

Teens have the highest crash rate of any age group in the United States.



Parents, Teens and the Learner Stage of Graduated Driver Licensing

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EXECUTIVE SUMMARY

Motor vehicle crashes are the leading cause of death for teenagers in the United States. In an effort to reduce crashes and fatalities among young drivers, nearly all states have implemented graduated driver licensing (GDL) systems. GDL systems are designed to provide beginning drivers with substantial driving practice under the safest possible conditions, exposing them to more risky situations (e.g., night driving, multiple teen passengers) only as experience is gained over time. An important component of graduated licensing is the extended learner stage for beginning drivers. The learner stage provides an opportunity for novices to obtain “real world” driving experience in a relatively safe fashion.

Presently, although most state GDL systems now require learner periods of six months or longer, little is known about the nature and quality of parental supervision during this initial licensing stage. The goal of this project was to develop a better understanding of how parents approach and manage their teens’ driving during the learner stage of GDL. If we are to develop and implement useful guidance for parents to become better driving mentors – and thus to maximize the effectiveness of supervised driving practice – much more information is needed about current parent practices.

Method

We recruited 50 families in North Carolina as teens applied for a learner’s permit. A series of 10 semi-structured interviews was conducted with a parent in each family during the year-long learner stage. The interviews focused on how parents approached their supervisory role, the type, frequency and duration of practice, the problems they encountered in the process of supervising their teen and how they dealt with those problems. In addition, cameras were installed in the vehicles of these families to capture information that could not be obtained by self-report. The cameras – triggered by hard acceleration, braking or turns – recorded activity within the driver compartment as well as in front of and behind the vehicle. Although the 50 families who participated in the study were closely monitored over the course of North Carolina’s year-long learner stage, the study was naturalistic – no attempts were made to alter parent or teen behavior.

Results

Parents’ approach to supervision. One goal of the study was to examine how parents approach the process of supervising their teen’s driving. The initial interview was conducted within a few days after the teen had received his/her permit (and sometimes on the same day). Hence, we could assess parents’ earliest plans and expectations for the learner stage. Among the findings:

- At the outset of the learner stage, most parents had given at least some thought to plans for supervising their teen. The most common plans were to make sure the teen received lots of practice (52%) and/or to make sure the teen's practice came in controlled conditions (50%). Fewer parents were planning to have their teen practice in a wide variety of driving situations/conditions (24%).
- Many parents had already introduced their teen to driving before the teen obtained a permit. For example, forty percent (40%) of teens had driven with a parent in an empty parking lot.
- Only four of the 50 parents (8%) reported receiving materials that offer advice for parents of beginning drivers.

Parent and teen eagerness for the teen to begin driving and vehicles driven by teens were also examined.

Amount of driving practice during the learner stage. Another goal of the study was to obtain a more accurate estimate of the amount of driving experience teens obtain during the learner stage. Parents were asked during each interview to recall how many days and the total amount of time their teen had driven during the previous week. Findings here include:

- On average, parents reported teens drove 3.21 days and 1.60 hours during the previous week. There was substantial variability between families in the average amount of weekly driving, ranging from just 20 minutes to almost 5 hours.
- In 13% of interviews, parents reported no driving at all by their teen during the previous week. Although parents gave numerous reasons why their teens sometimes did not drive, the most common reasons fell into two categories: 1) teens and/or parents were too busy with other activities; and 2) teen disinterest in driving.
- Over most of the year-long learner stage, driving practice was evenly distributed. However, practice increased at the final interview, just prior to the teen being eligible for a license. For many families, parents did not report any special effort for the teen to get more practice. Rather, parents were simply feeling more comfortable with the teen's driving after having spent nearly a year together in the vehicle.

Conditions in which teens drive. In addition to examining how much teens were driving, we examined the types of conditions in which teens drove and when parents introduced new driving conditions. In brief, the main findings were the following:

- Even in the earliest interviews, most parents reported their teen had driven in residential neighborhoods and light traffic during the previous week. By contrast, other driving conditions were introduced more slowly by parents, including highways, rain, heavy traffic, and 2-lane country roads.
- The data from the in-vehicle cameras generally aligns with what parents reported. In most of the driving clips, teens were driving in relatively benign conditions. Only a small percent of clips were recorded in the dark (16%), in rain (3%), or in traffic that was judged to be heavy (2%).

Characteristics of teen driver practice sessions. The video clips provided a great deal of information about the characteristics of teen driver practice sessions. Among the findings:

- Most of the clips occurred in the afternoon, particularly just after school or in the early evening. In addition, practice was quite common on weekends; 40% of clips occurred on either a Saturday or Sunday.
- Seat belt use was nearly universal among both parents and teens during practice sessions.
- Parents generally were attentive to the roadway during driving clips. Potential distractions such as operating a cell phone, reading, eating, etc., were evident in less than 5% of clips.
- Music was barely audible or absent in three-quarters (74%) of all clips.
- Potentially serious events were relatively rare. None of the teens participating in the study was involved in a collision during the year-long learner stage. There were approximately 10 occasions where parent intervention may have prevented a collision, usually by the parent alerting the teen to a potential danger in the driving environment (e.g., another vehicle running a red light).

More information about the characteristics of practice sessions, including the g-forces recorded by the in-vehicle cameras, are reported in this section.

Teen driving skill. The present study aimed to determine what kinds of driving mistakes teens make when they are learning to drive, and how quickly they seem to become proficient at handling the vehicle. The findings here include:

- The number of clips recorded by the in-vehicle cameras decreased during the first four months of the permit stage, suggesting teens improved relatively rapidly during the initial few months of driving.

- The most common driving mistakes reported by parents during interviews were problems with turning or braking. In addition, two types of errors – hugging the right side of the road and driving too slowly – were frequently mentioned during the earliest interviews.
- According to parents, many teens (58%) seemed comfortable with driving at the third interview – just four weeks into the learner stage. By week eight, the vast majority of parents (88%) reported their teen felt comfortable behind the wheel.
- Some teens, in parents' words, became "overconfident" a few months into the learner stage. Parents reported their teen began driving faster, leaving shorter following distances, braking abruptly, etc.

Parent-teen anxiety, communication and relationships. The present study was among the first to examine parent-teen anxiety, communication and relationships during practice sessions and how this may change over the course of the learner stage. Some of the findings include:

- In a small percent of families (16%), parents reported the teen refused to drive with one of the parents because he or she was too nervous or critical. During interviews, a number of parents commented on the importance of remaining calm and not letting their anxiety show. Anxiety on the part of parents was evident in 8% of video clips.
- Based on the interviews, parents' self-reported feedback to their teens declined over the course of the learner stage. In fact, fully 87% of parents reported during one or more interviews that they made a conscious effort to limit how much feedback and instruction they gave their teen, citing teen sensitivity to perceived criticism or not wanting to distract them.
- The most common form of parental instruction during video clips involved vehicle handling/operation (e.g., you need to slow down), which was found in 54% of clips. By contrast, "higher order" instruction such as visual scanning, hazard perception, or anticipating the behavior of other drivers was observed in just 5% of clips.
- From the driving clips, yelling between parents and teens was rarely observed. On the other hand, there were a number of instances where a teen told their parent to stop yelling when the parent's voice was barely raised, if at all.

Transition to independent driving. A final goal of the study was to learn how teens make the transition to independent driving. Among the findings:

- After just two weeks of driving, more than half of parents thought their teen was ready to drive unsupervised in light traffic or on a two lane country road. Moreover, almost half were comfortable with the thought of their teen parking unsupervised. After 12 weeks of driving, most parents reported they would be comfortable with their teen driving unsupervised in these conditions.
- By comparison, it took much longer before parents thought their teen was ready to drive unsupervised in heavy traffic, on a highway, or in rain. Even after a full year of driving, one in three parents still did not consider their teen ready to drive unsupervised in heavy traffic or on a highway, and one in five believed the teen was not ready to drive unsupervised in rain. In total, half (47%) of parents in the final interview reported there was at least one condition where they did not feel comfortable with their teen driving unsupervised. Nonetheless, 68% of families allowed their teen to obtain a license within one month of being eligible.

Parent awareness and opinions about restrictions for newly licensed teen drivers, vehicles driven following licensure, opinions about the length of the learner stage, and advice for other parents of beginning drivers were also examined in this section.

Discussion

To date, there has been almost no research on the nature and quality of parental supervision during the learner stage of graduated licensing. This study was designed to be a first step in advancing our understanding of this issue. Some of the major findings from the study are discussed below.

Driving with a parent is a safe environment for teens to obtain driving experience. Parents did several things to create a safe driving environment for their teen. During practice sessions, parents nearly always paid attention rather than engaging in secondary tasks such as operating a cell phone, reading, or eating. Seat belt use by both parents and teens was nearly universal. Although music was playing during about half of all driving clips, the music volume was rarely judged to be high enough to distract the teen. Finally, even though many parents reported feeling nervous while their teen was driving, obvious tension and raised voices were apparent in only a small percentage of driving clips. All of these behaviors likely helped to promote a safe driving environment for the teen. Nonetheless, there are several areas where it appears parents could potentially improve the quality of their supervision.

Teens appear to be driving less during the learner stage than previously assumed. Overall, the average amount of weekly practice reported by parents in this study is noticeably lower than what has been reported previously.

Extrapolating across the entire 12 month learner stage, teens drove an average of approximately 85 hours during the year-long learner stage. Although 85 hours seems like a substantial amount of time, it is currently not known how much supervised driving experience is needed to reduce subsequent crash rates among newly licensed teens. One encouraging finding from the present study is many parents seemed to recognize the importance of their teen obtaining a substantial amount of driving practice. This was reflected in parents' stated plans for the learner stage, their frustration about the difficulty in finding enough time for practice, and their advice for other parents of beginning drivers.

Driving practice is relatively homogeneous. Although many parents were concerned about the amount of practice their teen obtained, a distinct minority of parents seemed cognizant of the need for substantial experience in a wide variety of settings/conditions. Findings from both the interviews and in-vehicle cameras suggest that teens did much of their driving in residential neighborhoods and relatively light traffic. Teens drove less frequently in more challenging settings such as highways, inclement weather, darkness, heavy traffic, or country roads.

Given busy family schedules, the majority of practice seems to have been done at the time of day, and along the routes, that the family normally traveled. Although this is understandable, the result is that experience was obtained within a relatively narrow – and generally benign – range of driving conditions. In most cases, “typical family travel” holds few opportunities for teens to drive in more challenging conditions. For novice drivers to obtain experience driving in the full range of conditions that they will confront as a licensed driver necessitates either special trips or a concerted effort to vary normal driving routes.

Although there is probably some benefit to accruing large amounts of time behind the wheel during “routine trips,” this is unlikely to prepare teens fully for the wide range of driving conditions and potentially dangerous situations they will encounter, eventually, once they begin driving unsupervised. Ideally teens would get substantial experience in the full variety of driving conditions with a parent in the vehicle, before they confront these conditions on their own.

Parent instruction focuses on vehicle handling rather than higher-order skills. Higher order skills that are involved in recognizing inherently dangerous settings, making good judgments and especially translating understanding into specific driving behavior may take years to fully develop. In the present study, there was relatively little evidence that parents spent much time focusing on their teen's development of these higher order skills. During interviews parents rarely discussed, or evinced an awareness of, the cognitive aspects of driving. Rather, they tended to focus on errors with vehicle handling (e.g., braking, turns). The findings from the in-vehicle cameras bear this out. Because the cameras were triggered by changes in g-forces, they sometimes captured instances where the teen made some kind of driving error. Hence, they provided an opportunity to see

what parents said to their teens during potentially “teachable moments.” In these situations, parents usually responded with some form of basic instruction (e.g., “you need to brake sooner”). Rarely did they provide more thoughtful kinds of instruction that might help the teen to understand what the parent understands (e.g., “I try to look a few cars ahead for brake lights, so I know when I need to slow down”).

Given that most states now mandate a learner stage allowing only supervised driving for six months or longer, parents have an excellent opportunity to help their teen develop the higher order skills necessary to be a safe driver. Based on findings of the present study, it appears many parents are not taking full advantage of this opportunity.

It will be challenging to develop effective guidance for parents. During the past decade, numerous materials have been developed to assist parents as supervisors. Unfortunately, it has proven difficult to change parents’ supervisory behaviors. Findings from the present study help illustrate why this is the case.

First, supervising a novice teen driver is a highly complex task. It requires parents simultaneously to be a driving instructor, mentor, role model and psychologist. Even if parents know what they want to convey to their teen, effective communication is surprisingly difficult. Teens can be quite sensitive when first learning to drive, as evidenced by teen appeals for their parents to “stop yelling” at them (when parents barely raise their voice). In addition, it is important to consider that many parents have extremely busy schedules. Despite good intentions, they have limited time to devote to the process of supervising their teen. Because of this, guidance materials will need to be brief and emphasize a few key concepts. For example, priority might be given to how parents can help their teen develop the higher order cognitive skills essential to driving, moving them toward being a “wise” driver rather than simply a “skilled” driver.

Most guidance materials currently available to parents give little or no attention to what should be done over the long-term to take advantage of the GDL requirement that teens practice driving for at least 6 months, focusing instead on the beginning stage of driving, when basic skills are largely lacking. By failing to lay out a strategy, of a type and magnitude that parents can reasonably be expected to pursue, materials to guide parents fail to achieve the benefit available from the requirement of a lengthy practice period. Simply accumulating hours of driving may produce some benefit, but much more than that is desirable and appears to be possible.

In sum, if parents are adopting a “driving instructor” role for a few weeks then shifting to passive mode, without using the remaining time to instill broader principles of good judgment, accurate hazard perception and level-headed decision making, then they need to be pointed toward a different approach. This

new approach will need to emphasize how they should use the last many months of supervised driving to focus on a driving orientation that promotes safety rather than merely obtaining practice.

INTRODUCTION

Motor vehicle crashes are the leading cause of death for young people in the United States. In 2006, 6,072 persons ages 15 to 20 died of injuries resulting from motor vehicle crashes (CDC, 2010). Although 15-20 year-olds represent just 8.4 percent of the population and 6.4 percent of licensed drivers, they account for 13 percent of drivers involved in fatal crashes (NHTSA, 2008). The economic cost of crashes involving young drivers (both fatal and nonfatal) is more than 34 billion dollars a year (AAA, 2008).

In an effort to reduce crashes and fatalities among young drivers, nearly all states have implemented graduated driver licensing (GDL) systems. GDL systems are designed to provide beginning drivers with substantial driving practice under the safest possible conditions, exposing them to more risky situations (e.g., night driving, multiple teen passengers) only as experience is gained over time. A substantial body of evidence suggests GDL systems are highly effective in reducing young driver crashes and the resulting injuries and fatalities. Two of the earliest states to implement GDL, Michigan and North Carolina, found decreases of 25 percent and 23 percent, respectively, in crash rates for 16 year-old drivers (Foss, Feaganes & Rodgman, 2001; Shope, Molnar, Elliot & Waller, 2001). Since that time, many other states have documented similar crash reductions (Shope, 2007). Largely as a result of GDL, fatal crashes among 16-year-old drivers in the U.S. have decreased 42 percent, from a high of 33 per 100,000 population in 1996 to 19 in 2005 (Ferguson, Teoh & McCartt, 2007).

An important component of graduated licensing is the extended learner stage for beginning drivers. The learner stage provides an opportunity for novices to obtain “real world” driving experience in a relatively safe fashion. Research shows that novice drivers rarely crash while they are being supervised by an adult driver (Gregersen, Nyberg & Berg, 2003; Mayhew, Simpson & Pak, 2003). Prior to the mid-1990s, many states required beginning teen drivers to hold a learner permit for no more than 30 days, while in other states a permit was optional. Following the nationwide push to enact GDL programs, 46 states now require adult supervision of beginning drivers for 6 months or more, and 7 states require beginning drivers to be supervised for a full year.

Mandatory holding period for a learner’s permit, U.S.

Length of time	Number of states
12 months	7
9 months	3
6 months	36
6 months (4 mo. with driver education)	1
6 months (3 mo. with driver education)	1
10 days	1
None	1

Source: Insurance Institute for Highway Safety, February 2010

In addition, many states require parents to certify that their teens complete a certain amount of driving practice, usually 40 to 50 hours, before they are permitted to obtain an intermediate license. In some states, a certain number of these hours must be accumulated in specific situations (e.g., at night). The purpose of an extended learner stage and practice requirements is to ensure teens obtain considerable driving experience before driving independently. This practice is critical given that crash rates increase by 1000% to 3000% once teens begin driving unsupervised (Senserrick & Haworth, 2005).

The specific effect of learner stage requirements is largely unknown. One study found the combination of a three month holding period and a 30 hour supervised driving requirement reduced fatal crash involvements among 16 year-old drivers by 18% (Baker, Chen & Li, 2006). Although encouraging, some researchers have maintained that learner stage requirements may be effective largely because they reduce teen exposure rather than through producing teens who are “safer” drivers (Karaca-Mandic & Ridgeway, 2009). Depending on how it is enacted, an extended learner stage may delay the age at which teens become licensed. Therefore, to the extent there are fewer licensed teen drivers of a given age, there will be fewer crashes.

One possible explanation for the failure to find “safer” drivers following the extended learner stage may be that parents are not adequately prepared to supervise their teens’ driving. If teens are not getting enough practice – or enough of the right kind of practice – then improved guidance for parents should help to further reduce novice driver crashes beyond what has been achieved by GDL programs to date. Young driver experts are in substantial agreement that more effective parental involvement in supervising and monitoring teen drivers holds substantial promise for further reducing young driver crashes (Hedlund, Shults & Compton, 2003; Simons-Morton & Ouimet, 2006).

