father's monitoring knowledge about (1) who their friends were; (2) how they spent their money; (3) where they were after school or work; (4) where you went at night; and (5) what they did with their free time (1=don't have/see father or mother/guardian; 2=he/she doesn't know anything; 3=he/she knows a little; and 4=he/she knows a lot). The internal consistency of the five items was measured using Cronbach's alpha. The alphas for adolescents' responses to father- and mother- related questions were .86 and .94 for W1, .90 and .96 for W2, and .91 and .97 for W3, respectively. Means scores were calculated for the father's and mother's monitoring knowledge at each wave.

Potential Confounders

Heavy episodic drinking—Teens were asked, “Over the last 30 days, how many times (if any) have you had four (for females)/five (for males) or more drinks in a row on an occasion?” with response options from 1=none to 6=10 or more times. The scores were dichotomized, 1=at least once vs. 0=none. The question was adapted from the Monitoring the Future national survey (Johnston and others 2010).

Substance use—Substance use was measured by asking participants 10 questions derived from the Monitoring the Future national survey (Johnston and others 2010) on how often they have ever used drugs (e.g., marijuana, medication to get high) in the last 12 months with seven options from 1=never to 7=40 times or more. A dichotomous variable was then generated as 1=have used any of those drugs as least once and 0=none.

Peer alcohol and substance use—Peer alcohol and substance use was measured by averaging five items derived from the National Longitudinal Study of Adolescent Health (Harris and others 2009) by asking participants how often they thought their five closest friends drank alcohol, got drunk, smoked cigarettes, smoked/used marijuana, and took other drugs with options from 1=never to 5=almost always. The internal consistency coefficients of this scale are 0.85.

Demographic Variables

Participants reported age ($M = 16.19$ years/ $SE = 0.02$ at W1, 10th grade), gender, race/ethnicity, family socioeconomic status, family structure, and days driven in the last 30 days, and their parents reported their education level. Family socioeconomic status was estimated using the Family Affluence Scale (Currie and others 2004; Spriggs et al. 2007). Students were categorized as living with both biological parents, with one biological parent and one step-parent, single parent (mother only), single parent (father only), and others to indicate their family structure. Parents reported the education level of both parents and were categorized based on the highest level of education of either parent. The demographic variables were selected as covariates in the model fitting.

Statistical Analyses

These analyses were conducted in 2014 and a path analysis approach was used to examine the autoregressive cross-lagged association between DWI and father's (father's model) and mother's (mother's model) monitoring knowledge (Selig and Little 2012). Features of complex survey design (i.e., stratification, clustering and longitudinal sampling weights) were taken into account. Mplus (Version 7) program was used for the analysis (Muthen and Muthen 2001). Probit regression coefficients were estimated with weighted least squares estimation (WLSMV) for the DWIs which are binary outcomes.

Model fit (Weston et al. 2008) was assessed using (a) the Chi square statistic, (b) Standardized Root Mean Square Residual (SRMR), (c) Root Mean Square Error of Approximation (RMSEA), (d) the Comparative Fit Index (CFI) and (e) the Tucker–Lewis index (TLI). The following thresholds were used to determine model fit: a non-significant chi-square; a SRMR value below 0.10, a RMSEA less than 0.06, and CFI and TLI values approaching 1.0.

Six steps were conducted for the modeling (Table 1) and the models were run including selected covariates. For questions related to DWI, the analysis was limited to those who had a license allowing independent, unsupervised driving at each wave.

Results

As shown in Table 2, among licensed students, 12.87% reported DWI at W1, 12.53% at W2, and 14.31 at W3 respectively for 10th, 11th, and 12th-grade students. Both father's and mother's monitoring knowledge significantly decreased over three waves.

As shown in Table 3, each measure was significantly and highly correlated over time, while correlations between the variables were generally significant, but modest. For example, correlations between the two parenting variables at W1 with DWI at W2 were $r = -0.07$ and $r = -0.16$, respectively.

Table 1 shows the fit indices of the tested cross-lagged panel models. For both father's and mother's models, the full cross-lagged model (M6) fit the data the best.

As shown in Figure 1 (M6 in Table 1), the stability between DWIs across three waves and between mother's monitoring knowledge across waves are significant ($p < .001$) and their magnitudes were similar. The cross-lagged effect from mother's monitoring knowledge to DWI was only found between W1 and W2, not between W2 and W3. The W2 DWI is negatively associated with W3 mother's monitoring knowledge, which indicates that adolescents' DWI in 11th grade did not raise the mother's monitoring knowledge about their children.

