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## Individual Differences in Adolescents' Driving Practice during the Learner Stage

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Individual Differences in Adolescents' Driving Practice during the Learner Stage

A Thesis

Submitted to the Graduate Faculty of the  
University of New Orleans  
in partial fulfillment of the  
requirements for the degree of

Master of Science  
in  
Psychology

by

Yinan Zhao

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## **Abstract**

The implementation of Graduated Driver Licensing (GDL) policies has reduced the rate of car crashes among adolescents. However, limited research has focused on adolescents' supervised driving during the learner permit stage of GDL. The study aimed to describe supervised driving practice during the learner permit stage and to test predictors of individual differences in the amount and the quality of supervised driving. 183 adolescents ( $M$  age = 16.4 years, 54.1% female) and their parents (84.1% mothers) participated. Adolescents reported driving an average of 25 minutes per day. Adolescents living in single-parent households, with less family income, and with a stronger motivation to drive reported more daily driving. Adolescents with a stronger motivation to drive reported driving in more settings. Discussion focuses on implications for developing effective driving-specific parenting strategies and helping to enrich adolescents' supervised driving experiences.

*Keywords:* Adolescent drivers, learner permit stage, supervised driving

## Individual Differences in Adolescents' Driving Practice during the Learner Stage

Injuries and deaths of teenagers due to car crashes is a serious issue in the United States. In 2011, nearly 2,000 adolescent drivers lost their lives due to motor vehicle crashes, and an additional 180,000 adolescents suffered injuries from motor vehicle crashes (National Highway Traffic Safety Administration, 2013). In the United States, teenagers are allowed to drive a vehicle as early as age 15 (Insurance Institute for Highway Safety [IIHS] 2010). A lack of driving skills and experience is a major risk factor for adolescent car crashes (Williams, Preusser, Ulmer, & Weinstein, 1995). More specifically, inexperience is linked to inappropriate speed control and insensitivity to the potential dangers of the driving situations (Mueller & Trick, 2012). Compared with experienced adult drivers, adolescent drivers are five times more likely to be involved in risky driving behaviors and car crashes (Simons-Morton, et al., 2011). Research based on adolescents' driving habits shows that compared to experienced drivers, adolescents are less likely to identify driving hazards and are more likely to focus on the road in front of them without being aware of the conditions besides or behind their vehicles (Masten, 2004).

Because of the high rate of car crashes, injuries, and fatalities among the adolescent drivers, policies have been implemented to provide adolescents with more driving experience and with more opportunities to improve driving skills. Graduated Driver Licensing (GDL) is a general policy approach that provides a series of graduated licenses. GDL policies are designed to protect novice drivers from driving risks by extending the learner's permit period, setting minimum amounts of supervised driving practice, and restricting driving privileges under risky environments (Simpson, 2003). Each level in the graduated licensing process provides adolescents with more opportunity and responsibility.

Even though the basic idea of GDL was proposed in early as 1970s, the US government did not adopt it as a policy until the late 1990s (Garay & Benavente, 2004). In 1996, Florida



became the first state in the United States to adopt GDL system (Simpson, 2003). By 2014, GDL policies had been put in places in all 50 states and the District of Columbia (IIHS, 2014).

Typically, GDL policies specify three progressive stages (IIHS, 2014). The first mandatory stage of GDL is a learner stage. During the learner stage, novice drivers acquire driving experience by driving under the supervision of a licensed adult, typically for six to twelve months, varying by state and age of the adolescents (IIHS, 2010). GDL policies often formalize expectations for driving practice during the learner stage (Garay & Benavente, 2004). Parents are expected to coordinate and supervise their teenagers' driving practice. During the learner stage of GDL, teenagers are expected to gradually gain driving experience through regular practice.

Most state-level GDL policies specify that drivers need to practice driving during both daytime and nighttime for a certain minimum amount of time to satisfy the requirements of the learner stage, although states vary in the amount of time required as well as in terms of how experience is documented (IIHS, 2014). In addition to specifying an overall minimum amount of driving time, the majority of states also require a minimum of 10 hours of nighttime driving during the learner stage (IIHS, 2014). Driving at night is more challenging than driving during the day, and more car crashes occur at night (Williams & Preusser, 1997). While only 15% of adolescent drivers drive at night, 40% of the nighttime fatal car crashes involve adolescents 16 to 19 years old (Lin & Fearn, 2003). Without sufficient experience and a strong awareness of nighttime driving difficulty, adolescents face a great challenge when driving at night. The GDL requirement of nighttime practice is intended to help adolescents acquire a better appreciation for nighttime driving risks and to provide opportunities to improve nighttime driving skills.

After holding a learner's permit for the required amount of time and with completion of sufficient supervised driving practice, adolescent drivers are eligible to transition into the

intermediate license stage. Adolescents are allowed to drive independently during the intermediate license stage, but there are restrictions on driving. The majority of states restrict unsupervised nighttime driving and many state policies also place restrictions on the number of adolescent passengers permitted in a vehicle when the driver has an intermediate license (IIHS, 2014). After successfully completing the requirements of the learner stage and intermediate stage, a full unrestricted driver's license will be issued providing the teenager with the same rights and responsibilities as licensed adults.

Multiple studies conclude that the implementation of GDL policies has reduced the rate of both fatal and non-fatal car crashes among adolescents (Simpson, 2003; Shope & Molnar, 2003). GDL policies are thought to reduce crash risk by delaying independent driving (McKnight & Peck, 2003). The delay functions to both extend the period of supervised driving and to increase the age at which adolescents are permitted to drive independently. However, the rate of car crashes for novice drivers age 16-19 is higher than those age 20 with similar driving experience (Mayhew, Simpson, & Pak, 2003). This finding suggests that crash risk may decrease with age and maturity independently of driving experience and suggests that the functional increase in driving age may be partially responsible for the reductions in crash risk following the implementation of GDL policies. However, an extended learner's phase is assumed to increase adolescents' driving practice (Williams, 2003; Williams, 2007; Shope & Molnar, 2003), which is also believed to help adolescent drivers improve their sense of safety and judgment of traffic patterns (Beck, Hartos, & Simons-Morton, 2002). Moreover, an evaluation of the imposition of an extended learner period to older novice drivers showed that the extended learner period decreased subsequent crash risk, suggesting that the practice and exposure aspects of the learner

period contribute to safer driving above and beyond the effect of delaying licensure to later ages (Mayhew, Williams, & Pashley, 2014).

