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The association between kinematic risky driving among parents and their teenage children: Moderation by shared personality characteristics

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Abstract

This study examined the driving behavior of 42 parent–teenager dyads for 18 months, under naturalistic driving conditions. At baseline participants' personality characteristics were assessed. Objective risky driving measures (kinematic risky driving) were captured by accelerometers for the duration of the study. To estimate teenage and parent correlations in kinematic risky driving, separate Poisson regression models were fit for teenagers and parents. Standardized residuals were computed for each trip for each individual. Correlations were obtained by estimating the Spearman rank correlations of the individual average residuals across teenagers and parents. The bootstrap technique was used to estimate the standard errors associated with the parent–teenager correlations. The overall correlation between teenage and parent kinematic risky driving for the 18-month study period was positive, but weak ($r = 0.18$). When the association between parent and teenagers' risky driving was adjusted for shared personality characteristics, the correlation reduced to 0.09. Although interesting, the 95% confidence intervals on the difference between these two estimates overlapped zero. We conclude that the weak similarity in parent–teen kinematic risky driving was partly explained by shared personality characteristics.

Keywords

Parent; Teenager; Family; Driving behavior; Naturalistic driving

1. Introduction

It has previously been shown (Bianchi and Summala, 2004; Miller and Taubman-Ben-Ari, 2010; Prato et al., 2009) that teenagers drive in a similar manner to their parents. Several direct and indirect mechanisms have been proposed to explain possible familial associations in driving behavior. Throughout childhood and adolescence, children directly observe and

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Conflicts of interest

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are encouraged to emulate the habits of their parents, and this could apply to driving (Wilson et al., 2006). When teenagers are learning to drive, parents exert direct and immediate influence through driving instruction. However, indirect pathways such as common personality traits or attitudes may also account for similarities between parent and teenagers' driving behavior as well as driving in under similar geographic and traffic conditions.

The majority of studies examining the association between parents and their children's driving behavior have relied on archival driving records or self-reported driving behavior. An early study using driver history records established the initial evidence for parent-teenage associations in driving behaviors (Carlson and Klein, 1970). Recent studies extended the use of driver history records (Ferguson et al., 2001) by testing the prospective association between parent driver history and teenage driving violations and motor vehicle crashes (MVCs) (Wilson et al., 2006). Self-reported surveys, combined with self-reported traffic violations and crashes (Bianchi and Summala, 2004) have provided further evidence of similarity in the way parents and their children drive. However, few studies have evaluated factors that might moderate these similarities.

Studies using instrumented vehicles provide an opportunity to advance our understanding of the associations between parents' and teenagers' driving by providing an objective measure of risky driving (Simons-Morton et al., 2012). Using accelerometers, kinematic risky driving behavior can be quantified for each driver and the association between parent and teenage risky driving behavior objectively established. The first study of this kind was conducted in Israel in 2009 and tracked risky driving maneuvers for 75 families over a 9-month period using in-vehicle data recorders (IVDR). The results indicated parents' driving was moderately correlated with their children's and the associations varied by parents' and children's gender (Prato et al., 2009). These findings provided initial evidence of a correlation between parents and their teenage children's driving risky driving behavior using objective measures of risky driving.

However, data collection for the Prato et al. study coincided with the period that teenagers were required to drive under the direct supervision of a parent (for the first three months as part of Israel's Graduated Driver Licensing System). Unlike the high crash risk that is associated with first years of licensure (Williams, 2003), research has shown that teenage driving that occurs under parental supervision entails very low crash risk (Mayhew, 2003). Drivers participating in this study also received feedback (Toledo et al., 2008) that was shown to be effective over time in reducing their risky driving behavior and motor vehicle crashes. It is likely that teenage driving behavior was also more conservative when parents were present in the vehicle, and when monitoring devices were providing feedback on their driving behavior to their parents than would have been the case without parent passengers or IVDR feedback. Therefore, while the Prato et al. (2009) study provides a useful preliminary examination of the potential application of instrumented vehicles to measure the association between parents and their teenage children's driving behaviors, it is timely to evaluate this association under naturalistic conditions, where parents are not present as passengers and no feedback or intervention is provided.