Presently, although most state GDL systems now require learner periods of six months or longer, little is known about the nature and quality of parental supervision during this initial licensing stage. One survey of more than 600 parents and teens found parents often demonstrate positive behaviors such as complimenting their teen and pointing out possible hazards during practice sessions; however, they also exhibit less desirable behaviors such as raising their voice or stepping on an “imaginary” brake – much to the annoyance of novice drivers (Goodwin, Waller, Foss & Margolis, 2006). In addition, focus group discussions have revealed that many parents do not appear to approach the learner permit period with any particular plan for what they want their children to learn or how best to reach that goal (Foss, Margolis & Holladay, 2000).

Numerous materials have been developed in an effort to assist parents as supervisors. Most large insurance companies and many state motor vehicle divisions have produced booklets or CDs for parents of beginning drivers. These materials are generally based on a “driver education” model, focusing on skill acquisition for completely new drivers. Only two such guides for parents have been evaluated. *The Novice Driver’s Road Map*,

produced by the Network of Employers for Traffic Safety and developed with input from driver training experts, describes eight driving sessions of increasing difficulty, from practice in an empty parking lot to driving in inclement weather. It provides several detailed checklists of specific skills and situations to be practiced. The goal is to ensure teens are introduced – relatively quickly – to a wide range of driving situations. An accompanying booklet provides general guidance for parents such as encouragement to be a good role model, what to expect from a novice driver, and a sample parent-teen driving agreement.

In a large scale study in Tennessee and a smaller one in North Carolina, parents of novice drivers were given copies of the *Road Map* by mail or at licensing offices (Chaudhary, Ferguson & Herbel, 2004; Goodwin et al., 2006). In both studies, parents reported they appreciated receiving the information. However, there was no discernible effect on the nature or amount of teens' driving practice or the degree of parental involvement during the learner stage. Most parents indicated they did not use the book as intended, but rather looked it over to obtain general guidance, if they used it at all.

Another newly developed guidebook, designed with input from highway safety research experts, is the National Safety Council's *Family Guide to Teen Driver Safety*. The *Family Guide* uses a magazine format and, at 68 pages, is considerably longer than the *Road Map*. The purpose of the guide is to inform families about teen driver risks, to provide advice on ways to reduce risk, and to encourage parent-teen cooperation. A sample of families in North Carolina and Maryland was recruited through driver education classes to evaluate the guide. Although parents liked the format and content, almost half did not read the *Family Guide* (even though the researchers had asked them to), and a sizeable percentage felt it was too long and repetitive (Hartos & Greenspan, 2007). The study did not examine whether the guide had any effect on what parents actually did as supervisors.

These studies suggest the need for more appropriate guidance for parents, with materials and advice based on a better understanding of parents' perspective, behaviors, and needs. Given the limitations of what parents are likely (or able) to do, guidance should help them to focus on the factors known from empirical research to be important in reducing novice driver crashes. In sum, to ensure the GDL process produces safer drivers, it is important we gain a better understanding of how parents approach and manage their teens' driving during the learner stage. If we are to develop and implement useful guidance for parents to become better driving mentors – and thus to maximize the effectiveness of supervised driving practice – answers are needed to questions such as:

- How does the course of supervised practice change, in terms both of time and nature, during the learner permit period?
- Do parents have a plan in mind for what they want their child to accomplish and, if so, how do they go about implementing it?
- How, and how effectively, do parents attempt to convey what they want their child to know?

- What kinds of problems arise that can interfere with effective practice and how are those handled, both by parents and teens?

The goal of this project was to develop a better understanding of how parents approach and manage their teens' driving during the learner stage of GDL. The study involved regular interviews with parents to obtain detailed information about their experiences during the learner stage. In addition, cameras were placed in the vehicles of participating families so parent and teen behaviors during practice sessions could be directly observed.

North Carolina's Limited Learner Permit

All new drivers under the age of 18 in North Carolina are required to complete a state-approved driver education course, which includes 30 hours of classroom instruction and 6 hours of on road practice, before they can obtain a learner permit. Teens may obtain the permit as early as age 15, and they must hold the permit for 12 months before they are eligible for a provisional (restricted) license. The requirements for the learner permit in North Carolina include the following:

- Teens must be supervised at all times by a parent, grandparent, guardian, or driver approved by a parent or guardian.
- The supervisor must be a licensed driver who has been licensed for at least 5 years.
- During the first 6 months of the permit, the teen may drive only between 5 a.m. and 9 p.m. After 6 months, the teen may drive with a supervisor at any time of day.
- Everyone in the vehicle must use seat belts or be restrained as required by child restraint laws.
- Teens are prohibited from using a cell phone while driving (with the exception of calling a parent or using the phone in an emergency situation).
- There is no minimum supervised hours requirement.

The earliest age at which teens can obtain the provisional (restricted) license in North Carolina is age 16.

METHODS

We recruited 50 families as teens applied for a learner's permit. A series of 10 interviews were conducted with parents during the year-long learner stage. The interviews focused on how parents approached their supervisory role, the type, frequency and duration of practice, the problems they encountered in the process of supervising their teen and how they dealt with those problems. The interviews were semi-structured to learn about each family's unique perspective and experiences. In addition, cameras were installed in the vehicles of these families to capture information that could not be obtained by self-report. The cameras – triggered by hard acceleration, braking or turns – recorded activity within the driver compartment as well as in front of and behind the vehicle.

Recruiting Families

Families were recruited for this study through two Division of Motor Vehicles (DMV) offices: one in Durham and one in Chapel Hill, North Carolina. Licensing officials handed a letter to families applying for a learner's permit inviting them to participate in a research study on young drivers. Details about the study – including the in-vehicle camera – were not mentioned in the letter. Families interested in learning more about the study were asked to provide their contact information on a postcard. Licensing examiners collected these postcards and a member of the project team collected them daily from the DMV.

One goal of the study was to learn about parent expectations for their teen's driving *before* they began driving practice sessions. Consequently, an attempt was made to reach parents by telephone as soon as possible after the teen obtained a permit. In many cases, we were able to contact parents on the day the permit was obtained. Parents were informed the study involved 10 telephone interviews over the course of the year-long learner stage. The first interview was then conducted with the parent. Following this, the in-vehicle cameras were described and parents were informed they would receive \$150 – and teens would receive \$50 – for participating. Families who agreed to participate were informed how and where to have the camera installed in their vehicle, and an appointment was made for the second telephone interview. Parents who declined to have a camera installed in their vehicle were excluded from the study.

The table below summarizes the results of recruitment efforts. Recruitment took place between January 2007 and June 2008. Fifty families were recruited during this period. This represents about 20% of all eligible families who visited the DVM.

Summary of Recruitment Results

	N	% of eligible
Eligible families visiting the DMV	257	---
Provided contact information	201	78%
Completed initial interview	140	54%
Unavailable on multiple call attempts, language barrier, or wrong number	46	
Refused initial interview	15	
Agreed to install camera	67	26%
Installed camera	50	19%

As shown in the table, there are several points at which families were lost from the study. Although many families were willing to provide their contact information, some families could not be reached after multiple attempts. Among those families who were successfully contacted and who completed the initial interview, approximately half (52%; 73 out of 140) decided not to participate after learning about the camera component of the study. Finally, 17 families were dropped from the study because they did not have the camera installed within the required time frame (four weeks from the date of permit).

Interviews

Three separate questionnaires were developed: 1) an initial interview conducted with parents immediately after the teen obtained his or her permit; 2) a follow-up interview with parents to track progress during the learner stage; and 3) a final interview conducted with parents just prior to the teen being eligible for a license.

Initial drafts of the questionnaires were pilot-tested with six families who were recruited through the DMV. Parents from these families were interviewed on three occasions. Interviewers noted confusing or awkward questions, problems with the flow of the interview, and interesting topics that arose during interviews that were not covered by existing survey questions. Parents were debriefed after the third interview and their feedback was solicited about the interview process, the interviews themselves, and parents' comfort in sharing their experiences with the interviewer.

Based on the pilot testing, it was determined the interviews should be semi-structured and include a number of open-ended questions. This was important to encourage parents to fully describe their feelings, frustrations, satisfactions and other relevant experiences during the supervision process. All interviews for this study were conducted by a senior member of the research team.

Interviews were recorded (with the consent of the parent) so the interviewer could focus on listening and asking related follow-up questions rather than writing down responses. Over the course of a full year, interviewers were able to develop good rapport with most parents. A few parents referred to the periodic interviews as “therapy” sessions, and many parents clearly enjoyed having an opportunity to share their experiences (and frustrations). Given the close relationship that was established with parents, a conscious attempt was made by interviewers to avoid providing advice, encouragement or other support that could potentially alter their behavior as supervisors.

Up to 10 interviews were conducted with each family. Following the initial interview, a call schedule for the family was created. Although we attempted to follow the schedule as closely as possible, some flexibility was necessary due to holidays, parents’ traveling, etc. The timing of the call schedule was as follows:

Interview number	Target date for interview
1	Within one week of obtaining the permit
2	Two weeks from date of permit
3	One month from date of permit
4	Six weeks from date of permit
5	Two months from date of permit
6	Three months from date of permit
7	Four and one-half months from date of permit
8	Six months from date of permit
9	Nine months from date of permit
10	Twelve months from date of permit – just prior to the teen being eligible for a provisional license

Initial interview. The initial interview took approximately 15 minutes to complete. Several questions were asked to determine who would be the primary supervisor of the teen. In most cases, this was the parent who was contacted for the initial interview (and who accompanied the teen to the DMV). If another parent was identified as the primary supervisor, the interviewer asked to speak with that person.

The next questions investigated whether the parent had already accompanied the teen to practice driving and, if so, how the driving session(s) went. If the teen had not yet driven, follow-up questions explored the parent’s plan for doing so and beliefs about how the teen would do. Other key questions in the initial interview included:

- Do you have any plans for what you want to do while [TEEN] has a permit, or are you just going to see how it goes?
- Are there any particular things that you want [TEEN] to learn or master during the next year?
- Some parents are in a hurry for their teens to begin driving while others are uneasy about it and are in no rush. What about you, how do you feel about [TEEN] beginning to drive?
- How about [TEEN]? How do you think [he/she] feels about starting to drive?

Additional questions investigated driving experience by teens *before* they got a permit, the kind of vehicle the teen would be driving most of the time while learning to drive, why that vehicle was chosen, whether parents were first time supervisors, and whether parents had received any informational materials to assist them in supervising their son or daughter. On all topics, the interviewer asked follow-up questions as needed to further clarify and expand on issues raised by parents.

Follow-up interviews. Follow-up interviews usually took between 15-20 minutes. Each follow-up interview began with an informal conversation of how the teen was progressing with his or her driving. The casual nature of this opening was designed to build rapport with the parent, encourage them to “open up,” and provide their unbiased perspective on the supervision process. Subsequent sections of the interview focused on the following topic areas:

- Amount of weekly driving practice and the types of situations in which teens were driving (e.g., parking lots, residential streets, heavy traffic, in rain, on an interstate highway).
- Types of issues dealt with during recent driving sessions (e.g., vehicle handling, rules of the road, hazard perception).
- Parent-teen communication during practice sessions (e.g., how often parents gave feedback or instruction to their teen and how teens responded to this feedback).
- Nervousness of parents and teens during driving sessions.
- Parents’ perceptions of their teen’s readiness to drive unsupervised.
- Observations about what went well and poorly during practice sessions
- Parents’ advice for other parents.
- Plans for the coming week(s).

In-vehicle Cameras

To provide additional information, of the sort that individuals usually cannot report, video cameras were installed in families’ vehicles for four months near the beginning of the supervised driving period. The cameras for this study were obtained from *DriveCam* (www.drivecam.com). A “DriveCam” is a small (11 cm x 9 cm) video camera that is mounted on the windshield behind the rearview mirror. It has a forward-facing lens to

record what is happening in front of the vehicle; a second lens records activity inside the vehicle. The camera is also equipped with a microphone that records sound inside the vehicle. Although the camera runs continuously, it only saves information when a triggering “event” occurs such as sudden braking or abrupt turns. As configured for the present study, once triggered, it saved the 10 seconds preceding and 10 seconds following the event. Thus, both the cause of the event and occupants’ responses can be viewed.



The sensitivity of the camera – the change in g-forces required to trigger the unit to record – can be adjusted. We assumed many teens would drive slowly and carefully while being supervised by a parent. Hence, we decided to use a relatively low threshold to trigger the cameras: 0.40 for longitudinal (forward) g-forces and 0.45 for lateral (side-to-side) g-forces. As a reference, another recent study of newly licensed teen drivers used threshold settings of .50 and .55 for longitudinal and lateral g-forces, respectively (McGehee, Raby, Carney, Lee & Reyes, 2007). Although the cameras are equipped with a small red light that flashes when a triggering event occurs, these lights were disabled for the present study. Our goal was to investigate the natural behavior of parents and teens; hence, anything that might draw attention to the camera was undesirable.

The cameras were installed by local auto electronics dealers contracted to provide this service. At the end of the initial interview, families were provided with the phone number for the installation department, and asked to contact the electronics store directly to schedule a time to install the camera. Installation time varied depending on the make, model and year of the vehicle, but in most cases was approximately 30 minutes. Some parents reported their teen would be driving more than one family vehicle. In these cases, they were asked to install the camera in the vehicle that they anticipated the teen would drive most often.

The cameras were capable of holding approximately 150 separate “events” in memory. Based on pilot testing, it was determined that data would need to be downloaded from cameras on a monthly basis. Therefore, a monthly appointment was made to swap the camera with a “fresh” one. The “used” camera was then returned to the research center where data files were downloaded. As a cost-saving measure, at the end of four months, the camera was removed from the family’s vehicle for use with another family.

Because all of the vehicles in which cameras were installed were shared vehicles, a substantial number of the clips recorded by the cameras show parents, siblings or other

persons driving. Hence, a necessary first step was to separate clips of teen drivers from clips of other drivers. A coding scheme was then developed to analyze the video clips in which the target teen was driving. The coding scheme included the following components:

Situational information

- Time and day of event
- Driver and supervisor's sex
- Driver and supervisor belt use
- Number of adult and young passengers
- Music presence and volume
- Ambient light
- Pavement condition
- Road geometry
- Amount of traffic
- External driving environment difficulty/stressfulness

Event information

- Whether the triggering event was noticed by parents and/or teens
- Maximum longitudinal g-force
- Maximum lateral g-force
- Seriousness of the event

Behavioral information

- Parent's focus of attention, pre-event
- Teen's focus of attention, pre-event
- Parent verbal behavior
- Nature of driving instruction
- Parent tenses up
- Parent raises voice
- Parent smiles or laughs
- Teen verbal behavior
- Teen acceptance of parent feedback
- Teen raises voice
- Teen smiles or laughs

RESULTS

Interview Completion Rates

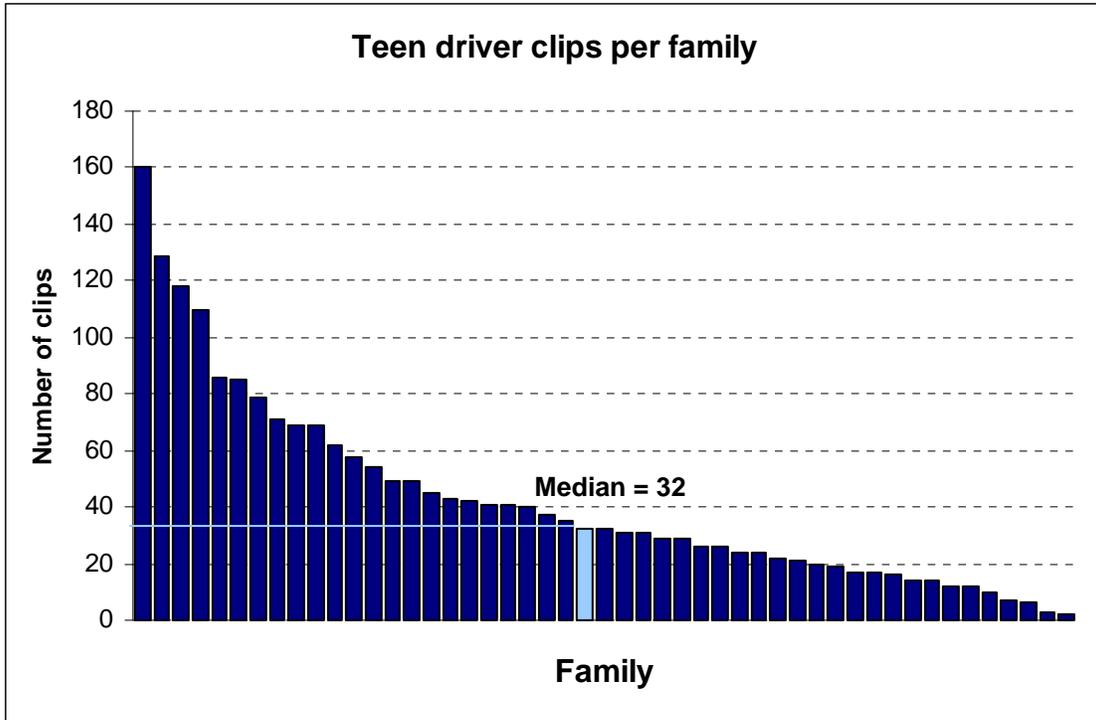
Our goal was to conduct 10 interviews with each participating family. Ultimately, some interviews were missed due to holidays, family travel, and other circumstances. In addition, one teen turned 18 after spending approximately 7 months in the learner stage. The teen thus became eligible for (and obtained) a full adult license, so future interviews with the parents were discontinued. In total, 466 interviews were conducted with parents, representing 93% of the goal of 500 interviews.