GDL policies typically specify that adolescent drivers need to practice driving under supervision for 30 to 50 hours and that the practice should include driving both during the day and at night (IIHS, 2014). However, the requirements for documenting supervised driving experience are often minimal. Thus, we know very little about the amount and quality of driving opportunities provided during the learner's phase of the graduated licensing process. Thus, the first purpose of this study is to describe the supervised driving experiences of a sample of novice adolescent drivers. In addition to considering the amount of time spent driving, State Farm Insurance Company (2014) recommends that parents require teenagers to practice in a variety of settings. Research also indicates that practice in different settings predicts better driving performance for teenagers (Mirman, et al., 2014). Once a novice driver is able to handle a vehicle safely and effectively in a residential area without complicated traffic patterns, parents should encourage the teenager to practice in relatively more complicated driving situations to enrich their driving skills and experiences. With the improvement of driving skills during the learner's permit stage, novice drivers should be provided with opportunities to practice driving on different road types (e.g., low speed residential streets, busy urban surface streets with complicated lights and turning lanes, high speed highways and interstates), in different traffic patterns (e.g., light weekend morning traffic, rush hour traffic), and in different weather conditions (e.g., bright sunny days, rainy days, snow). In the current study, in addition to the overall amount of time spent driving, we assessed the extent to which the novice driver was exposed to different road types, traffic patterns, and weather conditions.

The second purpose of the study is to consider predictors of individual variability in driving practice during the learner's permit stage. Four groups of predictors are considered in the current study. The most distal group includes adolescent and family background. The next group includes parent-child relationship qualities, followed by adolescents' and parents' beliefs about the riskiness of driving. The last group is the combination of adolescents' motivation to drive and parents' willingness to supervise driving.

Adolescent and family background factors that may be linked with supervised driving experiences include adolescent age and gender, family structure, and household income. In the state of Louisiana, GDL specifies that the minimum age for obtaining a learner's permit license is 15. A novice driver is required to hold a learner permit for at least 6 months and complete 50 hours of supervised practice including 15 hours nighttime practice. However, a learner cannot proceed into intermediate stage until age 16. Thus, older drivers are required to hold a learner's permit for shorter minimum time period than younger drivers. Older drivers should drive more hours per day than younger drivers during the learner stage to get the same total amount of practice. Therefore, older drivers are expected to practice more in an average day and to be exposed to more distinct settings than younger drivers during the learner permit phase.

Gender differences have been commonly reported across a broad range of adolescent risk behaviors including driving-specific activities (William, 2003). The rate of adolescent fatal crashes is much higher among males than females (IIHS 2013), which may due to the fact that male drivers perceive driving as a less risky activity than female drivers do (Rhodes & Pivik, 2011). With relatively lower risk perceptions, male adolescents may be more confident about their driving skills (Laapotti, 2005), which may mean that males believe they need less supervised practice than do females. Previous studies have not yet tested for gender differences

in supervised driving practice, but based on risk perceptions and presumed confidence, male adolescent drivers are expected to practice less and to be exposed to fewer distinct driving conditions than female adolescent drivers during the learner stage.

Multiple studies of parenting practices suggest that parental involvement in children's daily lives is associated with family structure. Specifically, children from two-parent families report more parental involvement in their activities than children from single-parent families (Astone & McLanahan, 1991; Kohl, Lengue, & McMahon, 2000; Weinraub & Wolf, 1983). Compared with married individuals, single parents report a greater number of working hours and more stressful life events (Weinraub & Wolf, 1983), which may restrict parental involvement in children's activities in single parent families. Family structure may have a similar impact on parental involvement in adolescent driving practice in the learner stage. Adolescents from single-parent families may need to drive more than adolescents from two-parent families after obtaining an unrestricted license, but adolescents from single-parent families may not obtain more supervised practice during the learner stage. Parents in two-parent households may provide more opportunities for driving practice and greater exposure to different driving conditions for their adolescents during the learner permit stage.

In addition to family structure, household income also may be linked with adolescent driving practice. The high costs of driving, such as insurance and gas, were reported as obstacles to effective driving practice and licensure (Tefft, Williams, & Grabowski, 2013). Even though no studies have tested whether household income is associated with the amount of driving practice, household income is associated with the timing of licensure (Tefft, et al., 2013). Specifically, after obtaining a learner's permit, adolescents with higher family incomes acquire licenses more quickly than adolescents with lower family incomes (Tefft, et al., 2013). Based on reports that

the costs of driving are linked to delayed licensure and less effective driving practice, lower family income is expected to be associated with less supervised driving practice and with exposure to fewer distinct driving conditions during the learner stage.

The second group of predictors is parent-child relationship qualities including an aspect of parenting style and dyadic feelings during supervised driving sessions. Autonomy support can serve as an index of parenting style that captures facets of parenting particularly relevant during middle adolescence (Grolnick, 2003). Autonomy is the extent that individuals are able to think, act, and make decisions on their own without being coerced (Grolnick, 2003). The effects of parental autonomy support have been largely studied in educational settings. Higher levels of autonomy support are associated with more positive feelings towards homework (Froiland, 2011), better academic achievement, and stronger intrinsic motivation to learn (Bronstein, Ginsburg, & Herrera, 2005). A highly autonomy supportive environment also benefits children in developing age-appropriate social adjustment, problem solving skills, and well-being (Grolnick, 2003). These empirical findings are expected to apply to adolescents' driving practice. Adolescent drivers with highly autonomy supportive parents may have more freedom to decide when and where to drive. Living with highly autonomy supportive parents, adolescents may develop more positive feelings toward supervised driving and a stronger intrinsic motivation to drive, which may contribute to more practice during the learner permit stage. Thus, higher levels of parental autonomy support are expected to be linked with more supervised driving and more distinct settings.

Taubman-Ben-Ari (2010) designed a measure to assess a variety of dyadic feelings experienced by parents and adolescents during supervised driving sessions. The measure includes subscales assessing tension (i.e., the level of agreement versus conflict between a

teenage driver and a supervisor), relatedness (i.e., the feeling of closeness between a teenage driver and a supervisor), avoidance (i.e., the tendency to avoid supervised driving), disapproval (i.e., the level of criticism between a teenage driver and a supervisor), and anxiety (i.e., the level of anxiety felt during supervised practice). In a sample of young Israeli drivers (ages 17 to 22), stronger feelings of tension, avoidance, disapproval, and anxiety were associated with stronger reckless driving attitudes, lower perceptions of driving as a pleasurable experience, and a poorer sense of control. Building upon the study from Taubman-Ben-Ari (2010), the current study will test whether the five feelings experienced by parents and adolescents during the supervised driving sessions are associated with the amount of driving and the range of settings. For both parents and adolescents, lower levels of relatedness and higher levels of tension, avoidance, disapproval, and anxiety are expected to be associated with less supervised practice and with exposure to fewer settings because such feelings convey a sense that supervised driving is not enjoyable for parents or adolescents.

The third group of predictors is made up of parents' and adolescents' beliefs about the riskiness of driving for adolescents. Parents' beliefs about the riskiness of adolescent driving may predict the amount and the variety of driving practice provided by parents. With a greater sensitivity to potential driving risks, parents are more likely to enforce high levels of control of adolescent driving and to be more engaged in adolescent driving behaviors (Williams, Leaf, Simons-Morton, & Hartos, 2006), which may result in a greater amounts of supervised driving practice and exposure to a wider range of settings. The current study will test whether greater parental perceptions of driving risks are associated with more driving practice and to exposure to more distinct driving conditions.