As shown in Figure 2 (M6 in Table 3), similar to mother's model above, the stability between DWIs across three waves and between father's monitoring knowledge across waves were significant ($p < .001$) and their magnitudes were similar. Father's monitoring knowledge at W1 was negatively associated with adolescent DWI at W2; but father's monitoring knowledge at W2 was not associated with adolescent DWI at W3. None of the

cross-lagged effect from DWI to father's monitoring knowledge between W1 and W2 and between W2 and W3 was significant.

Demographic variables and other covariates were included in the model fitting procedure as potential confounders. Given limited space, the results were not presented but are provided in Appendix 1.

Discussion

The current study extends the extant literature on the relationship between parental monitoring knowledge and teenage DWI behavior by examining temporal stability and bidirectional effects of these measures using three waves of data from a nationally representative longitudinal study.

Findings of this study provided information on three issues. First, patterns of change in parental monitoring knowledge and teenage DWI were identified. DWI prevalence remained stable from W1 to W2, but increased at W3. In contrast, teenager-self-reported father's and mother's monitoring knowledge decreased modestly over time, which is consistent with other studies (Kerr et al. 2010). Second, there was considerable stability in autoregressive associations from 10th to 12th grade for DWI as well as parental monitoring knowledge, indicating temporal stability across three years for both DWI and parental monitoring knowledge. Third, cross-lagged correlations indicate that both father's and mother's monitoring knowledge in 10th grade appeared to inhibit adolescent's DWI in 11th grade. DWI in 10th grade did not predict mother's monitoring knowledge in 11th grade. However, DWI in 11th grade was linked to reduction in monitoring knowledge in 12th grade, suggesting that mothers might be withdrawing from monitoring activities. Furthermore, this could suggest that parents had more difficulty obtaining information from adolescents who were engaged in DWI that adolescent independence from parents increased, or simply that adolescents disclosed less information. The increasing prevalence of DWI and decreasing parental monitoring knowledge should be of notable concern given that parental monitoring appears to protect against teenage DWI. This finding is in line with findings from a previous longitudinal study on parenting and alcohol use among early adolescents. In that study, Zehe and Colder (2014) found the parents were less likely to restrict their children's drinking or convey the consequences of alcohol use as their children grew older.

These findings are consistent with the previous cross-sectional studies on parental monitoring knowledge and DWI (Ginsburg et al. 2009; Li et al. 2014) and prospective studies on the association between parental monitoring knowledge and other teenage problem behaviors. For instance, Laird et al. (Laird et al. 2003) reported that higher parental monitoring knowledge was associated with a decrease in later delinquent behaviors. Stice et al. (1995) found that increases in adolescent substance use and externalizing symptoms were linked to a decrease in later parental control during the early adolescence (younger than 15 years). It is also noted that the prospective association between parental monitoring knowledge and later DWI was not found between 11th and 12th grades in our study which is consistent with Laird and colleagues' finding that showed significant association between parental monitoring knowledge and adolescent-reported delinquent behaviors from 11th and

12th grades. Yet, when parent-reported delinquent behaviors was used, the association was significant in their study (Laird et al. 2003). The discrepancy in the effects of parent- and adolescent- reported parental monitoring knowledge may indicate the following. First, parental monitoring knowledge plays an important role in early adolescence but its effect is attenuated as the child grows during later adolescence (Stice and Barrera 1995). Second, adolescent- and parent- reported parental monitoring knowledge about delinquent behaviors may be different. The adolescent's perceived parental monitoring knowledge may not reflect the real efforts of their parents in trying to identify the adolescent's problem behaviors. For instance, because DWI could have been a single event, teens could have sought to keep this information from their parents and parents might not have probed sufficiently to find out about DWI. So maybe parent knowledge about DWI would be moderated by parent knowledge about other relevant problems such as drinking from which DWI would be expected to follow. In other words, parents may need to improve their parenting and monitoring skills, and these improvements can lead to enhanced trust between adolescents and parents. This, in turn, may raise parents' alert against adolescent DWI and enhance the effectiveness of their efforts in reducing DWI in their own adolescent driver. Studies show that parent increased warmth, autonomy granting, and decreased negative control on children effectively develops positive parent-child relationship (Branstetter and Furman 2013; Fabrizio et al. 2013).