The Naturalistic Teen Driving Study provides an opportunity to examine the association between parent and teenage risky driving behavior when parents were not present in the vehicle and no intervention or driver feedback was provided. To date, much has been learned about teenage driving relative to adult driving behavior from the data gathered for this study. Specifically, teenage driving that occurred while parents were in the vehicle involved very low risk and crash rates, suggesting it is not indicative of independent driving behavior (Simons-Morton et al., 2011a). Driving independently, teenage drivers' crash and near-crash (CNC) rates were significantly higher during the first six months of driving, relative to the subsequent 12 months, and were significantly higher than their parents during the 18-month study period (Lee et al., 2011). Unlike the finding by Prato et al. (2009), teenage drivers showed a large amount of variability in driving behavior over the study period. Specifically, the within-subject variation in risky driving was approximately of the same magnitude as the between-subject variation (Kim et al., 2013). A final notable finding is that the objective composite measure of risky driving behavior predicted crashes and near crashes for both teenagers and parents (Simons-Morton et al., 2012).

Beyond basic demographic characteristics, few studies have identified individual level characteristics associated with driving behavior. Individual perceptions of risk and driving ability have been examined extensively (Hatfield and Fernandes, 2009; Jonah and Dawson, 1987; Ulleberg and Rundmo, 2003), with mixed findings. Social norms represent a promising avenue of investigation (Simons-Morton et al., 2011b). Personality characteristics are the subject of enduring research interest, as they are stable traits associated with behaviors other than driving, including adolescent risk behavior (Cooper et al., 2003). However, the literature on personality characteristics and driving behavior is limited, findings are mixed, and the magnitude of the association between personality characteristics and driving behavior are modest (Dahlen and White, 2006; Jonah, 1997), and few studies have been based on objective measures of driving behavior (Nichols et al., 2011). Data from the Naturalistic Teen Driving Study present a unique opportunity to examine the association between personality and driving. Using objective data of parents and their teenage children's driving behavior, shared personality characteristics that account for similarities between parent and teenagers driving behavior can be explored.

The primary purpose of this study was to examine the association between parents and their teenage children's driving behavior for 18 months under naturalistic driving conditions, where newly-licensed teenagers drove independently and without supervision, and where no intervention or feedback was provided to the study participants. A secondary purpose was to determine the extent to which associations between parent and teenage driving behavior could be explained by shared personality characteristics.

2. Method

2.1. Participants and data collection

The primary vehicles of newly licensed teens were instrumented with data acquisition capabilities within three weeks of licensure, and participants were instructed to drive as they would normally. Multiple measures were assessed over the first 18 months of licensure.

2.1.1. Participants and selection criteria—The protocol for this study required the participation of newly licensed teenage drivers and at least one of their parents. Recruitment was conducted in local newspaper and driving schools in southwestern Virginia, USA. Participants were initially screened in a telephone interview for eligibility using the following inclusion criteria: (a) being less than 17 years old; (b) being newly licensed to drive independently, defined as holding a provisional driver's license allowing independent driving for no more than three weeks; (c) having at least one parent willing and able to participate; (d) access to a vehicle expected to survive mechanically for at least 18 months; (e) residing within a one hour drive of the research center; and (f) holding liability insurance on the vehicle to be used in the study (required by state law). Participants were excluded during the pre-screen telephone interview if they: (a) had a diagnosis of attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD); (b) had an identical twins (difficult to distinguish when coding); (c) needed to enter restricted areas (i.e., that do not allow cameras for security reasons); and (d) had only access to a pick-up truck (due to lack of a concealed space to install the instrumentation).