Parents' risk perceptions may also influence children's beliefs about the riskiness of driving. During the supervised practice, parents can convey the importance of driving safety to novice adolescent drivers, which may strengthen adolescents' awareness of driving risks (Simons-Morton & Ouimet, 2006). With elevated perceptions of driving risks, adolescents report less risky driving behaviors (Brown, 2010). Adolescents with higher risk perceptions may believe that they need more practice to adeptly handle a vehicle. The current study will test the association between adolescent drivers' perceptions of driving risks and their individual differences in supervised driving. Adolescents who perceive driving as a more risky and challenging behavior are expected to report more supervised practice and exposure to more distinct settings than those with lower risk perceptions.

The fourth group of predictors combines adolescents' motivation to drive and parental willingness to supervise driving during the learner permit stage. From the adolescents' perspective, the motivation to drive may be strong determinant of the amount of driving practice one obtains. When people are highly motivated, they may have a strong desire to be engaged in certain activities and to reach their expected goals (Tamir, Bigman, Rhodes, Salerno, & Schreier, 2015). With a stronger motivation to drive, adolescents may be willing to put more effort into driving practice, which may be linked with more practice. Thus, an adolescent driver with a stronger motivation to drive is expected to drive more and to be exposed to more distinct settings.

Adolescents with a learner's permit can only drive under the supervision of a licensed adult (IIHS, 2010). Thus, parental availability is a necessary condition for driving practice. Therefore, an adolescent driver is expected to have more opportunities to practice when parents are more willing to supervise driving. Greater parental willingness is expected to be linked with more supervised driving practice and with exposure to more distinct settings.



In summary, the current study has two aims. The first aim is to describe mean levels and variability in supervised driving practice. The second aim is to test whether family background (age, gender, family structure, income), parental autonomy support, dyadic feelings (tension, relatedness, avoidance, disapproval, and anxiety) in supervised driving sessions, parents' and adolescents' beliefs about riskiness of driving, adolescents' motivation to drive, and parents' willingness to supervise driving are associated with individual differences in driving practice. More specifically: (1) Adolescent drivers from two-parent households, with higher family incomes, and who are female and older were expected to report more daily driving and more distinct settings of driving than adolescent drivers from single-parent households, with relatively lower family incomes, and who are male and younger. (2) Adolescent drivers with higher levels of parental autonomy support were expected to report more daily driving and exposure to more distinct settings. Adolescents and their parents who report stronger feelings of relatedness and weaker feelings of tension, avoidance, disapproval, disapproval, and anxiety were expected to report more driving and exposure to more distinct settings. (3) Adolescents with parents who have greater perceptions of driving risks and who perceive driving as a riskier activity were expected to report more daily driving and exposure to more distinct settings. (4) Adolescent drivers with a stronger motivation to drive and with parents who show more willingness to supervise driving were expected to report more daily driving and exposure to more distinct settings.

## **Method**

### **Participants**

The adolescent driving project initially recruited 242 adolescents and 276 parents. However, only 183 adolescents who had completed one or more learner permit driving logs

during the learner permit period and their parents ( $n = 200$ ) were included in the current analyses. The range of adolescent age was from 14 to 19 years ( $M = 16.4$  years,  $SD = .68$ ), and an approximately equal number of female (54.1%) and male adolescents participated. The adolescent participants were ethnically diverse: White (50.5%), Hispanic (15.4%), African American (17%), or of another ethnicity (17%). All parents living in the home were invited to participate, but only 1 parent in each family was required to participate. In most families, only one parent participated (84.1% mothers). In 14.8% of the families, two parents participated. Most of the parents were in their first marriage (55.7%), had been remarried (15.3%), or were living together (1.1%). Median annual family income was in the \$40-60,000 range with 7.5% of families reporting annual income of \$20,000 or less and 36% of families reporting annual incomes in excess of \$100,000.

### **Procedure**

Following IRB approval, adolescent participants, who were not yet driving, and their parents were recruited from two driver's training programs in Jefferson Parish (i.e., county), Louisiana in the United States. Jefferson Parish is adjacent to, and includes many suburbs of, New Orleans. Participants were recruited between June and October, 2012. As part of the graduated licensing regulations in effect at the time, all individuals 16 years or younger (through July 31, 2012) or 17 years or younger (beginning August 1, 2012) were required to complete a drivers' training program that included 30 hours of classroom instruction and 8 hours behind the wheel prior to obtaining a learner's permit or intermediate license. Therefore, driver's training programs served as the entry point into the licensing process for adolescent drivers. Families were compensated \$50 for completing the questionnaires. In addition, adolescent participants were asked to complete a driving log, as an on-line survey, every 2 months. Participants received

at least eight invitations. In the driving logs, adolescent participants were asked to report their current licensure status, and only logs for which “learner’s permit” was reported as the current status were used in the analysis. Participants were paid \$20 for each completed driving log. Parents and adolescents were asked to complete a second questionnaire shortly after the adolescents obtained his or her intermediate license.

## **Measures**

**Average amount of daily driving.** The amount of daily driving during the learner stage was estimated using driving logs completed online by adolescent participants. The amount of time driving each day for the past 7 days was documented. All responses were scored using a four-point scale (0 = none, 1 = less than 30 minutes, 2 = 30-60 minutes, 3 = more than an hour) with an intraclass correlation coefficient (*ICC*) of .53. First, the number of learner’s permit logs completed and the amount of practice reported in each log was calculated. After taking the mean of daily driving from each log, the overall daily amount of practice across all learner permit logs for each person was obtained. Finally, the total amount of daily driving across all learner permit logs was divided by the number of completed learner’s permit logs to obtain the average amount of daily driving reported per log.

**Settings.** The number of driving settings also was derived from the driving logs. For each of the 10 settings (e.g., “in the rain” “in the afternoon” “on roads that you had not driven on before” etc.), the adolescent participants reported the frequency of driving in each settings during the past 7 days. The frequency of driving in each setting was scored as: 0 = never, 1 = 1 time, 2 times, or 3 more times. Across all completed logs, the number of distinct settings in which the adolescent reported driving at least once was counted to index setting variety.

**Parental autonomy support.** Adolescents' perceptions of parental autonomy support were assessed using ten items (e.g., "I am able to tell my parents when I disagree with their rules" "My opinion counts in decisions when my parents and I are in conflict" "When my parents have rules, I have opinions for how I can follow them") developed from the open-ended coding system used by Farkas and Grolnick (2010). Participants responded to each item using a four-point scale (1 = "Not at all True", 2 = "Not Very True", 3 = "Sort of True", 4 = "Very True"). The mean of the adolescents' responses was computed to index autonomy support ( $\alpha = .82$ ). Scores index the adolescents' perception of parental autonomy support with higher scores indicating greater levels of parental autonomy support.