Number of Clips Recorded by In-vehicle Cameras

Cameras were installed for four months during the early part of the learner stage. All the vehicles in the present study were shared vehicles. The following table shows the number of clips recorded for each type of driver.

Number of Video Clips Recorded by Driver Type		
	N	%
Parent	18,406	80%
Target teen	2,068	9%
Older sibling	2,580	11%
Total	23,054	100%

On average, there were 41.4 teen driver clips per family, ranging from 2 to 160. The figure below shows the distribution of teen driver clips for the 50 families participating in the study.



Family Characteristics

Parents. Mothers generally assumed most of the responsibility of supervising the teen driver. They were the exclusive (or nearly exclusive) supervisor in 50% of the families. Fathers were the exclusive (or nearly exclusive) supervisor in 24% of families. Both served as supervisors in another 24% of families. In one family, most of the supervising was conducted by an adult friend of the family.

For each family, one parent was identified as a primary contact for the study. In nearly all cases, this parent also conducted most (or at least half) of the supervisory duties. The table below shows characteristics of the parents who served as primary contact for the study.

Parent Characteristics		
	N	%
Age		
Less than 40	4	9%
40-44	10	22%
45-49	20	44%
50-54	8	18%
55 or older	3	7%
(Mean age: 46.2 years)		
Race		
Caucasian	43	86%
African-American	7	14%
Education		
Trade or vocational degree	1	2%
Some college but no degree	5	11%
College or university degree	8	17%
Some graduate work	10	22%
Graduate degree	22	48%

Employment		
Full-time	35	71%
Part-time	11	22%
Not employed	3	6%
Marital status		
Single, never married	2	4%
Married	39	80%
Widowed	2	4%
Divorced	6	12%
Number of children in family		
One	6	12%
Two	27	54%
Three	10	20%
Four	7	14%
Household income		
Less than \$25,000	0	0%
Between \$25,000 and \$49,999	1	3%
Between \$50,000 and \$74,999	9	23%
Between \$75,000 and \$99,999	6	15%
\$100,000 or more	24	60%

Clearly, the sample of participating families represents a highly educated, affluent population. To some degree, this reflects the region from which participants were sampled. For example, the median family income in Chapel Hill is \$89,507, well above the national average of \$63,211 (Census, 2010). Even taking this into account, however, the sample is noticeably better educated and more affluent than the Durham/Chapel Hill region as a whole.

Teens. Two of the families had twins. In both cases, each of the teens agreed to participate; hence, there were 52 beginning teen drivers in the study sample. The table below shows the characteristics of these teens.

Teen Characteristics		
	N	%
Age at enrollment in the study		
15	46	88%
16	5	10%
17	1	2%
Sex		
Male	17	33%
Female	35	67%
Year in school		
Freshman	24	46%
Sophomore	23	44%
Junior	4	8%
Senior	1	2%
Completed driver education		
Yes	52	100%
No	0	0%

Refusers. Information about families who refused to participate in the study is limited. Nothing is known about families who were unwilling to provide their contact information at the DMV. We have limited information from the 90 families who completed the initial interview, but who ultimately did not get the camera installed in their vehicle. These families did not differ from study participants on the teen's sex, whether the mother or father served as the primary supervisor, whether the parent was a first-time supervisor, or the type of vehicle driven by the teen (all p 's > .09). However, we do not have information on age, household income or other potentially important characteristics of these families.

Parents' Approach to Supervision

A major goal of the study was to examine how parents approach the process of supervising their teen's driving. During the initial interview, parents were asked whether this was their first experience supervising a novice driver, their self-described plans for the learner stage, their eagerness for their teen to begin driving (and their teen's eagerness to drive), whether they had received any guidance materials, and the type of vehicle their teen would be driving most. The initial interview was conducted within a few days after the teen had received his/her permit (and sometimes on the same day). Hence, responses reflect parents' earliest plans and expectations for the learner stage.

First-time supervisors. Approximately half (54%) of parents reported they were first-time supervisors. Among those with prior supervisory experience, most (70%) had supervised one teen, but some had supervised two (22%) or three (9%) teens.

Guidance materials for parents. Only four of the 50 parents (8%) reported receiving materials that offer advice for parents of beginning drivers. In two cases it was a booklet/pamphlet from an insurance company. In the other two cases it was a driving agreement/contract. Two of the four parents reported they hadn't looked at the materials. One parent who had looked at the materials felt it was "mostly common sense and not very helpful."

Several parents who hadn't received materials asked whether the interviewer could provide some. Another parent made the following comment regarding guidance for parents of beginning drivers:

"The only thing they hand you at the DMV is a list of what the rules are. They don't give you any guidance; they don't even tell you where to go for guidance on what you should be doing to teach your kid how to drive. It's really ironic, because on other parenting things you get so much information, more information than you really want. Here they give you this massive responsibility and very little guidance."

Plans for the learner stage. Parents were asked several questions about their plans and goals for the learner stage. These seemed to cluster around several main themes:

- A desire to give the teen **lots of driving practice**. Examples:

"We're definitely going to let him drive every day. I honestly believe the more practice he gets, the better he'll be."

"My plan is that if she's with us, whether it be myself, my wife, or the whole family, I intend to have her driving. I want her to drive practically every time, so that she gets really comfortable and can learn from her mistakes, and with us giving her some help along the way. I just feel like practice makes you a much better driver."

- Interest in the teen getting **practice in many different types of driving situations/conditions**. Examples:

“I personally plan on supervising her in as many different atmospheres as possible, like making sure that she’s comfortable merging onto a highway, driving on a highway, and navigating all kinds of different circumstances.”

“The more you make them drive in all situations, even on the highway, the more comfortable I’ll be when they get their license and drive on their own.”

- A desire to **control the teen’s practice**, starting in less demanding settings and gradually working toward more challenging situations. Example:

“I think we want to first start by doing small trips, like driving to the grocery store, school, or maybe to an appointment, something like that, and as she gets more confident, take her out on the freeway, and do more complicated things, parallel parking, stuff like that.”

- A **lack of any plan**, or the intention simply to “see how it goes.” Examples:

“Yeah, just kind of see how it goes. We don’t have any plan that we’ve thought about or anything.”

“You know, I don’t have a plan, but it sure would be nice to have one, you know what I mean? Especially when they’re first driving, you don’t really know where to take them, or what exactly to practice with them, and that’s been the most frustrating part for me.”

The percent of parents reporting each of these orientations is presented in the table below. Parents could report more than one type of plan (e.g., planning both lots of practice and practice in many types of situations).

Parents’ Plans/Goals at the Outset of the Learner Stage		
	N	%
Lots of driving practice	26	52%
Practice in many different types of driving situations/conditions	12	24%
Control the teen’s practice	25	50%
Lack of any plan	8	16%

At the outset of the learner stage, most parents had given at least some thought to plans for supervising their teen. The most common plans were to make sure the teen received lots of practice, or to make sure the teen's practice came in controlled conditions. Fewer parents were planning to have their teen practice in a wide variety of driving situations/conditions. Note that this is parents' self-reported plans at the very beginning of the learner stage. Parents' goals and plans may have changed based on their experiences during practice sessions with their teen.

Regarding plans for the learner stage, we compared the responses of parents who had previously supervised a teen driver with parents who were new to the supervision process. The only significant finding was that parents with previous supervisory experience were less likely to say they were planning to "see how it goes" compared to parents with no previous experience (4% vs. 26%; $\chi^2 = 4.30$, $df = 1$, $p < .05$).

Eagerness for the teen to begin driving. During the initial interview, parents were asked the following question: "Some parents are in a hurry for their teens to begin driving while others are uneasy about it and are in no rush. What about you, how do you feel about [teen] beginning to drive?" After several follow-up questions, they were then asked: "As with parents, some teens are in a rush to begin driving while others may be a little scared, or just not that interested in driving. How about [teen]? How do you think [he/she] feels about starting to drive?" Parent and teen eagerness for the teen to begin driving is shown in the table below.

	Teen eager to begin driving (according to parent)			Total
	Yes	No	Conflicted/ mixed	
Parent eager for teen to drive				
Yes	15	0	1	16
No	7	3	3	13
Conflicted/mixed feelings	15	2	4	21
Total	37	5	8	50

Since the teen had just obtained his or her permit, it was not unexpected that many parents described their teen as enthusiastic to begin driving. As one parent said:

"Oh yeah, she wants to drive as soon as possible! She's just excited at the whole concept of driving."

However, one in four parents described their teen as reluctant, unwilling or scared to begin driving:

“Surprisingly, I practically had to push him out the door to go take his test. When I was a kid, one day after my 16th birthday, I was taking my driving test. And he doesn’t seem to be all that anxious. And that’s surprising.”

“She is excited and tentative. Like when we went to do an errand on Sunday, she didn’t want to drive and I encouraged her to and she was fine as soon as she got going. So, I think that there’s a part of her that is excited about learning to drive and being able to drive and then there’s a part of her that’s a little bit frightened by it.”

Parents’ feelings about their teen beginning to drive varied considerably. Some parents were eager to have their teen drive:

“We’re at the stage where he wants to go places and we have to chauffeur, and that really does take a great deal of time, so we’d like him to become independent.”

“I’m excited. To me, it’s like a milestone. And it’s another step towards independence. Not that I want to push him out, but I want him to be confident, and a good driver and so that when he does get his license, he’ll be able to handle it – as much as he can, as a 16 year old.”

Other parents had mixed feelings, or expressed considerable anxiety about the process:

“I’m okay with it. I mean he’s a pretty responsible kid for the most part. I guess I’m a little uneasy. We’ve had friends that had their child die at 16 in a car accident. So, I know it happens and I know more accidents happen to teens than anyone else, so in that respect I’m anxious about it. I’m not in a hurry for him to, just because it means that he’s growing up and he’s out of here. But I remember being excited when I was a kid, being able to drive. It’s just a rite of passage.”

“I would as soon wait 10 more years! He’s my only child, and I just don’t trust the idiots out there not to kill him.”

“I want her to drive because I want her to have her autonomy. I think as a female, that’s really important. But by the same token, I could wait until she was 18. My feeling of fear is always great. When you hand your kid the car keys – to me, it’s like an African Warrior telling his son ‘Go out in the jungle – I’ll see you in four days.’ Same tribal initiation, you know? There’s just no way of getting around this. Parenting isn’t for cowards.”

There was no difference between first-time supervisors and parents with previous supervisory experience in their eagerness for their teen to begin driving ($\chi^2 = 0.42$, $df = 2$, $p = .81$).

Vehicles driven by teens. All of the teens in the study drove vehicles that belonged to a parent or an older sibling. The table below shows the characteristics of the vehicles driven by teens.

Vehicles Driven by Teens During the Learner Stage		
	N	%
Number of vehicles driven by teens		
One vehicle	20	40%
Two vehicles	25	50%
Three vehicles	5	10%
Primary vehicle driven by teens		
Passenger car	25	50%
Minivan	13	26%
SUV	9	18%
Pick-up truck	3	6%

Forty percent (40%) of teens drove one vehicle during the learner stage. In some cases, this is because only one vehicle was available to the teen. Several parents mentioned they deliberately had their teen drive more than one vehicle so they could learn how different vehicles handled (e.g., large vs. small vehicles, automatic vs. stick shift).

Driving experience before permit. All new drivers under age 18 in North Carolina are required to complete a state-approved driver education course, which includes 30 hours of classroom instruction and 6 hours of on road practice, before they can obtain a permit. During the initial interview, we asked parents whether their teen had received any driving experience outside of driver's education before obtaining a permit. Sixty percent (60%) of teens had practiced driving outside the standard driver education course. Forty percent (40%) of teens had driven with a parent in an empty parking lot. Others had driven in their neighborhood (10%), their driveway (8%), or on gravel roads in the country (2%). In most cases, parents reported their teen drove on only one or two occasions in these various settings, although a few reported up to 10 special trips to practice. Several parents also mentioned their teen had experience driving other types of vehicles, such as "Go Karts," motorbikes, riding mowers, etc.

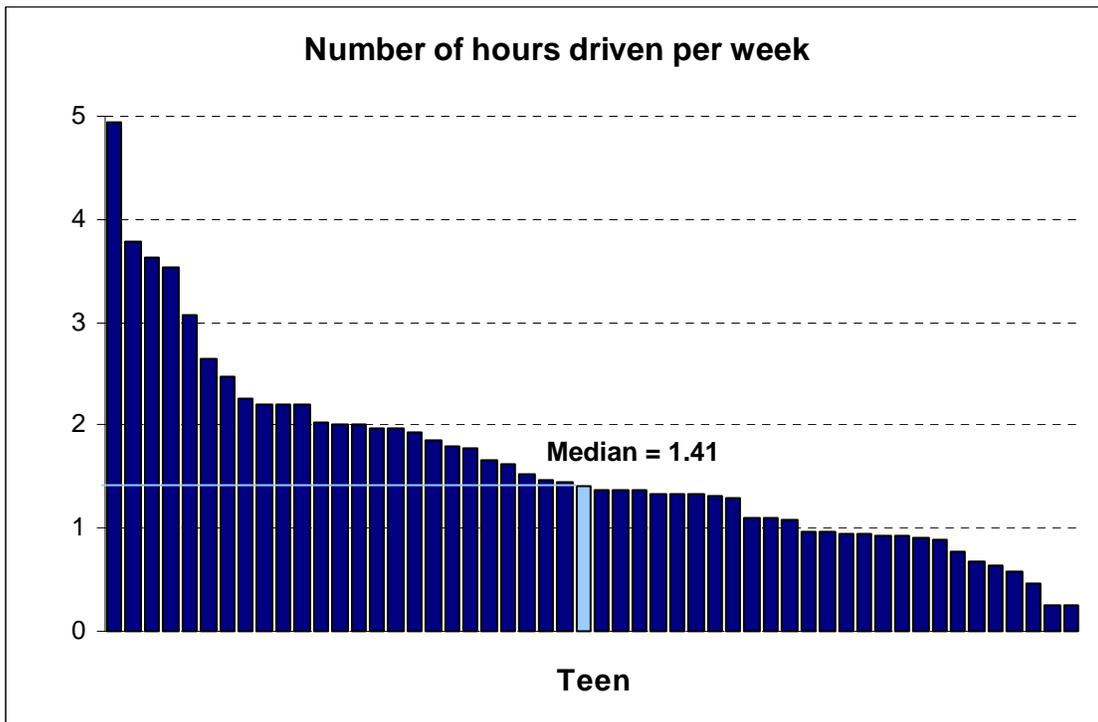
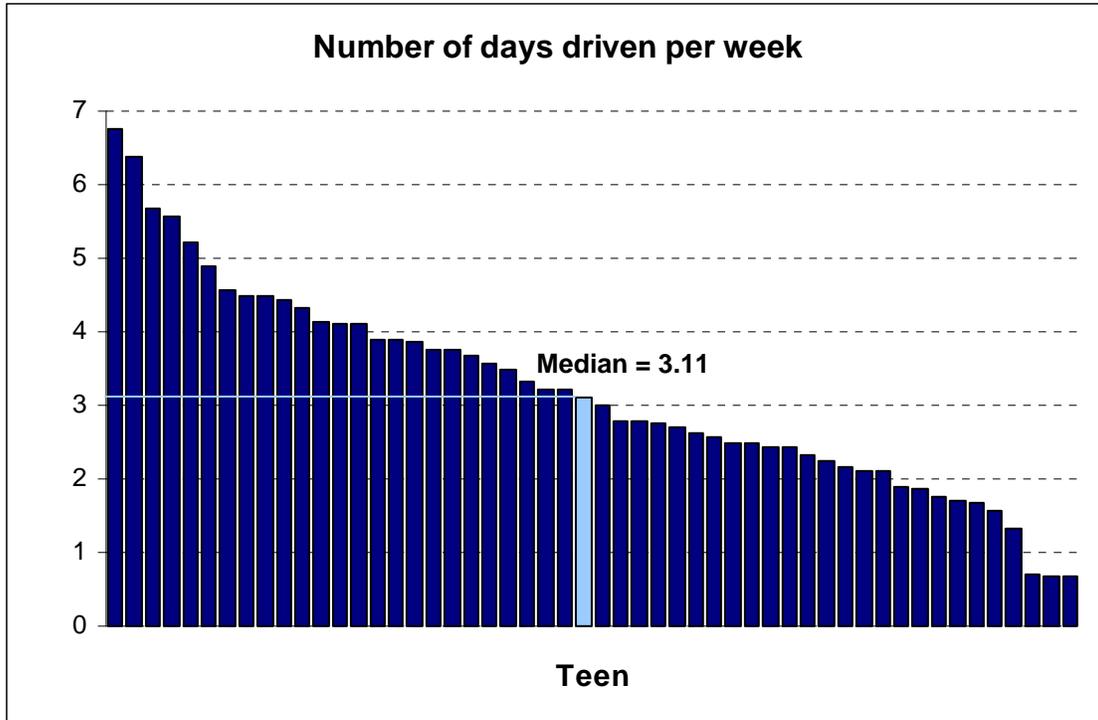
Amount of Driving Practice During the Learner Stage

One goal of the present study was to obtain a more accurate estimate of the amount of driving experience teens obtain during the learner stage. A few studies suggest that most teens obtain 50 or more hours practice with a learner's permit (Waller, Olk & Shope, 2000; Williams, Nelson & Leaf, 2002). A limitation of these studies is they are based on retrospective self-reports – parents were asked at the end of the learner stage to recall how much their teen had driven over a long period of time. The accuracy of these reports is questionable, especially considering the lengthy time frame (6 months or more) about which they were asked to report.