Participant recruitment was stratified to have a similar number of male and female teenage drivers and participants sharing and not sharing a vehicle with their parents. A total of 315 individuals responded to recruitment efforts, of which 42 fulfilled the eligibility criteria and were enrolled in the study. The final teenage sample comprised 22 females and 20 males with an average age of 16.4 years (± 0.3). The parent sample for this study had 13 males and 29 females. Four participants withdrew from the study before the end of the 18-month data collection period, however, only one of those participants did not complete the final set of questionnaires. Over half of the parent participants (53.3%) reported a household income of over \$100,000 and 84.4% reported a parent education level of a bachelor degree. During the study period, average household income in Virginia was \$61,406 (U.S. Census Bureau, 2013a), and the percentage of individuals reporting educational attainment of a bachelor degree or higher was 34.4% (U.S. Census Bureau, 2013b). Vehicle and survey data were collected from June 2006 to September 2008.

2.1.2. Consent and incentives—Three consent forms were required for the study: parental consent and teenagers' assent for their participation, and an adult consent form for parent participation. Teenager assent was obtained separately from the parent to ensure their participation was voluntary, and free of parental coercion. Participants were provided \$75 for each month of participation in the naturalistic part of the study up to 18 months, and \$20 per hour for completing questionnaires. Each participant received a bonus of \$450 for completing all aspects of the study. The protocol was reviewed and approved by the Virginia Tech Institutional Review Board for the Protection of Human Subjects.

2.2. Vehicle data

Teenage and parent dyads shared an instrumented vehicle, enabling assessment of parents driving the same vehicle as their teenager, and teenagers driving with their parent and alone. The data acquisition system included a computer that received and stored continuous data from accelerometers that measured longitudinal, lateral, and yaw inputs; vehicle network that collected speed, turn signals, brake, and throttle pedal usage; a global positioning

system (GPS) that calculated vehicle position, and speed; and 6 cameras. Four cameras recorded video images that continuously monitored the driver's face, the dashboard, and areas reachable by the driver's hands, as well as the forward and rearward roadway. Two cameras also provided snapshots of the interior cabin of the vehicle as well as the rear-seat pan to better obtain passenger presence, seatbelt use, and age of passengers. With participants' permission, data were downloaded periodically by swapping the hard drives in the computers installed in the trunks of the vehicles. The replacements of the hard driver were not observed by study participants. The following data were collected from the event recorders.

2.2.1. Driver and passenger identity—Coders viewed the camera snapshot data for each vehicle trip and recorded the identity of the driver, the sex, and relative age of each passenger. This enabled trips where parents were present in the vehicle to be accounted for in the analysis. For the majority of the analyses, the sample of teenage drives was restricted to those trips where no adults were present in the vehicle. This sample of drives was selected to reflect teenage driver behavior in the absence of the risk-reducing influence of adult drivers (Mayhew, 2003).

2.2.2. Kinematic risky driving—Following the method of af Wahlberg (2007), where driver acceleration behavior (g-force events) was aggregated into an index, a composite variable of elevated gravitational-force (g-force) events was created by counting each event over the threshold set for each of the 5 individual measures: longitudinal deceleration/hard braking (>-0.45 g); longitudinal acceleration/rapid starts (> 0.35 g); hard left and hard right turns (> 0.50 g); and yaw (± 6 degrees within 3 s). Yaw is the delta ψ between an initial turn and the correction. A composite variable was created by counting any event over the threshold set for each of the five individual measures. The Cronbach's alpha for the composite measure was 0.78 (Simons-Morton et al., 2011b), and was highly correlated with crashes and near crashes ($r = 0.60$). In receiver operating curve analyses the area under the curve was 0.76, showing high predictive validity (Simons-Morton et al., 2012). Analyses were conducted using the counts of the elevated g-force, accounting for the number of miles driven by each teenage and adult driver.

2.3. Questionnaire data

Surveys were administered to participants at baseline assessing personality and sensation seeking. The properties of the measures are reported in Table 1.

2.3.1. Personality inventory—The NEO-Five Factor Inventory (NEO-FFI) is a 60-item measure of five personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience, with 12 items measuring each domain (Costa and McCrae, 1989). The scale has a five option response format (strongly disagree, disagree, neutral (cannot decide), agree, or strongly agree) to statements such as "I like to have a lot of people around me". The NEO-FFI was analyzed by the subscales corresponding to Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Dimensional scores derived from the standard NEO-FFI scoring system were calculated and used to

produce the median, mean, standard deviation, and correlation between teenage and parent participants.