**Dyadic feelings in supervised driving sessions.** Parents' and adolescents' dyadic feelings during supervised driving practice were assessed using 23 items developed by Taubman-Ben-Ari (2010). Separate scores were computed for tension (conflicts and stress in supervised driving; 10 items, e.g., "For us, accompanied driving is a battle."), relatedness (emotional bond between parents and adolescents in supervised driving; 2 items, e.g., "Accompanied driving generated a sense of closeness between me and my accompanying driver."), avoidance (the tendency to avoid supervised driving; 3 items, e.g., "Overall, I tended to avoid driving during the accompanied driving period."), disapproval (disagreement and criticism in supervised driving; 4 items, e.g., "Accompanied driving widened the gaps between me and my accompanying driver."), and anxiety (feelings of anxiety and fear in supervised driving; 4 items, e.g., "Most of the time I preferred to keep quiet during accompanied driving."). Parents and adolescents were asked to rate each item using a five-point scale, ranging from 1 ("not at all") to 5 ("very much"). Score index each attitude during supervised driving with higher scores indicating stronger feeling of

tension ( $\alpha = .88$  &  $.90$ , for parents & adolescents, respectively), relatedness ( $r = .69$  &  $.69$ ), avoidance ( $\alpha = .66$  &  $.74$ ), disapproval ( $\alpha = .67$  &  $.66$ ), and anxiety ( $\alpha = .61$  &  $.72$ ).

**Beliefs about riskiness of driving.** Parent and adolescent participants were asked to rate the level of risk when a novice adolescent driver was engaged in 36 driving behaviors or situations (e.g., in bad weather, nighttime driving, drugs or alcohol usage, not wearing seatbelt) adapted from Williams et al., (2006). Each behavior or situation was rated using a 5-point scale (0= “no risk”, 4 = “extreme risk”). Separate scores were computed for parents and adolescents as the mean of the 36 items, both  $\alpha$ s =  $.95$ . Scores index perceptions of driving risks with higher scores indicating greater perceived risk.

**Adolescents’ motivation to drive.** The extent to which adolescents wanted to drive and enjoyed driving was assessed in each driving log. Two items, “When I drove in the past week, it was because I wanted to drive” and “I enjoyed driving when I drove in the past week,” were scored using a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The correlation between the two items was moderately high,  $r = .60$ , as was the intra-class correlation across logs,  $.40$ . The mean score of the scale across all logs indexes adolescents’ motivation to drive.

**Parental willingness to supervise driving.** The extent to which parents were available to supervise driving was reported by adolescents in each driving log. Two items, “When I wanted to drive in the past week, it was hard to get a parent to supervise my driving” and “I would have driven more often in the past week if my parents would have let me,” were scored using a five-point scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The correlation coefficient between the two items was moderately high,  $r = .49$ , as was the intra-class correlation

across logs, .44. The mean score of the scale across all logs was computed to index parents' willingness to supervise driving.

## **Results**

The data analysis involved three stages. In the first stage, means, standard deviations, and frequencies for the amount of daily driving, the range of settings, and the number of logs completed were calculated. Each individual's amount of daily driving and experienced settings was obtained from reports of driving logs. The number of logs completed was included as an outcome variable in the analyses to evaluate whether the reports of daily driving and the range of settings were biased due to individual variability in the number of logs completed. In the second stage, bivariate associations and multivariate regression analyses were computed to determine whether each group of predictors (i.e., family background, parent-child relationship qualities, parents' and adolescents' beliefs about the riskiness of driving, and the combination of adolescents' motivation to drive and parental willingness to supervise driving) was significantly and uniquely associated with the amount of daily driving, the range of settings experienced, and the number of logs completed by adolescents. Finally, simultaneous regression analyses were computed to determine whether each predictive variable significantly and uniquely predicted the amount of daily driving, the range of settings experienced, and the number of logs completed by adolescents.

### **Descriptive statistics**

Adolescent participants were invited to complete 8 logs. The distribution of the number of logs is presented in Figure 1. 218 adolescents completed at least one log (*Median* = 5 logs). Among all completed logs, an average of 2.5 (*SD* = 1.37) logs were completed by adolescents when they held a learner permit. Adolescents reported the amount of daily driving and distinct

settings on each day for the past 7 days. The distribution of the daily driving frequency is presented in Figure 2. The mean score of daily driving is .83 ( $SD = .61$ ), which corresponds to the response option “less than 30 minutes”. Based on the assumption that adolescents who were scored 1 equals 30 minutes daily driving, the estimated average daily driving was obtained by looking at the fraction of mean score (.83) in score of 1 corresponding to the fraction of estimated average of daily driving in 30 minutes, which was approximate 25 minutes. In terms of the distribution of daily driving, 5% of the adolescents reported not driving at all. 68.5% of the adolescents reported driving less than minutes per day, and 26.5% of the adolescents reported driving more than 30 minutes per day during the learner permit stage. The percentage of adolescents who reported driving in each setting is presented in Table 1. Adolescents reported driving an average of 6.88 ( $SD = 2.96$ ) distinct settings during the learner permit stage. Among all of the settings, adolescents reported driving most frequently “in the afternoon” and “in the middle of the day” and least frequently “in the rain” and “across a bridge.”