Recently, Leaf et al. (2008) showed that teens provide more valid driving estimates when they are asked to enumerate specific trips. Accordingly, the questions asked of parents in the present study followed an informal, but detailed discussion about their teen's recent driving experience. This was intended, in part, to trigger parents' memories about when, where and how much driving their teen had recently done. This procedure is similar to the "timeline followback" technique that is used to assist individuals in recalling past drinking occasions. The technique has been demonstrated to be more accurate than asking for global estimates (Sobell & Sobell, 1992).

Hours/days driven. With the exception of the initial interview, parents were asked during each interview to recall how many days and the total amount of time their teen had driven during the previous week. On average, parents reported teens drove 3.21 days and 1.60 hours during the previous week. Males and females did not differ in the mean number of days they drove each week (3.18 vs. 3.23; $F = 0.05$, $df = 1$, $p = .83$). However, females drove marginally more hours each week than males (1.73 hours vs. 1.43 hours; $F = 3.04$, $df = 1$, $p = .08$).

There was substantial variability between families in the average amount of driving done each week. The figures below show the distribution of days and hours driven per week for the 52 teens participating in the study.



In about 5% of families, teens drove an average of less than one day and less than 30 minutes each week. In another 10% of families, teens drove an average of at least 5 days and at least 3 hours each week.

In 13% of interviews, parents reported no driving at all by their teen during the previous week. Parents gave numerous reasons why their teens sometimes did not drive. A few examples: the teen forgot (or lost) his/her permit; the teen had an injury (e.g., a broken arm); the family was traveling in another state; the family was running late/in a hurry; the teen was feeling tired; or inclement weather (e.g., rain, ice). However, the most common reasons given by parents for the teen not driving fell into two categories: 1) teens and/or parents were too busy with other activities; and 2) teen disinterest in driving. During interviews, two-thirds (68%) of parents at some point mentioned busy schedules as a reason for the teen not driving. Typically, parents cited their teen's involvement in multiple activities both in and out of school.

"It was easy to get the first kid in the car for some reason, but the second one, he's a little bit busier. I don't know, but it's less of a novelty now. You know what I mean? I need to make time to make sure I get him in there with me. And, you know, he doesn't have that much opportunity to be available because he's real busy with the sports, and everything."

"When he does drive he does well but, I hate to say it, we don't drive much anymore. It's because of our busy schedule. After football practice, he's usually too tired to drive, or he doesn't have his wallet or whatever. And on the weekends, he's gone with friends."

Two in five families (40%) at some point mentioned disinterest on the part of the teen as a reason for not driving during the past week (or sometimes for longer periods of time). Generally this seemed to occur one or two months after the teen obtained his/her permit.

"I've offered on many occasions to take her out driving, but she just is not interested in going which is so odd. It's hard to get her out there to drive. I think we may have driven once in the last two weeks."

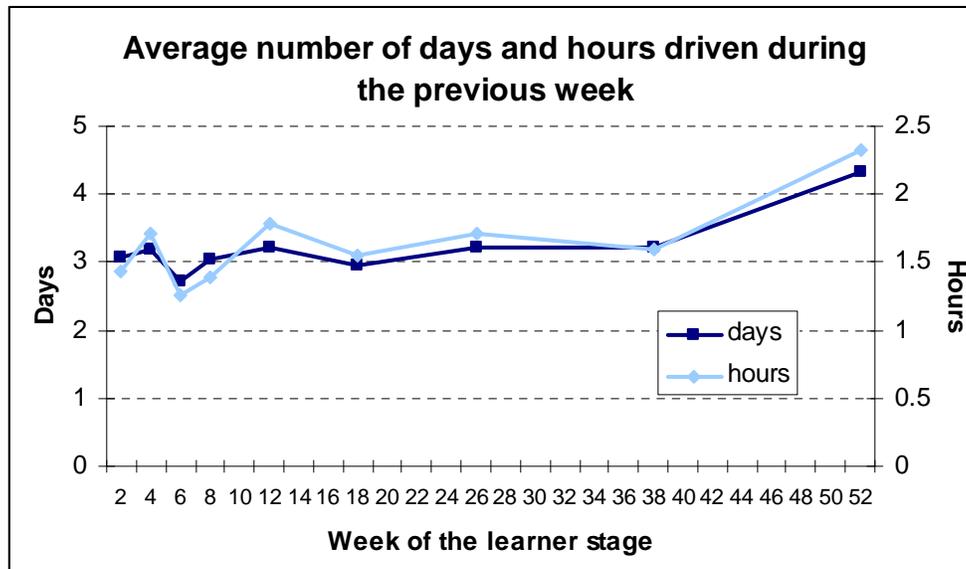
"The initial thrill has faded and we just sort of lapse back into old habits of Mom driving without either of us thinking about it too much. Except when I will say, 'Uh, you should be driving. Do you have your permit?' 'Oh, no.' And then there we are."

"I would say she never asks to drive. 100% of the time I bring it up. I don't even bring it up all that often anymore. I mean, she just shows no interest."

"He did tell me that he understands now why kids don't want to drive. He was very excited at the beginning, and now he sees it more as something he has to learn and has to do to get better. It's definitely not as exciting as it was in the beginning."

Change in practice over time. Another question of interest is how the amount of teen driving changed over the course of the learner stage. The figure below shows the

average number of days and hours driven during the previous week, by week of the learner stage. (Data points correspond to weeks when interviews were conducted with parents.)



In North Carolina teens must have a learner's permit for a minimum of 12 months. Over most of the learner stage, driving practice was evenly distributed. However, it is evident that practice increased at the final interview, just prior to the teen being eligible for a license. At the final interview, teens drove an average of 4.32 days and 2.33 hours during the previous week. Some parents reported making an effort to increase practice time as their teen approached licensure.

"I just make her drive all the time now. We really do. We just want her behind the wheel as much as possible, now. And boy that changed, because before it wasn't like that at all."

In some cases, parents said their teens requested more practice:

"She's just asked to drive more. So, times in the past when I say 'Would you like to drive?' it would be 50% of the time she would, 50% of the time she wouldn't. Now it's probably more like 80-20. She drives more often than not. She wants to get the practice."

"I guess one difference was that he initiated a lot more, every time we would get into the car he would say, 'Can I drive? Can I drive?' Which before a couple of months ago, that was not so much the case. Either I would forget to ask or he wouldn't ask, but it is a rare day now when we go to get in the car that he doesn't say, even if it's for a very routine trip, 'Can I drive?' And I always say yes."

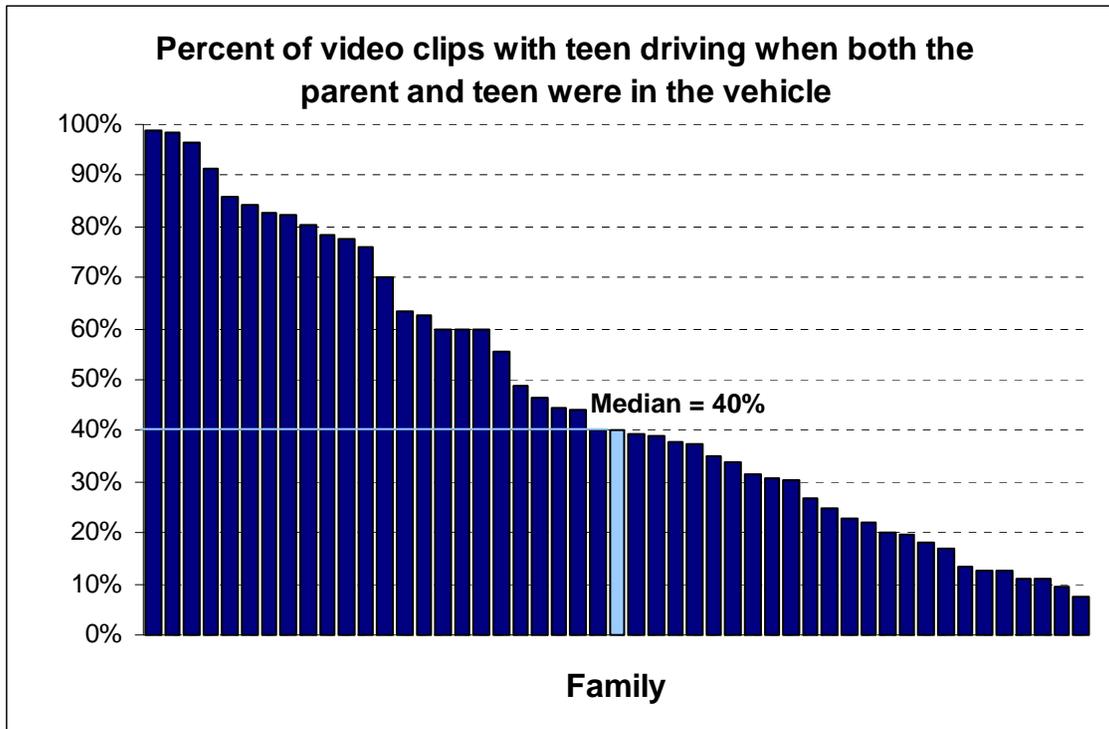
“Every time we go driving, or every time there’s an opportunity she asks to drive all the time. I think she’s trying to make sure she’s ready, but she’s been asking to drive pretty steady for the last couple of months. Before we kind of had to beg her, but now she asks to drive every time.”

For many families, however, parents did not report any special effort for the teen to get more practice. Rather, parents were simply feeling more comfortable with the teen’s driving after having spent nearly a year together in the vehicle:

“She’s doing much, much better. She’s more controlled and more relaxed behind the wheel and I trust her a whole lot more.”

“He just drives all the time now. And it’s not even any question he just, if I’m going any where, he drives. So, there’s really nothing special.”

Teen as driver versus teen as passenger. Another question of interest was whether teens usually drive when they are in the vehicle, or whether parents often drive when their teen could be driving. The driving clips from the in-vehicle cameras provide one method for examining this question. For each family, we looked at the number of clips with the teen driving compared to the total number of clips where both the teen and parent were in the vehicle. These latter clips represent occasions where the teen potentially could have driven. This analysis should be interpreted with caution. The number of events triggered by the in-vehicle cameras depends not only on the amount of driving a person does, but on a person’s driving “style.” Someone with a rough driving style, for example, will trigger more events than someone who drives slowly and smoothly. Nonetheless, the analysis provides a very crude indication of how frequently teens were driving when they were in the vehicle with their parent.



On average, teens were driving during 44% of the video clips where both the parent and teen were present in the vehicle. Once again there was considerable variability between families. In one family, the teen was driving in only 7% of the clips where he appeared with his parent. By contrast, three teens were driving in at least 96% of clips. In all likelihood this analysis overestimates the proportion of clips with a teen driver because – at least in the first month or two – teens may have been more likely than their parents to trigger the camera to record.

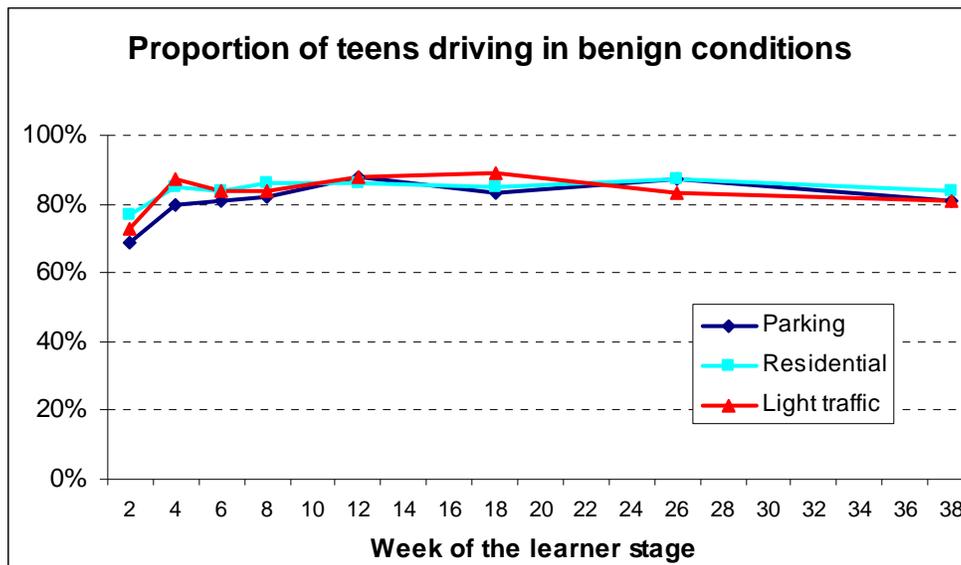
Conditions in Which Teens Drive

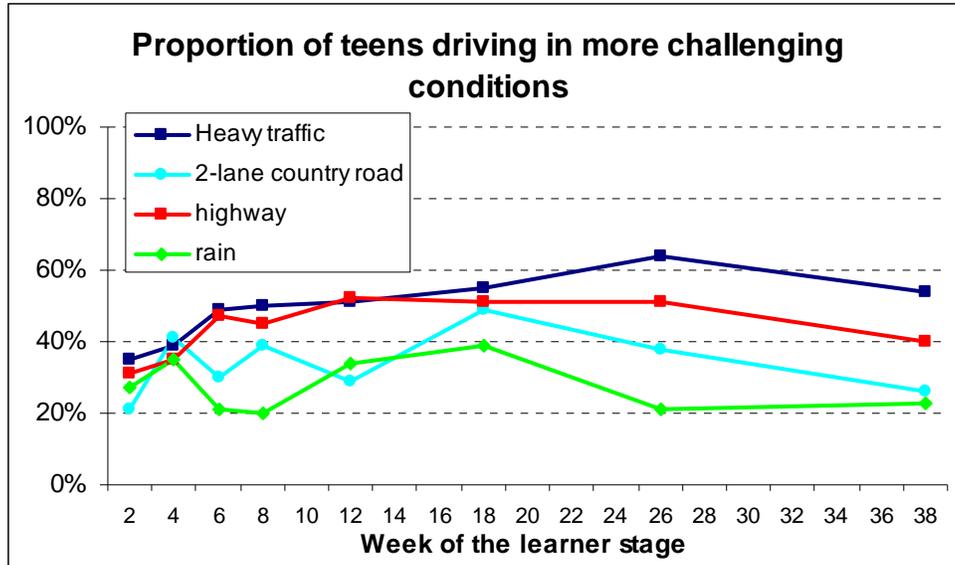
In addition to examining how much teens were driving, we examined the types of conditions in which teens drove and when parents introduced new driving conditions. Information on this issue comes from both the interviews with parents and the in-vehicle cameras.

Parent reports of driving conditions. During each interview, parents were asked whether their teen had driven in a number of different conditions or situations during the previous week. These included:

- Pulling into or out of parking spaces
- In residential neighborhoods
- In light traffic
- In heavy traffic
- On a two lane road out in the country
- On a freeway or interstate highway
- In the rain

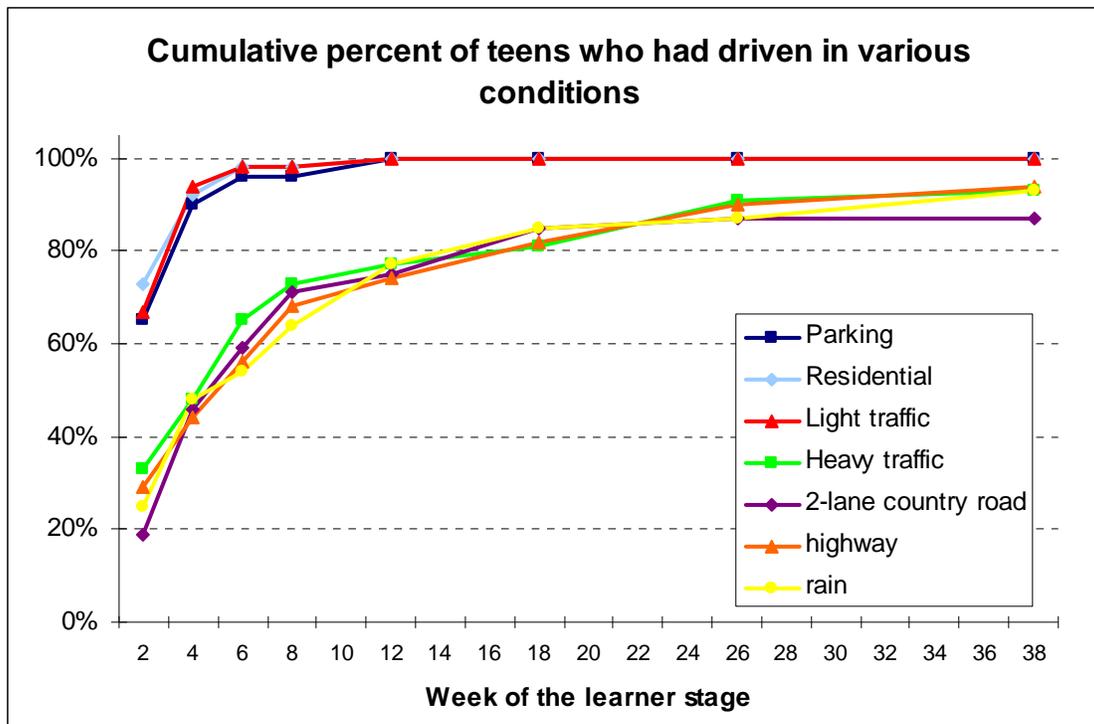
The first three conditions are likely difficult to avoid if teens are driving with any frequency. On the other hand, heavy traffic, country roads and interstates are more discretionary, as well as seemingly more challenging. Rain, besides being quite challenging, is not a readily available condition. The figures below show the percent of teens who drove in these conditions during the week prior to each interview. (The questions about driving conditions were not asked during the initial or final interviews.)