Interestingly, DWI in 10th grade was not predictive of subsequent monitoring knowledge of either fathers or mothers in 11th grade, while DWI of 11th grade adolescents predicted a decrease in mother's monitoring knowledge in 12th grade. The failure of adolescent DWI predicting parental monitoring knowledge may be due to a limitation of how parents acquire information from their children. As described by Kerr and Stattin (Kerr and Stattin 2000), parents acquire information primarily from child disclosure and parental solicitation which largely depend on adolescents' willingness to provide information. In other words, if teenagers, in this study, did not disclose their DWI behaviors to parents, parents might not be motivated to seek out such information or be aware of the need to increase their monitoring knowledge on their child's DWI activity. Previous research has shown that parents are not well informed about the drinking behavior of their adolescent children (Beck et al. 1999). The negative association between prior DWI and consequent decreased monitoring knowledge of mothers is consistent with previous community studies showing negative associations between adolescent problem behavior and perceived parental control (Baumrind 1991; Stice and Barrera 1995), and between parental monitoring knowledge and delinquent behavior problems (Laird et al. 2003). This may reflect the fact that adolescents are getting older and more independent, so parents may have fewer opportunities for communication with and observation of their children's behavior. It was found that unless parents responded to the early childhood behavior problems using a "prevention-oriented approach", i.e., parent proactive teaching before children actually engage in misbehavior (Pettit et al. 2001), it may be very challenging to begin or increase monitoring adolescents' activities effectively when they are already involved in a problem behavior (Laird et al. 2003; Pettit and Laird 2002). DWI is a problem behavior generally occurring in late adolescence. Therefore, it will be challenging for parents to increase their parental monitoring knowledge with respect to DWI and other behaviors if a positive parent-child

relationship and frequent parent–child conversations as a major source of parents' information has not already been established (Kerns et al. 2001).

We recognize that our study has some limitations. First, our measures of driving while impaired and riding with an impaired driver did not distinguish between drinking and driving versus using drugs and driving. Second, although the self-report measures employed are standard and widely used, social desirability bias could lead to under- or over- reporting of sensitive behaviors such as DWI. Finally, this study used adolescent self-reports only, not parents' reports, in assessing parental monitoring knowledge. Therefore, the sole reliance on adolescent reports inherently presents limitations in assessing parental monitoring knowledge.

Our study has several important implications. *First*, the lack of association between teenage DWI and parental monitoring knowledge is of concern and raises questions about how informed (quantitatively and qualitatively) parents are about whether or not their teenage children are engaging in DWI. Parents may have underestimated or been unaware of the children's DWI behavior. This is consistent with the imbalance between what the parents think about if their children are drinking and the facts reported by Mothers Against Drunk Driving (MADD) (2013). *Second*, effective interventions should be developed and intentionally focused on improving parental monitoring knowledge about teenagers' DWI corresponding to developmental changes in adolescence. “Parents do make a difference (pp. 12)” in decreasing teenage risk behaviors such as alcohol drinking (MADD, 2013) and substance use (Spoth et al. 2004). Known effective evidence-based interventions in reducing teenager's problem behaviors such as in substance use may be translated and adapted to enhance parental monitoring knowledge in the DWI context. For example, a successful intervention of substance use recommended parent-child skills training in five areas such as establishing effective child management including careful monitoring and establishing mechanisms for parent instruction (Spoth et al. 2001). To address DWI, MADD specifically recommends that parents should be knowledgeable about the provisions of graduated licensing and zero tolerance laws in their state to keep their teenagers from DWI (MADD, 2013). *Finally*, the weakening of the parental knowledge-DWI relation over time suggests three things. First, elevated parental monitoring knowledge on teen DWI is imperative. Less parental willingness to discipline a risk behavior such as underage drinking (Zehe and Colder 2014) may convey to adolescents a misleading message that that behavior is acceptable or at the least that behavior carries no consequence. Second, sustained parental efforts in monitoring teenager's risk behaviors are needed. Turrisi and Ray (2010) found that sustained parental efforts during adolescence is beneficial to preventing high-risk drinking related harm at the late stage of adolescence and early adulthood. Third, adults should be committed to be physically in the vehicle with novice drivers and purposefully participate in supervised driving, which is consistent with the requirement by the graduated licensing provisions (National highway Traffic Safety Administration 2008).

Conclusions

In our nationally representative sample of teenage drivers, early (at W1) parental monitoring knowledge longitudinally predicted lower adolescent self-reported DWI. However, the

protective effect of parental monitoring knowledge was not found at the later wave (W2). More notably, adolescent DWI did not seem to raise parents' concern, thereby increasing parental monitoring knowledge. Future interventions are needed to improve parental monitoring knowledge and enhance awareness of the DWI risk in their adolescent novice drivers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Figure 1. Autoregressive cross-lagged model of DWI and mother's monitoring knowledge
 Path coefficients are unstandardized and standardized (in the parentheses) probit regression coefficients. The model was adjusted for selected covariates. DWI: driving while alcohol/drug impaired; Mom: mother's monitoring knowledge.

Figure 2. Autoregressive cross-lagged model of DWI and father's monitoring knowledge
 Path coefficients are unstandardized and standardized (in the parentheses) probit regression coefficients. The model was adjusted for selected covariates. DWI: driving while alcohol/drug impaired; Dad: father's monitoring knowledge.