Figure 1. Distribution of learner permit logs

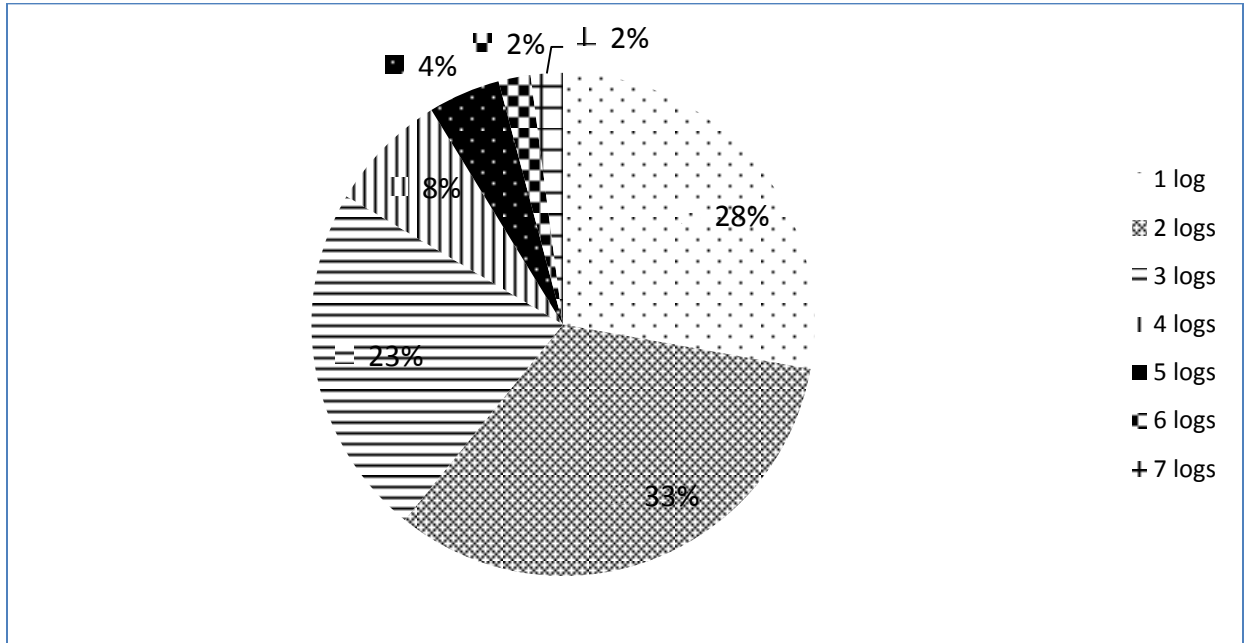


Figure 2. Distribution of daily driving

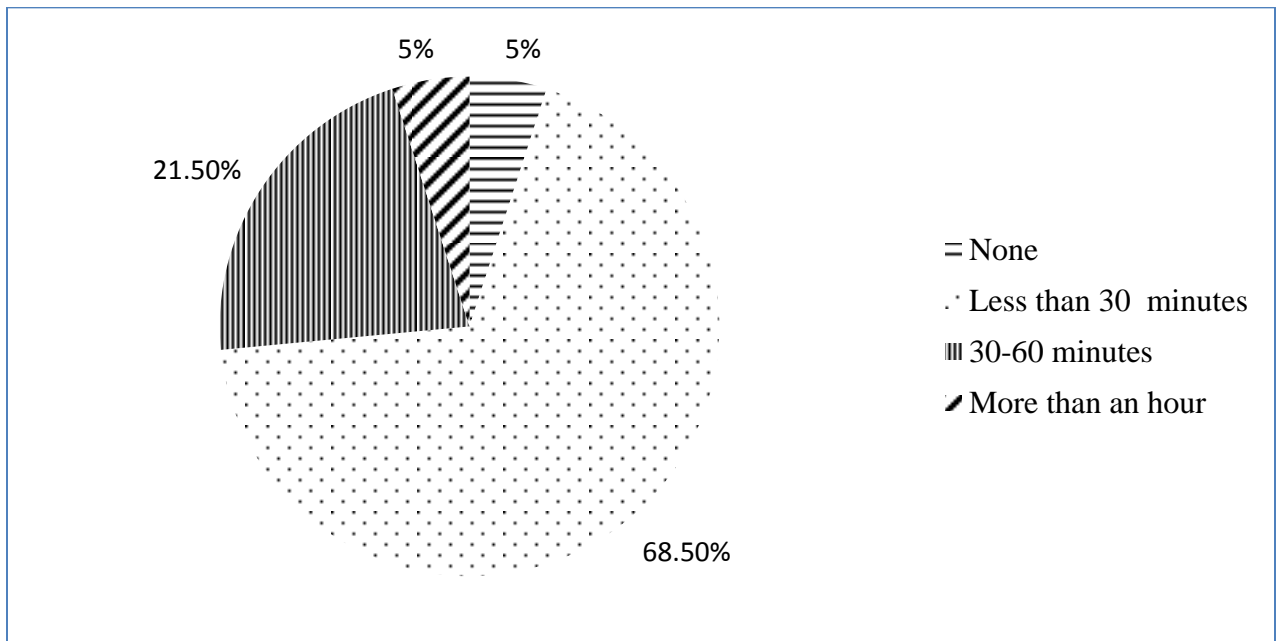




Table 1.

*Range of distinct settings*

Setting	% who driving in the settings
(1) In the rain	59.7
(2) In the afternoon	89.0
(3) On road that you had not driven on before	63.0
(4) In the morning	64.6
(5) Across a big bridge (e.g., HP Long ,Crescent, Causeway)	57.2
(6) After dark	72.4
(7) In the middle of the day	79.0
(8) On wet roads	68.7
(9) On an interstate or other high speed road	72.9
(10) With 2 or more passengers	68.5

**Predictors of individual differences in supervised driving**

In the second stage, bivariate associations and multivariate regression analyses were computed to test whether the four individual groups of variables predicted the amount of daily driving, the range of distinct settings, and the number of logs completed (see Table 2). The four groups of variables include (1) family background (i.e., adolescent age, gender, family structure, and household income), (2) parent-child relationship qualities (i.e., parental autonomy support and dyadic feelings of tension, relatedness, avoidance, disapproval, and anxiety in supervised driving sessions), (3) parents' and adolescents' beliefs about the riskiness of driving, and (4) the combination of adolescents' motivation to drive and parental willingness to supervise driving.

**Family Background.** According to bivariate correlation analyses, less family income was associated with more daily driving and adolescents who were older completed more driving logs.

None of other family background variables were bivariately associated with daily driving, the range of settings, and the number of logs completed.

Multivariate regression analyses indicated that family background variables significantly accounted for 7.0% and 9.8% of the variance in daily driving and the number of logs completed, respectively. However, family background variables did not account for significant variance in settings. Specifically, living in two-parent families and having less family incomes were uniquely associated with more daily driving. Adolescent age was the only unique predictor of log completion. Adolescent gender did not significantly predict daily driving, the range of settings, or the number of logs completed.

**Parent-child relationship qualities.** Bivariate correlation analyses showed that less intense parental dyadic feelings of tension and stronger parental dyadic feelings of relatedness were associated with more daily driving. Less intense parental feelings of avoidance were associated with more settings experienced. None of other parents' or adolescents' dyadic feelings were bivariate associated with daily driving, the range of settings, and the number of logs completed. In consideration of bivariate associations between parental autonomy support and individual differences in supervised driving, lower levels of autonomy support were significantly associated with more logs completed and were marginally associated with more settings experienced.

The group of parent-child relationship qualities did not significantly account for variance in daily driving, the range of settings, or the number of logs. The sub-group of parental dyadic feelings accounted for a marginally significantly 8.3% of the variance in daily driving but was not significantly associated with the range of settings or the number of logs completed. Upon examining the statistical significance of each specific parental dyadic feeling, none of them

significantly predicted daily driving, the range of settings, or the number of logs completed.

Adolescent dyadic feelings did not account for significant variance in daily driving, the range of settings, or the number of logs completed. When controlling for both parental and adolescent dyadic feelings, parental autonomy support significantly accounted for 4.9% and 4.5% of the variance in the range of settings and the number of logs completed, respectively. Specifically, at higher levels of autonomy support, adolescents reported fewer distinct settings and completed fewer driving logs. Parental autonomy support did not significantly predict the amount of daily driving.

**Beliefs about the riskiness of driving.** Bivariate correlation analyses indicated that only stronger adolescents' perceptions of driving risks were associated with more logs completed. Neither adolescents' risk perceptions nor parents' risk perceptions were bivariate associated with daily driving and the range of settings.