Even during the earliest interviews, most parents reported their teen had driven in residential neighborhoods and light traffic during the previous week. In addition, many parents reported their teen had pulled into (or out of) parking spaces. By contrast, teens did not appear to drive as often in heavy traffic, 2-lane roads out in the country, highways and rain.

We were also interested in discovering the earliest point at which parents reported their teen had driven in each condition. Note, this is not necessarily when the condition was first introduced by the parent. Interviews were spaced more than one week apart, and parents were only asked about their teens' driving during the previous week. Consequently, teens may have gained experience with a driving condition during one of the interview "off" weeks. With that in mind, the following figure shows the cumulative percent of teens who had driven in each condition over the course of the learner stage.



Several of the conditions/situations were introduced very early in the learner stage. At interview 2, just two weeks after obtaining a permit, about two-thirds of parents reported their teens had driven in residential neighborhoods and in light traffic during the previous week. A similar percent reported their teen had pulled into (or out of) parking spaces. The other driving conditions appear to have been introduced somewhat more slowly by parents. However, by the eighth week of the permit, about two-thirds of parents reported their teen had driven in heavy traffic, country roads, highways or rain during at least one of the interviews. By the 38th week, nearly all teens had received at least a small amount of experience in each of these conditions.

Conditions recorded by the in-vehicle cameras. Information about the conditions in which teens drove is also available from the in-vehicle cameras. Characteristics of the driving conditions during teen driver video clips are shown below. Keep in mind the cameras were installed for four months near the beginning of the year-long learner stage; hence, the data reflect only the driving conditions during the early portion of the teen's driving experience.

Driving Conditions During Video Clips		
	N	%
Ambient light		
Good light	1,381	67%
Degraded light (e.g., sunset; rain)	359	17%
Dark	328	16%
Pavement condition		
Dry	1,905	93%
Wet (no wipers)	85	4%
Raining (wipers on)	53	3%
Amount of traffic		
None	413	20%
Light	586	28%
Moderate	904	44%
Heavy	46	2%
N/A (e.g., parking lot, driveway)	109	5%
External driving environment difficulty/stressfulness		
1 low	1,634	79%
2	382	19%
3	39	2%
4 high	3	< 1%

Note: There were 2,068 total clips of teen drivers. In some cases data are missing due to darkness of the clip or other circumstances that prevented clear determination of condition.

The data from the in-vehicle cameras generally aligns with what parents reported. In most of the driving clips, teens were driving in relatively benign conditions. Only a small percent of clips were recorded in the dark, in rain, or in traffic that was judged to be heavy.

Coders rated the difficulty/stressfulness of the external driving environment as it might be perceived by an *experienced driver*. This excluded conditions inside the vehicle, for

instance due to parental actions or presence of siblings. Although it would have been desirable to know how a novice driver might perceive the situation, coders – who were experienced drivers themselves – could not make this judgment. What makes a driving situation difficult or stressful can include the amount or speed of traffic, behavior of other vehicles, weather, the presence of pedestrians or bicycles, road character, road construction, and many other factors. These kinds of stressful situations are obvious to experienced drivers and they adjust their driving and attention accordingly (cf, Lewis-Evans & Charlton, 2006). As shown in the table, most of the driving clips were judged to occur in driving environments of low difficulty/stressfulness. Again, this suggests most teen practice during the early portion of the learner stage occurred in relatively undemanding situations.

Whereas the parent reports provide a general indication of whether teens ever drove in a situation, the driving clips recorded by the in-vehicle cameras provide a quantitative assessment of the amount of driving in different conditions. Hence, it is a far more refined measure of teen driving experience. Nonetheless, findings from both the parent reports and in-vehicle cameras suggest most teen driving occurred in relatively benign conditions.

Characteristics of Teen Driver Practice Sessions

A main objective of the present study was to examine the nature and quality of supervised driving practice. The video clips provide a great deal of information about the characteristics of teen driver practice sessions during the first four months of the learner period.

Belt use. Belt use by teen drivers and their supervisors is shown below.

Belt Use		
	N	%
Teen driver belt use		
Belted	1,975	99%
No belt	25	1%
Supervisor belt use		
Belted	1,955	99%
No belt	25	1%

Note: There were 2,068 total clips of teen drivers. In some cases data are missing due to darkness of the clip or other circumstances that prevented clear determination of belt use.

Seat belt use was nearly universal among both parents and teens during practice sessions. In the 25 clips where a teen was not wearing a seat belt, 5 occurred in parking lots or driveways. The remaining clips occurred on roadways.

Passengers. Information about passengers carried during teen driver video clips is presented below.

Passengers		
	N	%
Adult supervisor		
Present	2,054	99.3%
Absent	14	< 1%
Supervisor sex		
Male	612	30%
Female	1,456	70%
Number of passengers		
Zero (teen was alone)	2	< 1%
One	1,310	64%
Two	545	27%
Three	140	7%
Four or more	40	2%
Young passengers (<18)		
Present	673	33%
Absent	1,381	67%

Note: There were 2,068 total clips of teen drivers. In some cases data are missing due to darkness of the clip or other circumstances that prevented clear determination of passengers.

Of the 14 clips where an adult supervisor was not present in the vehicle, 12 clips came from two families where the teen was driving with a slightly older teen sibling. (In North Carolina, the supervising driver is supposed to be an adult who has been licensed for at least 5 years.) In the other two clips, a teenager was driving on a roadway unsupervised. In a subsequent interview with the mother, it was clear she was unaware the teen had been driving unsupervised.

As shown in the table, teens carried young passengers in one third of all clips. These young passengers included both siblings and friends. In families with twins or sibling(s) who were close in age, parents often reported problems with having multiple teens in the vehicle at the same time:

“I think it’s hard for both of them because they always have a sister with them. We rarely have a chance for one to drive when the other one isn’t there. So I think that’s part of the problem, which is a variable we didn’t really anticipate. We’ve got to figure out a way to just go out alone, because the one in the back seat always adds comments that irritate the driver. They usually get along really well, but while they’re driving, they don’t.”

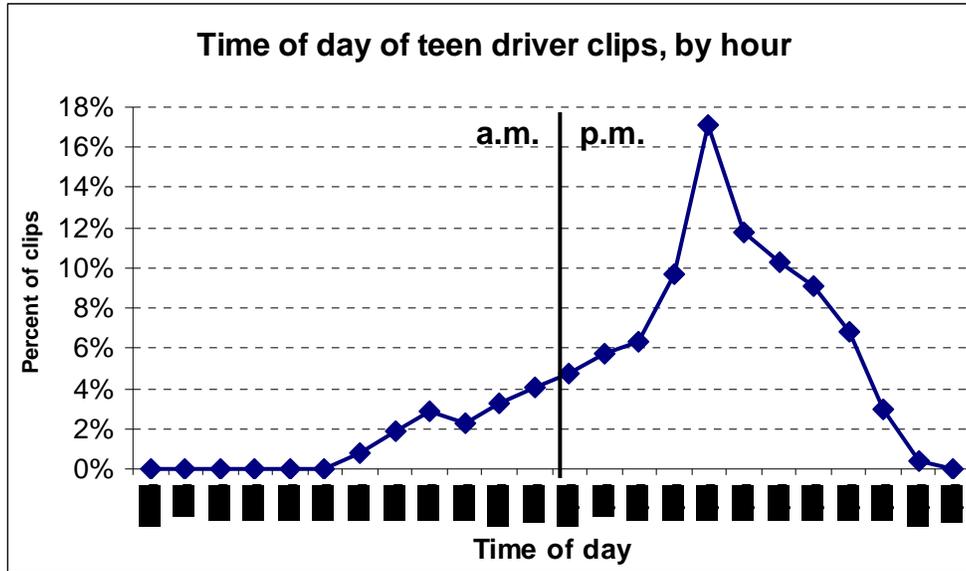
“They usually are together everyday because her brother has to go to school too. She drives and if they’re in a good mood, he’s supportive. If they’re in a bad mood, he can be kind of irritating, and when she’s irritated she doesn’t drive very well. They push each other’s buttons, call each other names, say that whatever they’re doing is stupid, or she gets involved in snapping back at him and not watching the road as much. So I have to correct him and say, ‘Look, she’s driving right now, let her pay attention to that, do not push her buttons.’”

“We are at a unique position in that we have 2 that are fighting for driving privileges at the same time, so that gets to be a little bit interesting. There’s also that same dynamic – I have to be careful – he and his older sister are the ‘Oil and Water’ individuals in the family. So, I have to be careful you know.”

“Whatever it is about the complexities of sibling rivalry, they just made each other nervous. And then they couldn’t resist saying things. And it’s bad enough having one person tell you what to do, but then having your sister also chiming in, or laughing, gasping, or something, you know – shrieking with fear, all those things.”

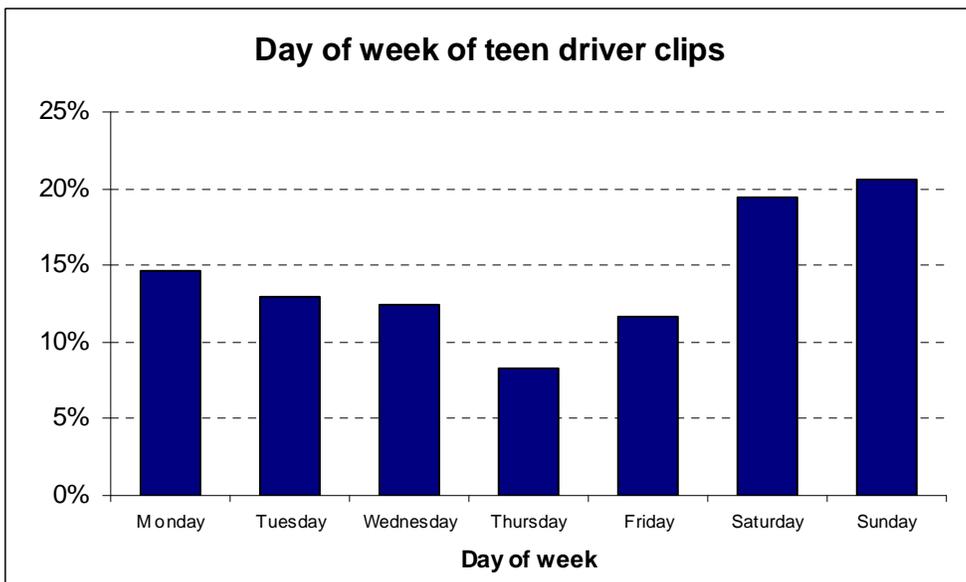
As a result of these experiences, some parents reported trying to minimize the presence of siblings in the vehicle to the extent possible.

Time, day and season of practice driving. The video clips from the in-vehicle cameras also provided a useful tool for examining when teens were driving. Once again, it is important to be cautious in using the clips as a measure of exposure because the number of clips recorded by the camera depends not only on how much a person drives, but also on his or her driving style. However, we consider it a relatively safe assumption that the driving style of a supervised teen varies little by factors such as time of day or day of week. Teen driver clips by time of day are shown below.



Most of the teen driver clips occurred in the afternoon, particularly just after school or in the early evening. No clips were recorded between 11 p.m. and 6 a.m. In North Carolina, teens may drive legally only between 5 a.m. and 9 p.m. during the first six months of the learner stage. A total of 69 clips (2.4% of all clips) were recorded after 9 p.m.

The following figure shows the distribution of clips by day of week.



Practice was most common on weekends. Forty percent (40%) of clips occurred on either a Saturday or Sunday.

In North Carolina, novice drivers are required to hold their permit for a full year. Hence, they have opportunities to drive during all four seasons (although winters are generally mild, with little or no snow). Based on the clips, teen driving practice was distributed relatively evenly across the year with one notable exception – only 2% of the teen driving clips were recorded during the month of July. During interviews, parents often said they anticipated their teen would be driving more during the summer months:

“It will be good when the summer gets here and she can drive more places, she’s not so tired up with school and swim team and stuff.”

“I think it’s just that they really need more time driving, to get better. At their pace. Some people learn faster than others. Maybe in the summer, when they’re not so tired from such long days and busy schedules, they should have some more time to do that.”

However, for many families summer turned out to be just as busy – if not more so – than the regular school year. For example, the parent who provided the first quote above said in a subsequent interview: *“She really didn’t have a whole lot more opportunities this summer to drive than during the year just with our schedule and everything.”* In particular, many teens traveled or had camps during the summer months.

Distractions. Distractions are anything that take the driver’s attention away from the task of driving, and can include something the driver hears or sees, physical tasks (e.g., eating or reaching for objects), or cognitive activities (e.g., operating a cell phone) (NHTSA, 2009). From the in-vehicle driving clips, it is not possible to know the mental state of the driver. We can only observe conditions that could be distracting, or behaviors that may indicate distraction. Potential distractions for both teen drivers and parental supervisors are shown in the table below.

Distractions and Distracted Behaviors		
	N	%
Music		
None	1,047	51%
Low (background – barely audible)	467	23%
Medium	505	24%
High	43	2%

Parent looking at road prior to event*		
Looking at road, or only brief glances away from road	1,644	92%
Extended glances away from road	68	4%
Mostly not looking at road	76	4%
Parent distracted behaviors		
Operating cell phone or PDA	74	4%
Reading, handling papers	50	3%
Reaching for object in vehicle (not cell phone)	50	3%
Adjusting controls (climate, CD, etc.)	13	1%
Eating or drinking	47	2%
Personal hygiene (combing hair, looking in mirror)	8	< 1%
Staring at something in mirrors/outside the vehicle	25	1%
None of the above	1,668	86%
Teen looking at road prior to event*		
Looking at road, or only brief glances away from road	1,816	99%
Extended glances away from road, or mostly not looking at road	12	1%
Teen distracted behaviors		
Operating cell phone or PDA	1	< 1%
Reading, handling papers	4	< 1%
Reaching for object in vehicle (not cell phone)	10	< 1%
Adjusting controls (climate, CD, etc.)	8	< 1%
Eating or drinking	12	< 1%
Personal hygiene (combing hair, looking in mirror)	3	< 1%
Staring at something in mirrors/outside the vehicle	6	< 1%
None of the above	1,941	98%

Note: There were 2,068 total clips of teen drivers. In some cases data are missing due to darkness of the clip or other circumstances that prevented clear determination of distractions and distracted behaviors.

*Only includes driving clips where the vehicle was in motion prior to the event. This item was not coded for pauses in driving (e.g., when sitting at a stoplight).

Potential distractions and distracted behaviors were quite rare during driving clips. Teens were attending to the roadway in virtually all clips, and behaviors such as operating a cell phone, reading, eating, and personal hygiene were almost nonexistent. Although music was playing in about half of the clips, the volume was usually judged to be low or medium. At that level, it would not be difficult for vehicle occupants to have a conversation (and for parents to communicate safety-related information, if necessary).

Parents generally were attentive to the roadway during driving clips. Distracted behaviors such as operating a cell phone, reading, eating, etc., were relatively uncommon.

Potentially serious events. Previous research has shown the learner's stage is very safe; novice drivers rarely crash while they are being supervised by an adult driver (Gregersen et al., 2003; Mayhew et al., 2003). The findings of the present study support this. None of the 52 teens participating in the study was involved in a collision during the year-long learner stage. Perhaps the most serious incident involved a teen who attempted to make a right-hand turn at too high a speed and drove the vehicle off the road into a grassy area. The vehicle was not damaged, and no one was injured. There were approximately 10 occasions where parent intervention may have prevented a collision, usually by the parent alerting the teen to a potential danger in the driving environment (e.g., another vehicle running a red light).