2.3.2. Sensation seeking—The Sensation Seeking Scale Form V (SSS-V) (Zuckerman, 1994) was administered to assess this personality trait. This 40-item scale has a forced choice format offering two possible options such as “I sometimes like to do things that are a little frightening” (higher sensation seeking) vs. “A sensible person avoids activities that are dangerous” (lower sensation seeking). Sensation seeking scores were derived according to the standard scoring protocol for the SSS-V and used to produce the median, mean, standard deviation, and correlations between scale values for teenage and parent participants.

2.4. Statistical analyses

Of primary scientific interest was estimating the parent-child correlations for kinematic risky driving. The goal was to examine the association between parent and teenage kinematic risky driving with and without adjustments for personality variables. We used a novel analytical approach to examine these associations with and without adjustments for personality characteristics. First, we fit Poisson regression with the dependent longitudinal variable being composite event counts on each trip and the independent variables being an offset term to account for a differing number of miles driven on each trip. The unadjusted model had no covariates, while the adjusted model incorporated individual personality variables as covariates into the models for teenagers and parents. Rather than fit a common model to both teens and their parents, separate models were fit to each group (McCullagh and Nelder, 1999). A Poisson model $\log(Y_{ij}) = \log(m_{ij}) + Bx_i$ was fit for the parents and another Poisson model for $\log(Y_{ij}) = \log(m_{ij}) + Cx_i$ for the teens, where Y_{ij} is the event count, x_i is the adjustment factor, and m_{ij} are the number of miles driven on the i th teen–parent combination and the j th trip. Second, we computed standardized residuals on the log scale as $r_{ij} = (\log(Y_{ij}) - \log(m_{ij}) - \hat{B}x_i / \sqrt{\log(m_{ij}) + \hat{B}x_i})$ for the parents and $r^*_{ij} = (\log(Y_{ij}) - \log(m_{ij}) - \hat{C}x_i / \sqrt{\log(m_{ij}) + \hat{C}x_i})$ for the teens, where the “hat” reflects the estimate from the Poisson model. We then computed the spearman rank correlations between averages of r^*_{ij} and r_{ij} over the entire 18 months as well as in 3 month intervals (quarter-specific analyses). We performed both unadjusted models (only offset term was included) and models that adjusted for personality (including variables separately and simultaneously in the model). Effectively, the effect of personality is “removed” in the adjusted models. In order to estimate standard errors for the Poisson regression models that adequately accounted for the correlation in the longitudinal data, we conducted Generalized Estimating Equations (GEE). Specifically, we fit the independence working model with a robust variance estimate which appropriately accounts for the correlation in measurements over individuals.

The bootstrap method was used to estimate the standard errors associated with the parent–teenager correlations (5000 bootstrap samples were constructed by sampling all trips for a parent–teenager pair with replacement) (Efron and Tibshirani, 1993). The bootstrap procedure accounts for the correlation across trips on each individual, the correlation between each parent and their teenager, and the parameter estimation for the Poisson regression required to compute the residuals.

3. Results

3.1. Parent–teenage correlation in personality measures

Correlations between parents and teenagers personality scales were small to moderate ($r = .07-.52$), not significant for sensation seeking and neuroticism, and statistically significant for openness, conscientiousness, extraversion and agreeableness (Table 1).

3.2. Parent–teenage correlation in kinematic risky driving

Over the 18-month study period, teenage drivers made a total of 68,507 trips. The majority of these trips did not include adult passengers (93.22% were driven with no adult passengers, $n = 64,578$). Over the same period, the primary parent sample made a total of 19,006 trips. Teenage drivers displayed greater variability in kinematic risky driving than parents during the study period (Fig. 1), with the widest range in g-force event rates occurring between 4 and 6 months of licensure. However, the incident rate of kinematic risky driving for both the teenage and parent sample did not vary significantly over time. Differences between teenage and parent kinematic risky driving, and individual trajectories are examined elsewhere (Kim et al., 2013; Simons-Morton et al., 2011a,b).