In multivariate analyses, parents' and adolescents' beliefs about the riskiness of driving were marginally significantly associated with the amount of daily driving. Adolescents reported more daily driving when they had lower perceptions of driving risks and had parents with higher perceptions of driving risks. Adolescents with higher perceptions of driving risks completed fewer logs. Adolescents' perceptions of driving risks were not associated with distinct settings. Parents' perceptions of driving risks did not predict distinct settings or number of logs completed.

**Motivation and willingness.** Bivariate correlation analyses showed that adolescents' stronger motivation to drive was associated with more daily driving and settings. Parental willingness to supervise driving was not associated with daily driving and the range of settings. Neither adolescents' motivation to drive nor parental willingness to supervise driving was associated with the number of logs completed.

The combination of adolescents' motivation to drive and parents' willingness to supervise driving accounted for 11.0% and 9.9% of the variance in daily driving and distinct settings, respectively. However, adolescents' motivation to drive was the only unique predictor of daily driving and the range of settings. Adolescents with a stronger motivation to drive reported more daily driving and more distinct settings. When controlling for adolescents' motivation to drive, parents' willingness to supervise driving did not significantly predict daily driving or distinct settings. Additionally, neither adolescents' motivation to drive nor parents' willingness to supervise driving predicted the number of logs completed.

### **Simultaneous linear regression analyses**

Finally, simultaneous linear regression analyses were computed to test whether each variable predicted the amount of daily driving, the range of settings, and the number of logs completed. As shown in Table 3, adolescents' motivation to drive predicted both daily driving and the range of settings. Adolescents with a stronger motivation to drive reported more daily driving and drove in more distinct settings. Additionally, adolescents from two-parent households and with relatively lower household income reported more daily driving. Adolescent age was the only unique predictor of the number of logs completed. Older adolescents completed more logs than younger adolescents. None of any other variables uniquely predicted daily driving, the range of settings, or the number of logs completed.

Table 2.

Summary of multivariate regression models predicting daily driving, number of settings, and number of logs.

Predictors	Daily driving				Number of settings			
	r	R <sup>2</sup>	B (SE)	B*	r	R <sup>2</sup>	B (SE)	B*
<b>Background variables</b>		.07*				.03		
Adolescent age	-.05		-.10 (.07)	-.11	.03		.07 (.35)	.02
Adolescent gender	.04		.12 (.09)	.99	.01		.04 (.46)	.01
Single parent	-.08		-.25 (.12)	-.19*	.11		1.07 (.58)	.16 <sup>+</sup>
Family income	-.15*		-.09 (.03)	-.26**	.06		.25 (.15)	.15 <sup>+</sup>
<b>Parent-child relationship</b>		.12				.13		
Parental Autonomy Support	-.06	.01	-.10 (.10)	-.09	-.13 <sup>+</sup>	.05*	-1.22(.47)	-.25*
Parental dyadic feelings		.08 <sup>+</sup>				.04		
Parent-Tension	-.21*		-.23 (.12)	-.29	-.08		-.68 (.56)	-.18
Parent-Relatedness	.20*		.07 (.07)	.09	.06		.10 (.35)	.03
Parent-Avoidance	-.11		-.10 (.11)	-.08	-.18*		-.82 (.53)	-.15
Parent-Disapproval	-.09		.07 (.10)	.09	.02		.66 (.48)	.16
Parent-Anxiety	-.12		-.03 (.10)	-.04	-.08		-.04 (.49)	-.01
Adolescent dyadic feelings		.03				.03		
Adolescent-Tension	.04		.15 (.12)	.22	.07		.56 (.58)	.18
Adolescent-Relatedness	.03		.02 (.07)	.03	-.04		-.07 (.34)	-.02
Adolescent-Avoidance	-.09		-.09 (.07)	-.14	-.08		-.36 (.32)	-.12
Adolescent-Disapproval	.01		.02 (.11)	.02	.03		.38 (.50)	.11
Adolescent-Anxiety	.01		.00 (.10)	.00	-.01		-.53 (.45)	-.18
<b>Beliefs about driving risks</b>		.03				.01		
Parental risk perceptions	.11		.21 (.11)	.15 <sup>+</sup>	-.04		-.03 (.54)	-.01
Adolescent risk perceptions	.09		-.15 (.09)	-.13 <sup>+</sup>	-.11		-.59 (.43)	-.11
<b>Motivation-willingness</b>		.11**				.10**		
Motivation to drive	.33**		.26 (.06)	.34**	.32**		1.19 (.28)	.32**
Willingness to supervise	.02		.03 (.05)	.05	.06		.02 (.24)	-.01

Note: <sup>+</sup>p < .1, \*p < .05, \*\*p < .01.

Table 2 (Continued)

Predictors	Number of logs			
	r	R <sup>2</sup>	B (SE)	B*
<b>Background variables</b>		.10**		
Adolescent age	.28**		.64 (.16)	.31**
Adolescent gender	.02		.12 (.21)	.04
Single parent	-.04		-.13 (.26)	.04
Family income	.07		.07 (.07)	.09
<b>Parent-child relationship</b>		.12		
Parental Autonomy Support	-.14 <sup>+</sup>	.05*	-.58 (.24)	-.24*
Parental dyadic feelings		.07		
Parent-Tension	.12		.49 (.28)	.27
Parent-Relatedness	-.03		-.00 (.17)	-.00
Parent-Avoidance	.02		.19 (.27)	.07
Parent-Disapproval	.10		.28 (.24)	.14
Parent-Anxiety	.02		-.35 (.24)	-.18
Adolescent dyadic feelings		.06		
Adolescent-Tension	-.08		-.49 (.29)	-.31
Adolescent-Relatedness	.04		.06 (.17)	.04
Adolescent-Avoidance	.01		.13 (.16)	.09
Adolescent-Disapproval	-.09		-.06 (.25)	-.03
Adolescent-Anxiety	-.01		.09 (.22)	.06
<b>Beliefs about driving risks</b>		.03		
Parental risk perceptions	.00		.16 (.25)	.05
Adolescent risk perceptions	-.16*		-.45 (.20)	-.17*
<b>Motivation-willingness</b>		.00		
Motivation to drive	-.02		-.05 (.14)	-.03
Willingness to supervise	-.01		.00 (.12)	.00

Note: <sup>+</sup>p < .1, \*p < .05, \*\*p < .01.

Table 3.