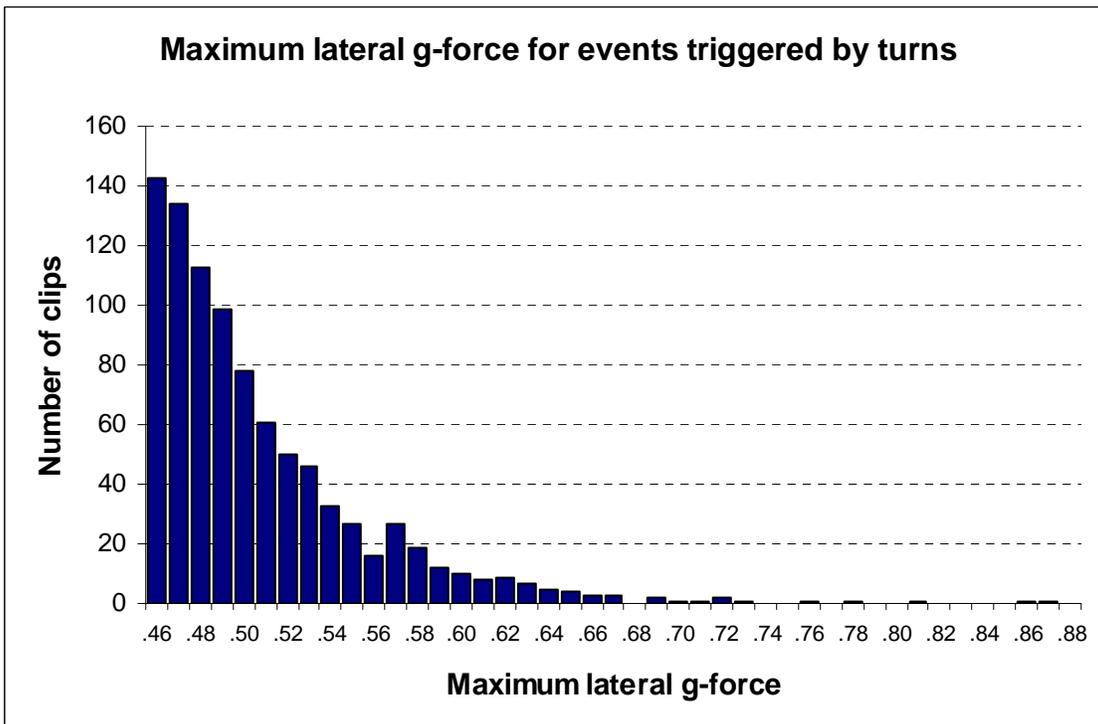
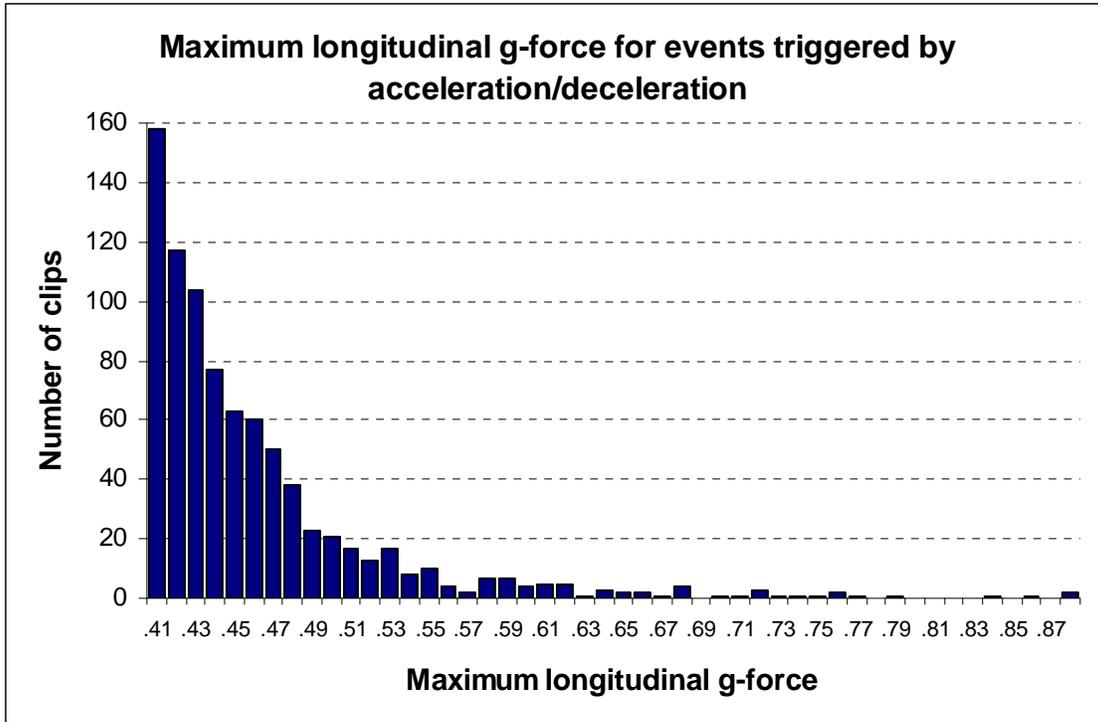
To obtain a more objective measurement of how many potentially dangerous "events" were recorded by the in-vehicle cameras, two different aspects of the video clips were coded. Coders rated the seriousness of each driving clip on a 4-point scale. As shown in the following table, most of the clips were judged to be "not at all" serious. Only a small percent of clips were judged to be "very" serious. These situations typically involved: 1) making judgments about when to turn at an intersection, 2) changing lanes in traffic, or 3) the teen not attending to the roadway requiring parental intervention.

Potentially Serious Events		
	N	%
Judged seriousness of the event		
1 Not at all serious	1,640	80%
2	302	15%
3	97	5%
4 Very serious	9	< 1%
Triggering event noticed		
Not noticed	1,343	67%
Noticed by parent and/or teen	660	33%

Note: There were 2,068 total clips of teen drivers. In some cases data are missing due to darkness of the clip or other circumstances that prevented clear determination of potentially serious events.

Another indication of the relatively benign nature of practice sessions is that the event that triggered the camera went unnoticed by both parents and teens in two-thirds of all clips. That is, neither the parent nor the teen gave any indication (verbal or nonverbal) that anything out of the ordinary had occurred.

The potential seriousness of an event is also reflected by the strength of the g-forces produced by the event. The figure below shows the maximum g-force that was recorded for each event, based on whether the camera was triggered by a change in longitudinal g-force (acceleration/deceleration) or lateral g-force (turns). (Recall that a change of .40 in longitudinal or .45 in lateral g-forces was required to trigger the camera.)



In general, the camera was seldom triggered by a substantial change in g-forces. Most events involved g-forces of .55 or less. As a reference, other studies that have used Drivecams with licensed teen drivers have employed threshold settings of .50 longitudinal and .55 lateral, with the goal of identifying incidents serious enough to

suggest the teen had done something potentially dangerous (McGehee et al., 2007). In the present study, only 18% of clips would have met these criteria. Hence, it is clear most of the video clips recorded by the cameras in this study capture what are essentially random driving moments. This is yet another indication that events of a serious nature during the learner stage are relatively rare.

As might be expected, events that were noticed by parents and/or teens were generally associated with higher g-forces. For example, on events that were triggered by acceleration/deceleration, the mean longitudinal g-force was .49 when the event was noticed compared to .44 for events that were not noticed ($F = 103.25, df = 1, p < .001$). Similarly, on events triggered by turns, the mean lateral g-force was .54 for noticed events compared to .50 for events that went unnoticed ($F = 50.00, df = 1, p < .001$).

Teen Driving Skill

Limited available evidence suggests that novice drivers learn to manage a vehicle relatively quickly (Hall & West, 1996), but that higher order skills take much longer to develop and are only acquired through extensive practice. The present study aimed to determine what kinds of driving mistakes teens make when they are learning to drive, and how quickly they seem to become proficient at handling the vehicle (turning, braking, etc.).

Driving errors recorded by in-vehicle cameras. One rough indication of teen driving competence is the frequency with which they trigger the camera to record. It is possible that, as teens become more proficient drivers, they make fewer driving mistakes resulting in fewer recorded events. The table below shows the number of teen driver clips recorded by the in-vehicle cameras during the first four months after cameras were installed vehicles.

Teen Driver Clips, by Month		
	N	%
Teen driver clips		
Month 1	585	32%
Month 2	441	24%
Month 3	467	25%
Month 4	357	19%
Events noticed by the parent and/or teen, by month		
Month 1	217	39%
Month 2	149	35%
Month 3	155	34%
Month 4	91	25%

Note: There were 2,068 total clips of teen drivers.

There was a decrease in the number of events recorded by the camera from month 1 to month 4 ($\chi^2 = 57.56$, $df = 3$, $p < .001$). This finding does not appear to reflect reduced exposure. Based on parent reports discussed above, the amount of time teens spent driving was relatively stable over this period.

As described previously, the in-vehicle cameras were set to be very sensitive. Hence, many of the events recorded by the cameras probably do not reflect driving errors by teens. To more accurately identify clips with potential errors, we examined the number of clips recorded each month where the event was noticed by the parent and/or teen.

Presumably these reflect situations where something happened that was serious enough to draw their attention. As shown in the table, the proportion of clips that were noticed dropped from month 1 to month 4 ($\chi^2 = 19.53$, $df = 3$, $p < .001$). This provides some indication that teen driving may have been improving over the first few months of driving.

From the teen driver video clips, it was also possible to determine what action on the part of teens triggered the camera to record. The cause of triggering events is shown below.

Cause of Triggering Event		
	N	%
Cause of the triggering event		
Acceleration	390	19%
Deceleration	453	22%
Left turn	528	26%
Right turn	394	19%
Bump (e.g., speed bump, driveway, pothole)	258	13%
Stalled the vehicle (on stick shift)	10	< 1%
Triggered manually (by pressing a button on camera)	12	< 1%
U-turn	5	< 1%
Events noticed by parent and/or teen, by cause of triggering event		
Acceleration	96	25%
Deceleration	238	54%
Left turn	134	26%
Right turn	87	23%
Bump (e.g., speed bump, driveway, pothole)	94	37%
Stalled the vehicle (on stick shift)	10	100%
U-turn	2	40%

Note: There were 2,068 total clips of teen drivers.

Overall, the cameras were triggered about equally between changes in longitudinal (acceleration/deceleration) and lateral (left/right turn) g-forces. Again, however, this reflects many clips of a mild nature. When only examining clips where the event was noticed by the parent and/or teen, it is evident that parents perceived their teen's

behavior regarding braking, bumps, and stalling the vehicle more frequently than other types of behaviors ($\chi^2 = 146.88$, $df = 6$, $p < .001$).

Driving errors described by parents. In addition to the driving clips, we also investigated the types of teen driving mistakes that parents reported during interviews. This was done through a variety of conversational questions such as: “Is there anything in particular [teen] has been struggling with?” The table below shows the number (and percent) of parents who mentioned various driving mistakes.

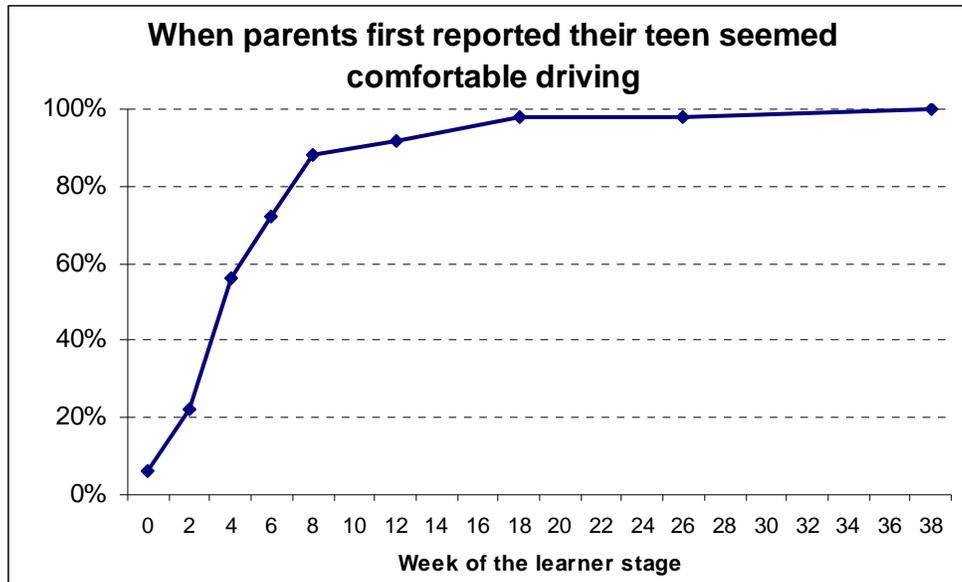
	N	%
Errors making turns	46	92%
Braking errors	36	72%
Hugging the right side of road	28	54%
Driving too fast	28	54%
Parking errors	27	52%
Driving too slowly	20	40%
Errors when changing lanes	16	32%

During at least one interview, most parents reported their teen made a mistake while turning or braking. Two types of errors were mentioned almost exclusively during the earliest interviews: hugging the right side of the road and driving too slowly. Of the parents who reported their teen hugged the right side of the road, all did so during the first three interviews (i.e., the first month of driving). Similarly, most of the parents who mentioned the teen drove too slowly did so during the first three interviews.

“I think it’s pretty classic, but she tends to pull a little bit over to the right. I remember both the older girls doing that – they don’t want to be near that car coming toward them. So I’m watching those telephone poles and trees that are right next to the curb there!”

“He’s timid about speed. To the point where a couple of times people were passing him because he was going 10 miles under the limit. I didn’t encourage him to go any faster necessarily, but you know, when I was 16 the speed limit was like a suggested retail price, nobody paid attention to it. He’s not confident enough to get up to that most of the time.”

Many parents reported substantial improvements in their teen’s driving within a few months. For example, the figure below shows when parents first reported their teen seemed comfortable while driving.



According to parents, many teens already seemed to be comfortable with driving at the third interview – just four weeks into the learner stage. By week eight, the vast majority of parents reported their teen felt comfortable behind the wheel. As one parent said:

“It’s like it clicked. They feel more comfortable at the wheel; they feel like they’re doing better. I mean they still have moments when you can tell they’re not experienced drivers, but it’s nothing dangerous. You know the acceleration or deceleration is a little bit awkward, but it’s like they clicked.”

It sum, this suggests many teens seemed to master the “basics” of driving within a short period of time.

Another pattern that became apparent is that 24 teens (48%), in parents’ words, became “overconfident” a few months into the learner stage. Parents reported their teen began driving faster, leaving shorter following distances, braking abruptly, etc. Parents found themselves becoming increasingly uncomfortable. As some parents said:

“He was starting to speed up more, and that concerned me a little bit. He was getting, you know, too confident too quick. And so, that’s when I was on him a bit.”

“All of the sudden she wants to go faster than usual. I didn’t think that she would be like that, but she is. I asked her, one day coming home from gymnastics, ‘What do they do, put lead in your foot in gymnastics or what?’ You can tell she’s a little more confident. You know, everybody drives faster than the speed limit, but you certainly don’t want your 15 or 16 year old doing that. It’s just because she’s not going to know how to react in a dangerous situation, especially if she’s going faster. She’s just not used to how fast a car can go.”

“He’s maybe getting too confident. Just this morning we were turning into a parking area, and he just took the turn too fast. Nobody was coming out, but you know, it just turned out to be a very wide turn. And I was just like ‘you just did that way too fast.’ So I just think the confidence is building up too quickly. It just makes me a little nervous.”

“I might judge that she’s getting a touch over confident at this point, but I think that kind of goes with the territory. She’s accelerating quickly, maybe cutting into traffic a little aggressively, although I have myself to blame cause I kind of sort of tried to teach her to do that. But yeah, maybe just not quite leaving a margin for safety, so if something unexpected happened you still got some room to maneuver.”

Parent-Teen Anxiety, Communication and Relationships

Parent and teen anxiety. No studies to date have examined parent and teen anxiety during practice sessions or how this may change over the course of the learner stage. Although we did not systematically measure this in the present study, parent and teen anxiety was frequently discussed during interviews.

There was substantial variation in the degree of anxiety reported by parents. Based on responses during interviews, 25% of primary supervisors seemed mostly relaxed about supervising their teen. Another 63% occasionally seemed nervous, especially during the first few months of supervising their teen. The remaining 12% seemed very nervous during the entire year of supervised driving.

In virtually all families, parent anxiety appeared to decrease over the course of the learner stage. One of the few exceptions was a family where the mother had been in a crash that totaled her car shortly before her teen obtained his permit. During each interview she discussed her feelings of nervousness while her teen was driving. As she commented:

"I'm just nervous. When I'm driving, I'm in control. But when he's driving, I'm not in control. And that's what scares me, because I couldn't control the idiot that hit me. So, that's the thing, it's the lack of control issue, but that's MY issue. He does very well."

For some families, parent anxiety seemed to play a role in who served as the primary supervisor. In a small percent of families (16%), parents reported the teen refused to drive with one of the parents because he or she was too nervous or critical.

"She doesn't like to drive too much when her dad's in the car. He does that gasping sound and it kind of scares her. So, most of the time if there's a crowd of us, I'm the one that's been supervising her."

During interviews, a number of parents commented on the importance of remaining calm and not letting their anxiety show:

"The only thing I think I've ever done that wasn't that helpful, was acting nervous myself. I don't think it helps for the parents to be nervous in the car with them. It probably makes them more nervous."

"I know this with [Teen], and driving with her, is not to panic. When we panic, they panic too. Or when we raise our voice, it makes them nervous as well."

"Well, I am still just trying not to scare her. I don't think I've jerked, or grabbed the wheel lately, because that really scared her when I did that once."

Anxiety on the part of parents was sometimes evident in video clips. In 8% of clips, parents were observed tensing up, as evidenced by facial gestures or other nonverbal or verbal behaviors. In more than half (55%) of the clips in which a parent tensed up, the triggering event was deceleration – much higher than left turns (14%), acceleration (13%), right turns (10%), or other types of triggering events ($\chi^2 = 97.10$, $df = 7$, $p < .001$).