The overall correlation between parent and teenage kinematic risky driving for the 18-month study period was $r = 0.18$ (95% confidence interval $[-0.06, 0.42]$), shown in Table 2. When teenage driver trips involving adult passengers were excluded from the sample, the value remained unchanged. Due to the small sample, it was not possible to estimate gender-specific correlations in kinematic risky driving between parents and teenagers.

3.3. Parent–teenage correlation in kinematic risky driving over time

Also shown in Table 2, change in the correlation between parent and teenage kinematic risky driving occurred over time. During the periods of 0–3 and 4–6 months since licensure, the parent–teenage correlation in kinematic risky driving (excluding teen trips with parents) were .30 and .27, respectively. The correlation between parent and teenage kinematic risky driving was statistically significant during the first six months post-licensure. Thereafter, there is a decline between 7 and 9 months to .04 and then .10 between 10 and 12 months post-licensure. From 13 to 15 months post licensure, the correlation was .19, and between 16 and 18 months post-licensure it was .17. Bootstrap 95% confidence intervals included zero for the overall study period and from 7 to 18 months post-licensure. Furthermore, there was no significant decreasing trend of correlations over the 18 months study period.

3.4. Personality correlates of kinematic risky driving

First, the association between personality characteristics and kinematic risky driving was estimated for parents and teenagers separately (Tables 3 and 4). The correlation between sensation seeking and kinematic risky driving was $r = .18$ for teenagers and $r = -.05$ for parents, and neither was statistically significant.

Bivariate analyses of parent–child kinematic risky driving, controlling for personality scales were conducted on the sample of all trips and teenage trips excluding adult passengers. Table 5 shows the correlation between parent and teen responses for the personality

variables. Parent–teenage correlations in the survey measures were applied to the overall correlation in kinematic risky driving as covariates, one at a time. Significant deviations from the unadjusted overall correlation of $r = 0.18$ would be evidence of an effect of the covariate/moderation by the covariate. Accounting for parent–teenage correlations in openness, conscientiousness, and neuroticism changed the association between parent and teenage kinematic risky driving not at all or minutely. The openness and extraversion scales reduced the overall correlation from .18 to .13. When the openness, conscientiousness, extraversion, agreeableness scales were all included as covariates in a single model, the association between parent and teenage kinematic risky driving reduced from .18 [95% CI (−.06, .42)] to .09 [95% CI (−.23, .37)]. Although interesting, the 95% confidence intervals on the difference between these two estimates overlapped zero suggesting that there is not sufficient statistical evidence to confirm this observation.

4. Discussion

The Naturalistic Teenage Driving Study provided an opportunity to examine the association in driving behavior of 42 parent–teenager dyads over the first 18 months of teenage licensure, and determine the extent to which associations between parent and teen driving behavior were explained by shared personality characteristics. This proved challenging to accomplish for several reasons. The overall correlation between parent and teenage kinematic risky driving over the first 18-months of teen licensure was $r = .18$, which is modest, and given the small sample size, not significant. The reduction in the correlation between parent and teenage kinematic risky driving when controlling for personality (from 0.18 to 0.09) was consistent with an effect of personality, but not significant.

Despite the non-significant findings, this is one of the largest naturalistic driving studies of its kind and the weak correlations observed warrant closer examination. We used a sample of trips from teenage drivers that did not include adult passengers, as was the case for the first three months of previous study of parents and teenagers (Prato et al., 2009). Although we found little effect of adult passengers on parent–teen correlations, we attribute this in part to the low proportion of teenage drivers' trips with adult passengers in our study (6.78%). Differences in the correlations in the two studies may also be due to differences in the studies, including the somewhat older population of Israeli teenagers, and possible differences in driving culture and norms (Moeckli and Lee, 2007) in Israel and the U.S. Similar to Prato et al., our study found that the correlation between parents and teenagers' kinematic risky driving generally declined over time. The association between parents and teenagers was modest and significant during the first six months of driving, and became weak ($<.2$) and non-significant for the remainder of the study period. However, the decreasing trend in the correlations over the 18 months of driving was not significant. Accounting for shared personality characteristics resulted in a reduction in the association between parents and their teenage children's kinematic risky driving, from $r = 0.18$ to $r = 0.09$. While the decrease was not statistically significant, this finding suggests that some parental influence on children's driving may be due to pathways not directly related to driving itself, but to biological and long-term environmental origins, as suggested by Loehlin (Loehlin, 2005). However, given the small sample size of this study and little previous research on this topic, a definitive conclusion cannot be reached at present.