Table 1

Fit Indices of the Models Tested

Model	χ^2 (df)	<i>p</i>	RMSEA (90% CI)	CFI	TLI
DWI and Mom					
M1: Initial stability	42.463 (8)	<.001	0.116 (0.083 0.151)	0.904	0.833
M2: Adjusted stability	62.341 (9)	<.001	0.057 (0.044 0.071)	0.919	0.003
M3: Adjusted stability, dropping insignificant	82.445 (55)	0.010	0.017 (0.008 0.024)	0.958	0.916
M4: Cross-lagged: Mom $\rightarrow$ DWI	71.698 (53)	0.045	0.014 (0.002 0.022)	0.972	0.941
M5: Cross-lagged: DWI $\rightarrow$ Mom	80.487 (53)	0.010	0.017 (0.009 0.024)	0.958	0.958
M6: Cross-lagged: DWI $\leftrightarrow$ Mom	69.279 (51)	0.045	0.014 (0.002 0.022)	0.972	0.940
DWI and Dad					
M1: Initial stability	19.050 (8)	0.015	0.065 (0.027 0.104)	0.954	0.920
M2: Adjusted stability	34.560 (9)	0.001	0.040 (0.026 0.054)	0.947	0.352
M3: Adjusted stability, dropping insignificant	67.185 (53)	0.091	0.012 (<0.001 0.020)	0.972	0.945
M4: Cross-lagged: Dad $\rightarrow$ DWI	60.406 (51)	0.172	0.010 (<0.001 0.019)	0.982	0.962
M5: Cross-lagged: DWI $\rightarrow$ Dad	65.722 (51)	0.081	0.013 (<0.001 0.021)	0.971	0.941
M6: Cross-lagged: DWI $\leftrightarrow$ Dad	58.202 (49)	0.173	0.010 (<0.001 0.019)	0.982	0.961

Dad: father's monitoring knowledge; Mom: mother's monitoring knowledge.

M1: initial stability model without including any confounders; M2: initial stability model including potential confounders; M3: initial stability model dropping non-significant confounders; M4: cross-lagged model including the paths from Mom (or Dad) to DWI only; M5: cross-lagged model including the paths from DWI to Mom (or Dad) only; M6: cross-lagged model including the paths between DWI and Mom (or Dad) reciprocally.

Table 2

Percentage of DWI in the Past Month among 10th (n=2525), 11th (n=2423), and 12th-Grade (n=2408) Students: NEXT Generation Study, 2009–2012^a

School Year/Wave	DWI at Least 1 Day			Father's monitoring knowledge			Mother's monitoring knowledge		
	No. ^b	Wtd % (SE)	95% CI	Wtd mean (SE)	95% CI	Wtd mean (SE)	95% CI	Wtd mean (SE)	95% CI
2009 – 2010	396	12.87 (3.57)	5.40, 20.33	3.14 (0.04)	3.06, 3.22	3.59 (0.04)	3.50, 3.68		
2010 – 2011	844	12.53 (1.44)	9.53, 15.52	3.05 (0.03)	2.98, 3.12	3.56 (0.02)	3.52, 3.60		
2011 – 2012	1208	14.31 (2.07)	9.98, 18.63	2.91 (0.04)	2.82, 2.99	3.50 (0.02)	3.46, 3.55		

Note. DWI = driving while alcohol/drug impaired;

^aThe differences in fathers' and mothers' monitoring knowledge between every 2 waves are significant adjusted for Bonferroni correction

^bthe analysis was limited the students who had independent, unsupervised driving license in waves 1, 2, and 3 respectively and had valid values for DWI and parental monitoring knowledge.

Wtd: weighted. The differences in father's and mother's monitoring knowledge between every two waves are significant adjusted for Bonferroni correction.

Table 3
Correlation between Mother's and Father's Monitoring Knowledge and DWI in Three Waves

	1	2	3	4	5	6	7	8	9
Wave 1									
1 DWI	-	-0.04	-0.23***	0.31***	0.02	-0.06	0.22***	0.01	-0.10*
2 Father's monitoring knowledge		-	0.26***	-0.07*	0.68***	0.09***	-0.08**	0.65***	0.08†
3 Mother's monitoring knowledge			-	-0.16***	0.13***	0.50***	-0.15***	0.12***	0.44***
Wave 2									
4 DWI				-	-0.09**	-0.22***	0.39***	-0.06†	-0.11**
5 Father's monitoring knowledge					-	0.23***	-0.05†	0.71***	0.12***
6 Mother's monitoring knowledge						-	-0.16***	0.12***	0.55***
Wave 3									
7 DWI							-	-0.08**	-0.16***
8 Father's monitoring knowledge								-	0.24***
9 Mother's monitoring knowledge									-

Correlation was calculated using Pearson's correlation between two continuous variables, and one continuous and one dichotomous variable, and Spearman correlation between two dichotomous variables.

† < .05 p .10, * p .05, ** p .01, *** p .001