*Summary of simultaneous regression models predicting daily driving, number of settings, and number of logs.*

Predictors	Daily driving ( $R^2 = .28^*$ )		Number of settings ( $R^2 = .22$ )		Number of logs ( $R^2 = .22$ )	
	B (SE)	B*	B (SE)	B*	B (SE)	B*
Adolescent age	-.00 (.01)	-.01	.03 (.03)	.09	.04 (.02)	.24*
Adolescent gender	.03 (.11)	.02	.06 (.53)	.01	.22 (.27)	.08
Single parent	-.36 (.13)	-.27**	.47 (.66)	.08	-.16 (.34)	-.05
Family income	-.08 (.04)	-.24*	.11 (.18)	.07	.07 (.09)	.08
Parental Autonomy Support	-.11 (.11)	-.10	-.53 (.54)	-.10	-.47 (.27)	-.18 <sup>+</sup>
Parent-Tension	-.04 (.13)	-.06	-.36 (.66)	-.10	.46 (.34)	.25
Parent-Relatedness	.06 (.08)	.08	.27 (.40)	.08	-.03 (.21)	-.02
Parent-Avoidance	-.08 (.12)	-.07	-.92 (.57)	-.17	.22 (.29)	.08
Parent-Disapproval	-.04 (.12)	-.04	.02 (.57)	.01	.27 (.29)	.13
Parent-Anxiety	-.07 (.11)	-.08	.00 (.52)	.00	-.38 (.27)	-.20
Adolescent-Tension	.09 (.12)	.13	.74 (.61)	.24	-.45 (.31)	-.29
Adolescent-Relatedness	.05 (.07)	.07	.07 (.36)	.02	.16 (.18)	.09
Adolescent-Avoidance	.01 (.08)	.01	.00 (.38)	.00	.10 (.19)	.06
Adolescent-Disapproval	.02 (.11)	.02	.23 (.55)	.06	.10 (.28)	.05
Adolescent-Anxiety	.03 (.09)	.04	-.38 (.47)	-.13	-.03 (.24)	-.02
Parental risk perceptions	.11 (.13)	.08	-.21 (.66)	-.03	.29 (.34)	.09
Adolescent risk perceptions	-.11 (.10)	-.10	-.99 (.51)	-.20 <sup>+</sup>	-.24 (.26)	-.09
Motivation to drive	.26 (.08)	.33**	.96 (.40)	.26*	-.07 (.20)	-.04
Willingness to supervise	.00 (.07)	.00	-.02 (.32)	-.01	-.02 (.17)	-.01

Note: <sup>+</sup>p < .1, \*p < .05, \*\*p < .01.

## Discussion

Little previous research has focused on adolescents' driving activities during the learner permit stage. This study aimed to fill in this gap by describing adolescents' supervised driving experience and investigating predictors of individual variability in supervised driving sessions. The supervised driving experiences were measured as adolescents' average amount of daily driving and the range of distinct settings experienced during the learner permit phase. Four groups of variables (i.e., family background, parent-child relationship qualities, parental and adolescents' beliefs about riskiness of driving, the combination of adolescents' motivation to drive and parental willingness to supervise driving) were tested as predictors of daily driving and setting exposure.

### **Individual differences in supervised driving**

**Amount of daily driving.** Adolescents reported driving an average of 25 minutes per day. Five percent of the adolescents did not drive at all; 68.5% of the adolescents drove less than 30 minutes per day; 26.5% of the adolescents reported driving more than 30 minutes per day (see Figure 2). The estimated mean amount of supervised driving over a six-month period was estimated from responses as  $25 \text{ (minutes)} \times 180 \text{ (days)} = 4500 \text{ (minutes)}$ , which equals to 75 hours. According to the policies of GDL in the state of Louisiana, adolescents are required to complete 50 hours of supervised practice (including 15 hours of nighttime driving). In this sample, the estimated mean amount of daily driving over a six-month period exceeds the required 50 hours of supervised driving. Since the current study measured adolescents' daily driving as time ranges, the specific amount of adolescents who drove over 50 hours during the learner permit stage is unknown. However, 26.5% of the adolescents who reported daily driving that fell in the ranges of "30 – 60 minutes" and "more than an hour" appear to be exceeding the required 50 hours during the six months of the learner permit stage. Five percent of the



adolescents who reported not driving at all were not on track to satisfy the GDL requirements. Thus, at least 26.5% of the adolescent participants were on track to satisfy the GDL requirement of the amount of supervised driving practice.

**Range of settings.** Adolescents reported experiencing an average of 6.88 distinct settings, and they drove most frequently in the settings of “in the afternoon” and “in the middle of the day.” Compared with rush hour traffic in the morning and in the evening, the traffic is relatively light in the afternoon and in the middle of the day. Thus, it may be easier for novice drivers to practice under light traffic conditions, which results in a higher rate of practice in the afternoon and in the middle of the day. Perhaps adolescents and their parents are in a hurry to go to school or go to work in the morning, so they may have more free time to drive or to supervise driving in the afternoon or in the middle of the day.

The settings of “driving in the rain” and “across a big bridge” were reported least by adolescents. Driving in the rain is relatively challenging for novice drivers. A driver’s visibility is usually reduced in the rain (Hautiere, Dumont, Bremond, & Ledoux, 2009), and more traffic crashes occur during adverse weather conditions (Qiu & Nixon, 2008). Thus, the low frequency of reported driving in the rain suggests that adolescents and parents may have realized the potential dangers of driving in the rain, and they may try to avoid risking driving or supervising driving during rainy days. It is also possible that it does not always rain in Louisiana, which may result in relatively fewer opportunities to drive during rainy days.

In the city of New Orleans, LA, family’s routine driving may not be require driving on big bridges on regular basis because most big bridges are not within the Great New Orleans Region. However, the low frequency of driving in big bridges implies that adolescents’ driving on the highway may be limited to the city. To leave the greater New Orleans area, it is necessary to

cross one or more bridges. Avoiding driving in the rain or driving across big bridges may prevent adolescent drivers experiencing risky traffic conditions. However, parents should gradually expose adolescents to complicated driving settings to enrich their driving experiences.

**Driving logs completion.** In order to examine the effect of variability of log completion on reports of daily driving and the range of settings, we included number of logs as an outcome variable in the analyses. Only adolescent age was found to be associated with the number of logs, suggesting that variation in log completion likely did not bias other results.

### **Predictors of individual differences in supervised driving**

**Family background.** Family background variables accounted for a significant amount of variance in adolescents' daily driving. As hypothesized, adolescents from two-parent households reported more daily driving than adolescents from single-parent households, suggesting that higher levels of driving-specific parental involvement in two-parent households may provide adolescents more driving opportunities. This finding is consistent with previous research showing that parents are more involvement in daily activities in two-parent households than in single-parent households (Astone & McLanahan, 1991; Kohl, Lengue, & McMahan, 2000; Weinraub & Wolf, 1983). Contradictory to the original hypothesis, results show that adolescents with less household income reported more daily driving than adolescents with higher household income. Perhaps parents with less household income may need to work more hours in order to support family. Under such condition, children may need to drive independently as early as they can to share parents' burden at home, such as helping with grocery and picking up younger siblings. The sooner these adolescents obtain an intermediate license, the sooner they can help to share parents' burden at home, explaining why adolescents from low-income families drive more during the learner permit stage.