Our finding that correlation between individual measures of personality (NEO FFI, sensation seeking scores) and kinematic risky driving were small and not statistically significant contributes to the literature on personality and risky driving behavior. Previous studies have had mixed findings, generally reported weak associations between personality characteristics and driving behavior, and few have been based on objective measures of driving behavior (Nichols et al., 2011). The small sample size of 42 teenage drivers and their parents is likely to have constrained our ability to reach statistical significance for some findings, and to replicate some of the analyses conducted by Prato and colleagues, such as the gender-specific correlation in kinematic risky driving.

Accordingly, we do not want to over-interpret the results in that they provide an estimate of the overall parent–teenage correlation between kinematic risky driving and the effect modification of personality in a small sample of U.S. families over the first 18 months of licensure. Study participants were volunteers that had education levels and household incomes above the state average, which limits the generalizability of the findings. Future studies examining this question would benefit from a larger, more representative sample of geographically distributed participants, roughly equal numbers of male and female participants, and ideally both parents of the teenage driver. In addition to personality measures, collection of genetic samples from both teenage and parent participants could provide an additional source of information about the heritability of risk taking behaviors. This would allow for a comprehensive examination of the correlation between teenage and parents kinematic risky driving behavior.

These analyses add to the literature on the association between parents and their teenage children's driving behavior in a number of ways. Driving occurred under naturalistic conditions, and the sample of teenage drivers used in the analyses excluded adult passengers, providing an unbiased estimate of the association in parent–teenage kinematic risky driving. The statistical approach that adjusted for personality variables in estimating the parent–teenage correlations using Poisson regression and the bootstrap for inference is novel, and we believe, will be useful in analyzing future naturalistic driving studies with this type of data structure. We found modest ($r = 0.18$) overall correlations in parent–teenage kinematic risky driving, which were reduced to $r = 0.09$ when adjusted for shared personality characteristics. Therefore, we conclude that the modest similarities in parent–teen kinematic risky driving may be partly explained by shared personality. Further research examining the association between parent and teenage driving behavior is necessary to confirm these results.

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Fig. 1.

Box plot of kinematic risky driving (g-force event rates) for teenagers and parents over 3-month intervals. Box represents the middle 50% of scores for the group. Whiskers represent scores outside the middle 50%. Median shown by the line that divides the box into two parts. Circles represent outliers.

Table 1

Personality variables for teenage and parent participants: number of items, range, mean, standard deviations, reliabilities, and correlation between teenage and parent respondents for each scale.

Personality scales	Teenagers				Parents				Teenage-parent correlation		
	# of items	Range	Median	Mean (SD)	Reliability	# of items	Range	Median	Mean (SD)	Reliability	Correlation (<i>p</i>)
Openness	12	12–60	28	27.62 (6.28)	0.74	12	12–60	27	27.5 (4.5)	0.53	0.33 (0.044)
Conscientiousness	12	12–60	30	29.78 (6.51)	0.81	12	12–60	36	36.28 (6.51)	0.88	0.33 (0.044)
Extraversion	12	12–60	30	30.24 (5.65)	0.74	12	12–60	32	30.83 (7.19)	0.86	0.52 (0.001)
Agreeableness	12	12–60	33	31.59 (5.97)	0.84	12	12–60	36	34.55 (5.57)	0.80	0.38 (0.021)
Neuroticism	12	12–60	19.5	18.93 (8.07)	0.88	12	12–60	14	14.8 (7.04)	0.85	0.22 (0.190)
Sensation Seeking	40	0–40	53	54.52 (7.63)	0.86	40	0–40	52	51.83 (5.5)	0.79	0.07 (0.678)

Table 2

Spearman correlation of teenage–parent kinematic risky driving for all trips and excluding teenage trips with adult passengers.