In virtually all families, parents reported teens were at least somewhat nervous about driving at the outset of the learner stage. This anxiety seemed to dissipate fairly quickly for most teens. However, three teens did not drive for a period of several months or more, apparently because of anxiety. In one family, the parent reported the teen seemed highly anxious about driving from the outset of the learner stage:

“Yeah, he doesn’t like it. I think he’s scared to death, quite frankly. You know when we’re out, people have cut us off and done stupid things, and I think that just freaks him out. I didn’t anticipate that [Teen] would prefer to be chauffeured than drive himself.”

Another family witnessed a crash, after which the teen was reluctant to drive. In the third family, the parent related a scary moment that took place about two months into the learner stage:

“It’s kind of a hair pin turn and she got confused. She knew she was supposed to use the brake, but she used the accelerator and boy did we go into that turn. That’s when I think I yelled, “What are you doing!?” and she just didn’t want to drive anymore. So, we pulled over and I took over and she hasn’t driven since. I’ve asked her several times if she would like to drive and each time she says no. And [her brother] says he never wants to drive with her again.”

Each of these parents reported feeling unsure on how to encourage their teen to drive. This seemed to result in a problematic cycle: the teen was highly anxious about driving and consequently did not obtain the practice needed to overcome fears and gain confidence.

Parent-teen communication. Parent-teen communication has the potential to greatly enhance, or degrade, the value of parental supervision. Poor communication can make driving sessions unpleasant for families. Perhaps more importantly, poor communication may result in parents not adequately conveying (or teens not “hearing”) valuable driving advice.

We first examined the frequency and general nature of parent and teen conversation during driving sessions. To obtain a sense of typical parent/teen conversation, we examined conversation during the 10 seconds that preceded the event. Conversation following a notable triggered event would likely be about the event itself, and this is examined separately. Some incident-related conversation is undoubtedly reflected in the pre-event period (e.g., “You need to slow down”), but that kind of comment could

still reasonably be considered proactive rather than reactive. The table below characterizes the conversation between parents and teens prior to the triggering event.

Parent and Teen Conversation, Pre-event		
	N	%
Parent speaking with teen*		
No conversation	672	33%
Related to driving	890	44%
Unrelated to driving	426	21%
Unable to hear/interpret	134	7%
Teen speaking with parent*		
No conversation	1,127	55%
Related to driving	461	23%
Unrelated to driving	353	17%
Unable to hear/interpret	121	6%
Proportion of parent conversation related to driving, by month		
Month 1	297	51%
Month 2	209	48%
Month 3	207	45%
Month 4	125	34%

Note: There were 2,068 total clips of teen drivers.

*Multiple codes were allowed on these items; hence, percentages do not total 100%.

In the table above, conversation “related to driving” consists of any statement, comment, question, etc. that pertained to driving. It not only includes comments related to the teen’s driving, but also comments about driving more generally (e.g., “I wish more drivers would use their turn signal” or “We need to get gas soon”).

Prior to the triggering event, parents were more likely to be talking than teens (67% vs. 45%, $\chi^2 = 199.39$, $p < .001$, $df = 1$). Parent conversation was usually related to driving. As shown above, the proportion of parent conversation that was about driving-related topics decreased over the course of the four months of the in-vehicle cameras ($\chi^2 = 28.32$, $p < .001$, $df = 3$).

We also examined the frequency and the nature of driving instruction that parents provided. Because the in-vehicle cameras were triggered by changes in g-forces, they often captured instances where the teen made some kind of driving error that prompted the camera to record. Hence, the driving clips provide an opportunity to see what parents said to their teens during potentially “teachable moments.” The table below characterizes the instruction made by parents during the teen driving clips. To more accurately identify clips where the teen may have made a driving error, we once again only included clips in which the event was noticed by the parent and/or teen.

Parent Instruction		
	N	%
Parent instruction during clips in which the event was noticed by the parent and/or teen*		
Helps driver navigate – gives directions (e.g., “turn right at the next light”)	101	16%
Helps driver by pointing out something on or about roadway (e.g., “the light is red,” “it’s clear to the left”)	53	8%
Gives warning – points out immediate danger (e.g., “watch out!” “Stop!”)	76	12%
Positive comment on the teen’s driving behavior (e.g., “nice job on that turn”)	46	7%
Negative comment on the teen’s driving behavior (e.g., “you took that turn too fast”)	168	26%
Reassurance (e.g., “It’s ok, we didn’t hit the curb,” “you’re doing fine”)	41	6%
Asks the teen a question regarding driving (e.g., “did you see that car?” “Are you going to stop?”)	41	6%
Instruction – vehicle handling or operation (e.g., “go now,” “tighten up on your turns,” “you need to slow down”)	348	54%
Instruction – higher order concepts (e.g., “try to watch for brake lights a few cars ahead”)	35	5%
Other comment related to driving	89	14%
No comment related to driving	72	11%

Teen acceptance of parent’s comments		
Rejecting	95	17%
Neutral/no reaction	398	72%
Accepting	61	11%

Note: There were 2,068 total clips of teen drivers. In 642 clips, the event was noticed by the parent and/or teen and parent comments could be coded.

*Multiple codes were allowed on these items; hence, percentages do not total 100%.

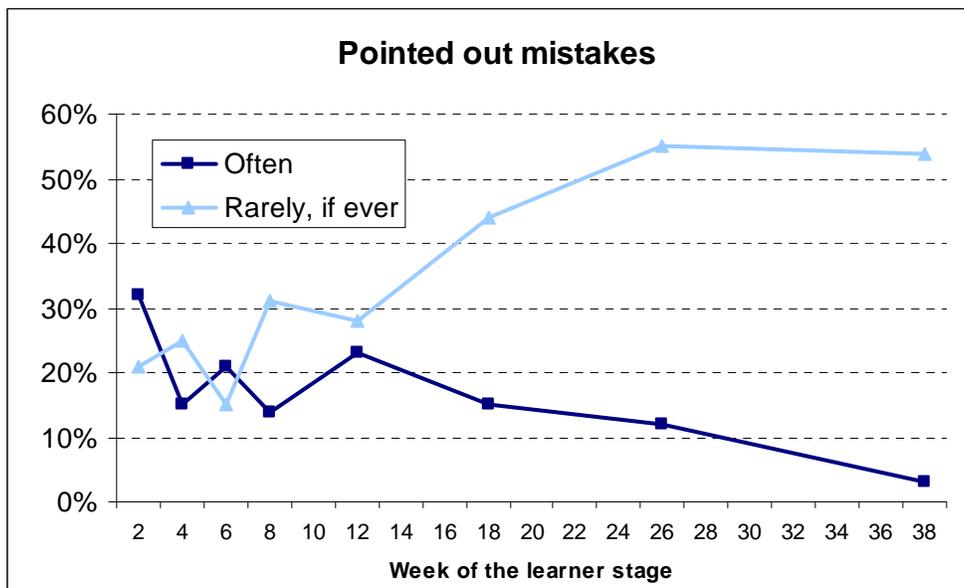
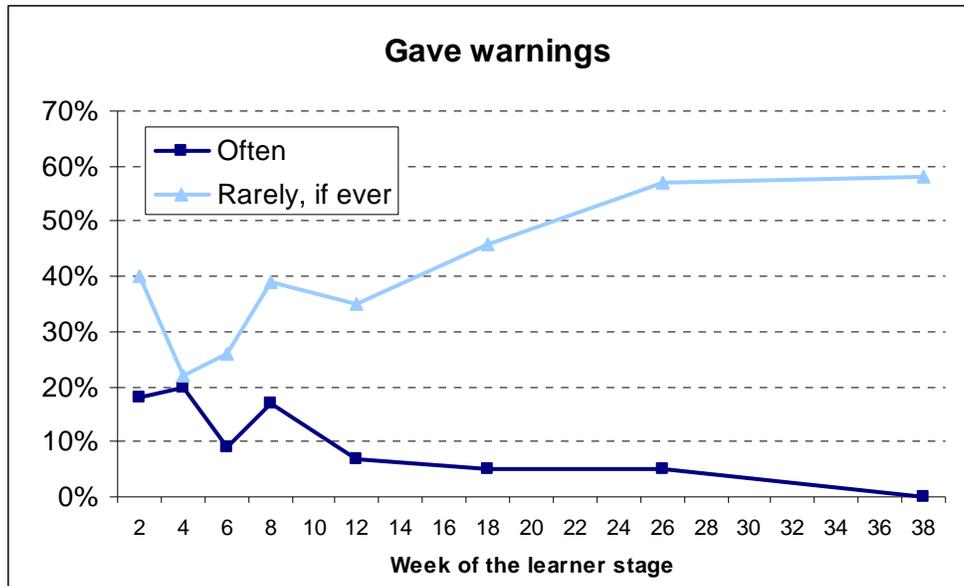
Instruction regarding vehicle handling/operation was by far the most common type of instruction provided by parents. This was followed by negative comments about the teen’s driving behavior. Keep in mind these comments were made during clips where the teen may have made a driving error. Positive comments in these situations would not be expected. In only a small number of clips did parents provide instruction that focused on “higher order” concepts such as visual scanning, hazard perception, or anticipating the behavior of other drivers.

When parents made a comment related to the teen’s driving, the teen’s reaction to the comment was typically neutral (or no reaction). In the 30% of cases where the teen responded to the parent’s comment, their reactions were about evenly divided between accepting and rejecting.

Parent-teen communication was also discussed with parents during all but the first interview. The following were asked each time:

- How often did you give warnings or alert [teen] to situations or things [he/she] didn’t see? Would you say often, sometimes, or rarely, if ever?
- How often did you point out mistakes or explain what [he/she] should have done? Would you say often, sometimes, or rarely, if ever?

The figures below show how parents’ responses to these questions changed over the course of the learner stage.



As might be expected, parents' self-reported feedback to their teens declined over the course of the learner stage. For pointing out mistakes, there is a clear divergence 12 weeks into the learner stage. As mentioned previously, the number of driving errors made by teens decreased over the first months of driving. Consequently, there was likely less need for parents to make comments. However, fully 88% of parents reported during one or more interviews that they made a conscious effort to limit how much feedback and instruction they gave their teen. The reasons for this varied. In some cases, parents reported their teen was highly sensitive to perceived criticism:

“He would prefer that I would talk less and that I talk less hysterically and be more specific in what I say. He still objects to the general, ‘John! John! John!’

which I've definitely tried to work on. To be calmer and to say, 'That car is stopping,' as opposed to just this general alarm. As we have been saying to our children all these years, 'use your words.' It was very useful to have it turned back on me."

In other cases, parents wanted to help their teen remain focused on driving:

"I like to let him concentrate on what he's doing. I try not to be a chatterbox."

In still other cases, parents wanted their teen to become more self-reliant while driving:

"I've been trying to not say as much, just to make sure that she's going to be okay if I'm not in the car with her. Like I don't want me to be the crutch. I want her to really be as independent as she can with it, so that when we turn her loose, she really is ready for it."

"I'm working on not talking as much. I was actually thinking about that today, to sort of wait and see, to sort of let him make some decisions instead of anticipating, saying, 'There's a stop sign' Not that I would wait until he was running through the stop sign, but I found that sometimes I was too anticipatory in particular things, and I have been trying not talk as much."

"I finally decided that I would let her drive a while even though there could be something I could comment on. I would let an episode of driving, which was – start the car, get to the destination – without actually making any comments at all. Just allow her to get confidence in her driving, and it seemed to have the desired intent. Now there were things that I could have commented on, but I didn't, and then subsequently, when we were driving, I was able to make small comments about things, and she was more receptive to them."

Regarding the timing of feedback, parents rarely mentioned they waited until after a driving session to discuss a mistake. They almost universally reported talking with their teen at the time mistakes occurred.

"I think the main thing is to address things when they really happen. Because you know, I think that if you try to talk about anything retrospectively, they just roll their eyes at you. It needs to be at the time, just sort of in a calm and sort of quiet manner, sort of address the issue, and that seems to work best."

One final theme that emerged from the parent interviews was that teens occasionally felt their parents were yelling at them when parents were trying to give instruction, advice, or encouragement. As one parent said:

"You know, we just sort of had to work out how to communicate with each other while she was driving. No yelling in the car and even when she thought I was yelling, but I didn't think I was. So, I think that was surprising to me, I didn't quite

expect that to happen. I would say it probably took us at least three months to really get to where if I said ‘watch that’ she wouldn’t say “stop yelling!” Yeah I can remember it being late spring before we got it under control and she was really able to take instructions without – and for me to give it properly.”

Or put more simply by another parent:

“If I say something to her, I’m yelling at her.”

This is consistent with previous research. For example, when asked if they have advice for parents of beginning drivers, many teens say parents should not “yell” at their child (Goodwin et al., 2006). From the driving clips, yelling between parents and teens was rarely observed. (See the section on “Parent-teen relationships” below.) On the other hand, there were a number of instances where a teen told their parent to stop yelling when the parent’s voice was barely raised, if at all. This suggests teen sensitivity, and perhaps nervousness, as they were attempting to handle the many physical and cognitive demands of learning to drive.

Parent-teen relationships. There is some preliminary evidence the extended learner stage is a positive experience for families. In a recent study, a majority of parents and teens said they enjoyed spending time together working on the shared goal of helping the teen learn to drive (Goodwin et al., 2006). The driving clips from the in-vehicle cameras provided an opportunity to investigate this issue further. The table below shows the percent of clips in which parents and teens raised their voice or smiled/laughed.

Atmosphere in Vehicle		
	N	%
Raises voice or yells		
Parent	108	5%
Teen	50	2%
Smiles or laughs		
Parent	310	16%
Teen	434	22%

Note: There were 2,068 total clips of teen drivers.

Yelling, or even a raised voice, was quite rare among both parents and teens. By comparison, smiling or laughing was substantially more common. Parents were more than 3 times as likely to smile or laugh as to raise their voice (OR = 3.43, 95% CI = 2.73, 4.31). Teens were more than 11 times as likely to smile or laugh as to raise their

voice (OR = 11.46; 95% CI = 8.50, 15.46). This provides some indication that the general tone in the vehicle when the teen is driving was generally more positive than negative in nature.

During the final interview, just prior to the teen being eligible for a license, parents were asked the following question: "Thinking back over this last year, did you enjoy it, was it hard, or something else?" Forty-four percent (44%) of parents said they enjoyed the process. Fewer parents said it was hard (22%), a combination of hard and enjoyable (19%), or something else (14%). Among parents who enjoyed the experience, comments included the following:

"Yeah, I enjoy it. Because when she's driving, it means we don't have other friends in the car. And I look for those times, just because it means that we're talking, and that she's not talking to friends. Yeah, I look forward to those times when we're alone."

"Frankly I've enjoyed it because it's my responsibility and I always loved the idea of being a Dad, and that's one of the things about being a Dad that I've, you know, I never had any boys so I didn't get to teach them how to play catch. But I got to teach them how to drive which is something that I could do, which is something you can do with girls. I'm not going to teach them how to play with dolls or pick out a pair of shoes. Actually, that's a really comical thing. I just stand around and write checks, that's what I do. Personally I've really enjoyed it, it's been a good experience and whether they know it or not, it's a bonding thing. So, it forces them to have to be with you at the age where they just don't care to be with their parents."

"It was really a lot easier than I thought it would be. I guess just because I thought it was going to be terrifying – the whole process – and it didn't really turn out to be that. It was for about two or three weeks but after that, we're totally at ease when she's driving."

"I guess it was a positive in that it was a shared experience between [Teen] and I. I felt like we were doing it together. You know, he couldn't do it without me, and so I think that was nice."

However, not all parents had good experiences:

"I did not enjoy it. None of it. No. The anticipation that what's coming from it, you know, that this is just the beginning of letting him go, and once he gets a driver's license I don't have a whole lot of control. And that's hard for me since he's my only. But we are supposed to raise our children to be independent and go out and do good things in the world, and so that's our job."

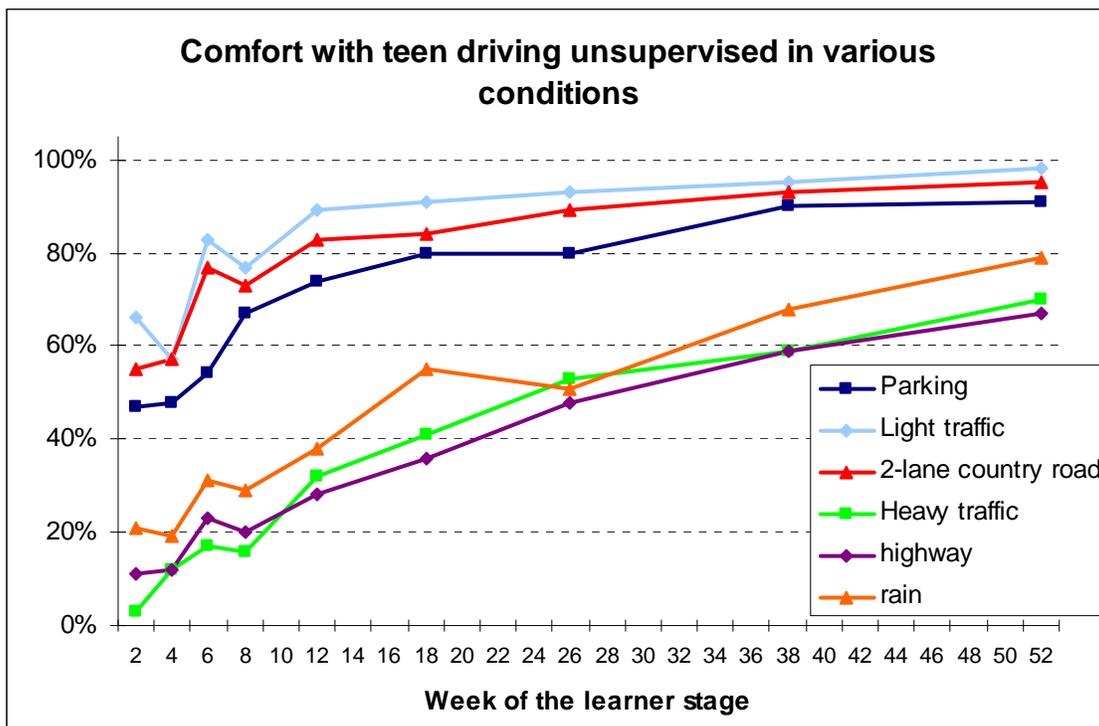
"I hated it. I was just not good at it. I'm just not patient enough, I'm just not in control enough. I just don't do well with it. And I've got one more. I'm a very kind

person other than when my children are driving, but then I just freak out. I explain that beforehand, before they get in and start driving with me, that I'm not good at this, it's not my strength and you know, you're going to have to just bear with me. I hate it. I don't know if any other parent – some parents are probably model instructors. I am just not one."