Adolescents' age and gender did not significantly predict individual variability in daily driving or settings. Age may be an indicator of the length of learner permit phase, because adolescents must hold a learner's permit until age 16. However, the length of learner permit phase does not appear to be linked with the amount of supervised driving. Younger adolescents, even though they already completed 50 hours of supervised driving within 6 months, have to wait until age 16 to transfer into the intermediate stage. During the waiting period, adolescents may either keep practicing regularly or may not drive, which could result in lack of consistent association between adolescents' age and individual differences in supervised driving. We hypothesized that female adolescents were expected to drive more and to be exposed to more settings than male adolescents, because males are found to be more confident than females in driving (Laapotti, 2005), which may result in less supervised practice for male adolescents. However, the results were in the opposite direction to what was hypothesized. Male adolescents reported more daily driving than females adolescents did. Perhaps with more confidence, male adolescents may be more willing to drive and are brave enough to take on new settings that they have never driven in before. On the contrary, with less confidence, female adolescents may choose to avoid driving in unfamiliar settings or even not to drive at all, resulting in less daily driving and exposure to fewer distinct settings.

**Parental-child relationship qualities.** The group of parent-child relationship qualities includes parental autonomy support and parental and adolescents' dyadic feelings during supervised driving sessions. Higher levels of parental autonomy support were expected to be linked with more daily driving and more distinct settings. The bivariate correlations and simultaneous regression analyses did identify a significant association between autonomy support and individual differences in daily driving and distinct settings. However, the

multivariate regression analyses showed that higher levels of parental autonomy support were associated with fewer reported settings and fewer driving logs completed when controlling for parental and adolescent dyadic feelings. This situation may suggest that the association between autonomy support and adolescents' engagement of driving may be biased by adolescents' and/or parents' dyadic feelings toward supervised driving. On the one hand, adolescents with high levels of autonomy support may choose to drive more if they consider supervised driving as enjoyable and relaxed. On the other hand, adolescents with high levels of autonomy support may choose to not drive if they perceive supervised driving as anxious. Thus, high levels of autonomy support, accompanied by a relatively happy and relaxed atmosphere during supervised driving may help to increase adolescents' daily driving and the range of settings.

Bivariate correlations indicated that more daily driving was associated with less intense parental feelings of tension and stronger parental feelings of relatedness during the supervised driving, suggesting that adolescents may be more likely to drive under relaxed parent-child interactive styles and when the parents and adolescents established a strong emotional bond. Thus, in order to encourage adolescents drive more, parents should avoid conflict, which may reduce adolescents' motivation to drive. Parents are highly encouraged to develop emotional bond with children during supervised driving practice, which may bring enjoyable atmosphere and facilitate adolescents practice more.

**Beliefs about the riskiness of driving.** Stronger parental and adolescent beliefs about the riskiness of driving were expected to predict more daily driving and more distinct settings. The association between parental and adolescents' beliefs about riskiness of driving and the amount of daily driving were marginally significant. Specifically, more daily driving was reported by adolescents when their parents perceived driving as more risky. However, adolescents who

perceive driving as more risky reported less daily driving. One may expect that parents with greater risk perceptions are more likely to be engaged in adolescents' driving activities (Williams et al., 2006), which may bring adolescents more supervised driving opportunities. Additionally, parents with greater risk perceptions may help to strengthen adolescents' awareness of driving risks by conveying their concerns about driving safety (Simons-Morton & Ouimet, 2006). Thus, adolescents who perceive driving as riskier may believe that they need to practice more to improve their driving skills. However, adolescents who perceived driving as riskier were found to report less driving per day, suggesting that they may avoid driving anxiety by minimizing the amount of driving. It is also possible that they may choose to drive less per day but prolong the duration of the learner permit phase, which may help to make a progress gradually. Both possibilities may lead to reduction of the average amount of daily driving.

**Motivation and willingness.** As anticipated, the combination of adolescents' motivation to drive and parents' willingness to supervise driving uniquely and significantly accounted for the variance in daily driving and the range of settings. Bivariate correlation analyses and simultaneous regression analyses showed that adolescents' motivation significantly predicted both daily driving and distinct settings. Similar to the association between stronger motivation to learn and more positive feelings toward homework (Froiland, 2011), adolescents with a strong motivation to drive may perceive driving as enjoyable and useful, which could result in more daily driving and distinct settings. This finding suggests that parents should explore effective parenting strategies that help to develop adolescents' motivation to drive. For instance, parents and adolescents should communicate with each other about supervised driving. By exchanging thoughts and feelings, the two parties may have a better understanding about mutual expectations about driving and may develop stronger feelings of relatedness, which could strengthen

adolescents' motivation to drive. Furthermore, parents should respect adolescents' willingness to drive, because adolescents' motivation is likely to be strengthened when they receive high levels of respect and support from parents. However, forcing adolescents to drive may weaken their motivation, because a coercive parent-child interactive style may undermine the effectiveness of driving-specific parenting and may bring adolescent drivers feelings of tension and anxiety.

When controlling for adolescents motivation, parents' willingness to supervise driving did not significantly predict daily driving and the range of settings. On the one hand, adolescents with a learner permit license can only drive accompanied by a parent. Under this condition, parental stronger willingness to supervise may bring adolescents more opportunities to drive during the learner permit phase. On the other hand, although parents are willing to supervise driving, adolescents without a strong motivation may not engage in driving. It is likely that parents' willingness to supervise is a necessary, but not a sufficient condition for driving practice. Thus, in order to help adolescents to drive more, parents should not only highly engage in driving supervision, but also create a relaxed and supportive parent-child interactive atmosphere during driving practice, which may strengthen adolescents' motivation to drive.

### **Strengths, limitations, and future research directions.**

Strengths of this study include a specific concentration on adolescents' driving during the learner permit stage, which has been under-studied. The study did not only measure the quantity of adolescents' driving practice (i.e. daily driving), but also measured quality of driving (i.e. settings). By looking at both the amount of daily driving and the range of settings, the analyses of individual differences in supervised driving may be relatively comprehensive.

However, there are several limitations of the study. First, we only measured adolescents' and parents' self-reports of driving-specific parenting. The information provided was based on participants' subjective interpretation, which may be different from objective assessment in real settings. Furthermore, the study was not able to obtain the exact amount of supervised practice during the learner permit stage for each adolescent. Average daily driving was estimated from reports of driving logs. However, there was substantial variability in the number of logs completed. Thus, it was not possible to calculate the exact hours of supervised driving for each adolescent. Finally, although the sample exhibited gender and ethnic diversity, adolescent drivers from the Great New Orleans Region may develop unique driving habits due to the local traffic patterns and weather conditions. Thus, the findings may not apply to adolescent drivers from other states or countries.

In conclusion, the findings provide valuable implications for developing effective driving-specific parenting strategies for parents of adolescents holding a learner permit. Parents are recommended to be highly engaged in adolescents' driving practice and to encourage adolescents to gradually practice driving in different road types, traffic patterns, and weather conditions. Parents should also create a relaxed and respectful atmosphere during supervised driving and help to strengthen adolescents' motivation to drive. Building upon this study, future research directions may include testing individual differences in supervised driving as a predictor of driving success when adolescent drivers proceed into the intermediate and unrestrictive licensing stages.

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