Months since licensure	Observed correlation for all trips (<i>r</i>)	Observed correlation for all trips excluding adult passengers ^a	95% confidence interval ^a	Observed correlation for teenage trips excluding adult passengers (<i>r</i>)	95% confidence interval ^a	Percentage of trips with adult passenger present (%)
Overall	0.18	0.18	(−0.06, 0.42)	0.18	(−0.06, 0.42)	6.78
0–3	0.30*	0.30*	(0.06, 0.5)	0.30*	(0.06, 0.5)	1.31
4–6	0.27*	0.27*	(0.02, 0.48)	0.27*	(0.02, 0.48)	1.11
7–9	0.04	0.04	(−0.22, 0.29)	0.04	(−0.22, 0.29)	1.06
10–12	0.10	0.10	(−0.16, 0.32)	0.10	(−0.16, 0.32)	1.29
13–15	0.19	0.19	(−0.04, 0.41)	0.19	(−0.04, 0.41)	1.06
16–18	0.17	0.17	(−0.09, 0.41)	0.17	(−0.08, 0.41)	0.95

* *p* < 0.05.

^a Estimated with bootstrap using the percentile method.

Table 3

Correlation (*p* value) between teenager's personality variables and kinematic risky driving event rates (g-force/miles driven).

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	Sensation seeking	Kinematic risky driving
Openness		-0.23 (0.18)	-0.02 (0.92)	0.04 (0.81)	0.18 (0.29)	0.53 (0.00)	0.02 (0.91)
Conscientiousness			0.29 (0.08)	0.36 (0.03)	-0.54 (0.00)	-0.28 (0.09)	-0.19 (0.25)
Extraversion				0.21 (0.21)	-0.38 (0.02)	0.17 (0.31)	-0.07 (0.66)
Agreeableness					-0.51 (0.00)	0.03 (0.88)	0.03 (0.84)
Neuroticism						0.04 (0.82)	0.24 (0.16)
Sensation seeking							0.18 (0.28)
Kinematic risky driving							

Table 4

Correlation (*p* values) between parent's personality variables and kinematic risky driving event rates (g-force/miles driven). *P*-values.

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	Sensation seeking	Kinematic risky driving
Openness		-0.07 (0.66)	0.08 (0.65)	0.28 (0.09)	0.15 (0.39)	0.15 (0.38)	-0.01 (0.95)
Conscientiousness			0.27 (0.11)	0.14 (0.41)	-0.49 (0.00)	-0.22 (0.19)	-0.12 (0.47)
Extraversion				0.34 (0.04)	-0.19 (0.25)	0.07 (0.67)	0.06 (0.71)
Agreeableness					-0.39 (0.02)	-0.31 (0.06)	-0.04 (0.81)
Neuroticism						0.31 (0.06)	-0.02 (0.90)
Sensation seeking							-0.05 (0.77)
Kinematic risky driving							

Table 5Correlation of teenage–parent kinematic risky driving adjusted for personality variables ($n = 42$).

	Observed correlation for all trips (r)	95% confidence interval ^a	Observed correlation for teenage trips excluding adult passengers (r)	95% confidence interval ^a
Openness	0.12	(−0.1, 0.44)	0.13	(−0.1, 0.44)
Conscientiousness	0.19	(−0.04, 0.47)	0.19	(−0.04, 0.47)
Extraversion	0.13	(−0.13, 0.4)	0.13	(−0.13, 0.4)
Agreeableness	0.17	(−0.12, 0.41)	0.17	(−0.12, 0.41)
Neuroticism	0.22	(−0.1, 0.44)	0.22	(−0.1, 0.44)
All personality subscales	0.09	(−0.23, 0.37)	0.09	(−0.23, 0.37)

*
 $p < 0.05$.^aEstimated with bootstrap using the percentile method.