Transition to Independent Driving

A final goal of the study was to learn how teens make the transition to independent driving. In this section, we examine a number of questions including: Did parents believe their teen was ready for a license after 12 months of supervised driving? Did teens obtain a license as soon as they were eligible? What restrictions did parents place on teens once they obtained their license? What vehicles were driven by newly licensed teens? Finally, we consider the advice parents had for other parents who are entering this process.

Perceived readiness to drive unsupervised. With the exception of the initial interview, parents were asked during each interview about their perceptions of their teen’s readiness to drive unsupervised in a number of conditions/situations. The figures below show how parents’ perceptions of their teens’ readiness to drive unsupervised changed over the course of the learner stage.



After just two weeks of driving (interview 2), more than half of parents thought their teen was ready to drive unsupervised in light traffic or on a two lane country road. Moreover, almost half were comfortable with the thought of their teen parking unsupervised. After 12 weeks of driving (interview 6), most parents reported they would be comfortable with their teen driving unsupervised in these conditions.

By comparison, it took much longer before parents thought their teen was ready to drive unsupervised in heavy traffic, on a highway, or in rain. After six months of driving (interview 8), only about half of parents reported they would be comfortable with their

teen driving unsupervised in these conditions. Even after a full year of driving (interview 10), one in three parents still did not consider their teen ready to drive unsupervised in heavy traffic or on a highway, and one in five believed the teen was not ready to drive unsupervised in rain. In total, half (47%) of parents in the final interview reported there was at least one condition where they did not feel comfortable with their teen driving unsupervised.

One common theme that emerged from the final interview was that, even though parents were still feeling reluctant about their teen driving in certain situations, they were ready to allow their teen to drive as long as the teen stayed within their “*comfort zone*” (as one parent said). Some examples:

“Well of course I would be nervous if she were driving in a lot of rain, or say she was at school and it started snowing and she has to get home, that kind of thing. But basically, just in day to day driving, I feel comfortable with that.”

“We’re just not going to turn her loose and just let her go all over, it’s just kind of little steps. Like going over to friends’ houses, and she’s restricted so she has to be back by 9, so that’s good. And it’s summer and it’s not dark yet. So we’ve got a lot of things working in our favor.”

“I think she takes it seriously, and I think she’s ready. I think she’ll do fine. She’s basically going to be just driving to friends and school, so it will be the same places we’ve been driving right from day one. It’s not like she’s going to take a road trip across country or anything.”

In sum, even though many parents did not think their teen was ready to tackle all possible circumstances, they believed the teen was sufficiently prepared for what they would be likely to encounter once they first began driving.

As mentioned earlier, most parents did not report doing anything special or different with their teen’s driving as they approached eligibility for a license. However, a few parents reported making special trips just prior to licensure so their teen could practice a specific skill or situation. Most often, parents mentioned 3-point turns – a skill required on the driving test in North Carolina. Parents also mentioned parallel parking, parking more generally, or merging and driving on interstate highways.

Obtaining a license. We also examined the timing of licensure for the 50 families participating in the study. The table below shows how soon teens obtained a license once they were eligible:

Obtaining a License		
	N	%
How soon teens obtained a license once eligible		
Within one or two weeks	28	58%
One month	5	10%
Two months	2	4%
Three or four months	3	6%
Five or six months	4	8%
More than six months	3	6%
Waited, length of time unknown	3	6%

Just over half the teens obtained their license within one or two weeks of eligibility. A number of parents described their teen as very excited to get a license:

“She’s pretty excited about it. She’s sitting beside me saying ‘7 days!’”

The remaining teens waited one or more months to obtain a license. Among the many and varied reasons for waiting were the following:

- Wanted the teen to get more driving practice
- Cost of insurance
- Wanted the teen to get a job
- Teen was not interested in getting a license
- Summer travel/camps
- Rules violation

Regarding the final bullet point, one teen was caught by his parents driving unsupervised without permission. His parents withheld his provisional license several months as a punishment.

We asked parents in the final interview whether their teen had driven unsupervised at any point during the learner stage. One quarter (24%) of parents reported their teen had driven unsupervised with their permission. In each case, parents said their teen drove unsupervised only once or a few times and the trips were very short, such as driving to a friend’s house in the same neighborhood.

“If you don’t report me to social services or something, I’ve let them drive to close places on their own a few times in the last week or two. Like basketball practice which is just around the corner and then they baby sit at church, which is just off of Garrett road, and I don’t know if you remember, we live off of Garrett road, so

they're very short trips. But they're confidence boosters. So I have let them do those things some. I feel comfortable doing them and I think it was good for them to have that bump in confidence. No other passengers."

Note that North Carolina law requires teens to be supervised at all times during the learner stage of GDL.

Restrictions on teens. North Carolina places several limits on teens who have a provisional (restricted) license. Driving unsupervised after 9 p.m. is not permitted unless the teen is driving directly to or from work. In addition, drivers may carry no more than one person younger than 21. Family members are excluded from the passenger restriction, but when carrying family members, no other young passengers are permitted in the vehicle. To gauge parents' awareness of these restrictions, we first asked: "So now that [teen] will be driving on [his/her] own, I guess there are some different and new restrictions on [his/her] driving. What do you think of those restrictions?" Follow-up questions asked specifically about whether parents were planning to allow their teen to drive at night and carry siblings/friends.

Two-thirds (66%) of parents were aware of the 9 p.m. night restriction for newly licensed drivers. As might be expected, awareness for the restriction was higher among parents who had previously supervised another teen driver than first time supervisors (83% vs. 40%; $\chi^2 = 5.31$, $df = 1$, $p < .05$). Parents who knew of this restriction were unanimous in their approval.

"But the thing about the license, the first six months you have to be in by 9 o'clock. And that's like the best rule ever, I love that rule. That helps out tons."

"I think it's a great idea. Because the transition for her is that she's got total freedom. And the transition for me is she's got total freedom. So, having the curfew thing kind of helps me curb it a little bit and keep control over it just a little bit. I think it's a really helpful thing."

Three-fourths (74%) of parents were aware of the restriction limiting newly licensed drivers to one teen passenger. Awareness for the restriction was marginally higher among parents who had previously supervised another teen driver compared to first time supervisors (79% vs. 53%; $\chi^2 = 2.51$, $df = 1$, $p = .11$). Approval for the passenger restriction was strong among parents. In fact, six parents reported they were planning to limit their teen to *no* passengers for a period of time once the teen obtained a license.

"One of the things is we don't allow any passengers at all for a little while until he gets more used to driving by himself. With our two older daughters we did it for different times. I think it just depends how he does and how serious we think he's taking driving."

"At least for the first several months, but I haven't quite put a time limit on that, she's not to have her friends in the car. Her sisters only. Her younger sister and

her older sister are the only people she's allowed to have in her car or me. No friends at all. That is one phone call I do not want to make. Your child was involved – God forbid, but I don't want to call another parent and say that."

"I like that they can only have one friend in the beginning in the car because I think that could be extremely distracting. And that makes me feel good as far as [Teen] being the driver or a passenger with no more than one of her friends."

At the final interview, most parents had experienced little resistance from their teens regarding these restrictions. (Recall the final interview was conducted approximately one week before teens were first eligible for their license; hence, they were not yet affected by the restrictions.) However, a few parents described discussions or negotiations they had with their teens regarding the restrictions. An extended example follows:

"Well there was a whole big thing about the graduated part of the license where for the first 6 months he can't drive after 9 o'clock. Because he's in the high school band. And when the football games are over, by the time they get the equipment put away it's usually 11, 11:30. We live four miles from the school. He wanted to just drive home. And we had to go around and around about that one. Because the law is the law and there's a reason that you're not supposed to drive after 9 o'clock. So that was ugly for a couple of days. [Interviewer: So how did you resolve that?] I said find a ride. You found a ride for the last two years; you can find a ride for 6 more months. And he said, 'Oh everyone else's parents let them do it.' You know all this kind of stuff. And actually I pulled a really dirty trick. One of his favorite adults who's not a relative has a daughter who's a year older and I asked him in front of [Teen] what they had done, because she's a student athlete. And I said 'What did you do when she was in this position? Did you let her drive home?' 'Absolutely not!' And at that point he acquiesced."

We also asked parents if there were any other particular things their teen would be, or would not be, allowed to do after licensure. Many parents seemed unsure at that point about other rules or restrictions they might enforce. However, 58% of parents reported something in addition to passenger and nighttime restrictions. The most frequently mentioned requirement was the teen must keep the parents informed of when and where they are driving. This was followed by cell phone restrictions, restrictions on where the teen could drive, no driving after drinking alcohol, and requirements to keep grades up.

"Anywhere he goes – and I've already told him this – if he goes from one location to another location, he has to call and let us know where he is at all times. I want to know where he is at all times."

"She's basically allowed to go to these friends' houses and school and the mall, which is all in the same circle that we did all the time. Before she goes out someplace else, we'll talk about it. Just like what I did with the other girls. Know

what the circumstances are – how long, how late, what kind of roads they are, has she done it before.”

Finally, two of the 50 families participating in the study completed a driving agreement during the learner stage. In one case, it was a driving agreement the parent found from the state highway patrol web site. In the other instance, the parent and teen created their own agreement.

Vehicles driven following licensure. We also examined the types of vehicles driven by teens once they made the transition to the provisional license. Several studies have shown teens tend to drive vehicles that are relatively old and small (Cammisa, Williams & Leaf, 1999; Hellinga, McCartt & Haire, 2007; Williams, Leaf, Simons-Morton & Hartos, 2006). These studies also suggest teens who “own” their vehicle (i.e., have unlimited access) drive more than teens who share their vehicle with other family members. The table below shows characteristics of vehicles driven by teens once they obtained their provisional license.

Vehicles Driven Following Licensure		
	N	%
Vehicle type		
Passenger car	28	60%
Minivan	7	15%
SUV	8	17%
Pick-up truck	4	9%
Same vehicle as permit stage		
Yes	30	64%
No	17	36%
Vehicle ownership		
Owned (or unlimited access) by teen	19	40%
Shared vehicle with parent or sibling	28	60%

Forty percent (40%) of teens had unlimited access to a vehicle following licensure. Similar to the permit stage, a majority of these vehicles were passenger cars. Of particular importance is whether teens used the same vehicle they drove during the learner stage, or whether they drove a different vehicle. Given the dangers associated with the first few months of unsupervised driving (Mayhew et al., 2003; McCartt, Shabanova & Leaf, 2003), it could increase risk if teens do not have previous

supervised experience with the vehicle they will be driving (cf., Perel, 1983). Thirty-six percent (36%) of teens drove a different vehicle during the provisional license stage, but in most cases they had at least a small amount of practice with their parent in this vehicle before beginning to drive it unsupervised.

Length of the learner stage. In North Carolina, teens are required to hold their learner's permit for a minimum of 12 months before they can apply for a provisional license. During the final interview, we asked: "Do you think having a full year for a permit is too long, too short or about right?" The vast majority of parents (87%) thought a 12 month learner's permit was "about right." Parents offered a number of reasons for this opinion:

"I think it's about right, because I think it takes a long time to become a good driver. I think it just gives a variety of driving situations, and allows for them to mature emotionally, and intellectually. So I think the more, the better."

"I think a year is wonderful. I want to be with my kid driving in a lot of circumstances. I think the year's great. I don't have any problem with that at all."

"I think it's about right. It gives them just enough experience, and I can tell a difference from when she started a year ago to where she is now. She feels more confident, which I think is the major thing. More than anything else is that she's had practice with us in the car with her, and I'm sure she has more confidence."

"I think it's about right. Because I think about allowing her to get her license about a month after she got her permit, no way on earth. 6 months, no way. Its been that second part the year that she's had more time to drive and experience different things and just be on the road more."

"I love the graduated driver's license; I think having a permit for a year is a wonderful thing. They didn't have that in my day and I wasn't nearly as experienced as he is."

"I think it's actually just right. I think shorter would probably be premature and any longer would be heinous punishment. [Laughter] A year gives a person a lot of time to practice. I think any shorter time you just won't have gotten in enough situations to find out how to handle it. But I definitely think a year is a good amount of time, definitely."

"A year is enough time to be able to get opportunities in. Especially when you have multiple siblings, you just don't have that many chances to let people have the wheel. And, so it's a good period, I think."

"For [Teen] it seems to be about right, because she's driven pretty much every chance that she's had; any chance that she's had she's driven – I've let her. And I've seen the improvement over time, so I think it's good. I really do. I think it's a

great thing. I mean you could make it longer, I don't know that there would be a huge advantage in that. I think it would be a mistake to make it much shorter though. That's just my personal opinion. And it's really based on my two daughters. But, I've seen it happen for both of them and it's pretty much the same, you could just see it over time. It's just like anything else, if you practice you get better at it and you get more confidence and you kind of understand the limits, you know, and that's what I've seen over the time. Yeah, it's been pretty good."

"I just think that the kids need as many opportunities as they can in different situations to drive. And in a short permit time, you can't come across those situations all the time. And it gives a parent time to give them feedback about what they need to think about. And what, you know, the different situations and how to handle them. And I think if it was any shorter than that, then you're not going to have that opportunity. Like snow, ice. That only happens a couple times a year. That's not going to happen over a few months. The rain from the hurricanes. Real, real hard rains. Just certain things that might happen seasonally."

"It seems about right to me. It's so much better than it was when I was a kid. I remember – in fact my mother was telling this story this weekend at a party because we were all talking about [Teen] getting her license potentially. And she said, 'Oh yeah, I remember when your mom got her license, there was no real Drivers Ed and she just like drove on the wrong –.' And I did, I drove on the wrong side of the road, I remember that, the day I got my driver's license. So, the year is good."

Even though most parents approved of the year-long permit, 11% of parents said 12 months was "too long," while 3% thought it was "too short."

"I kind of think a year is a little bit long, but I'm sure it depends on the individual and the family, and how much they have him drive and practice. I know kids who drive a whole lot when they first get a permit, then they don't drive for months until it starts to get close to their birthday time, and then they start driving again."

Several parents also offered unsolicited comments about graduated licensing or North Carolina's licensing system, more generally.

"Well, for me, its just a little more control before they just get their license and off they go and they're gone. So I do like it. It's like a car seat or something, or a bike with training wheels."

"I think it's a nice, even and steady progression. And not giving them too much freedom all at one time. Kind of work up to it, I think that makes sense."

“Sometimes the government just steps in just a little bit too much. But on the other hand, I think it’s because some people don’t give any rules. So it’s a good rule, it’s just there are some times that I wish we could just adjust it by a little bit, based on family circumstances. But I know you can’t do that.”

“I think the year of supervised driving and limiting the number of kids in the car and stuff like that are important and useful. And not enough of a restraint on their freedom, I mean too bad, I’m not remotely concerned about their lack of freedom that our law has. I don’t have a lot of sympathy for the wah wah’s of the drivers, ‘Why can’t we?’ because you’re bone-heads most of the time and behind the wheel is a bad time to be a bone-head.”

Advice from parents. Finally, parents were invited to give advice to other parents based on their own experiences in supervising a novice driver. The most common advice was to give beginning teen drivers lots of practice. Many parents also mentioned patience, staying calm, and not giving too much feedback. Here is a sample of parents’ advice for other parents:

“You just gotta jump into it. It’s not easy. It’s not easy to get in the car with a kid who’s never been behind the wheel. The most important thing is for them to get a lot of practice in a lot of different situations.”

“I just think it’s important to have them drive. I have a friend whose kids just aren’t driving. I mean, as long as they’re willing to say ‘okay, well then you’re not going to get your license,’ that’s fine, but if the pressure comes, and they really want to get it, I think you just can’t do that. That’s why I would always start from the beginning that they drive, and make it clear that if they don’t drive, they’re not going to get their license. I wouldn’t want to have a child be eligible to get her license and have to say ‘no’ because they didn’t drive enough, so I just think they have to have them do it. Have them drive.”

“Let them drive as much as you can. I think it’s really important for them to be behind the wheel a lot. And sometimes it’s more convenient for the parent to just get behind the wheel, but they really need that practice. It’s really better to let them drive as much as they possibly can.”

“I think it’s patience, patience, patience – practice, practice, practice. Patience is a virtue!”

“I’m still of the school that encouragement and positive reinforcement is better than anything else. So, like if he does notice something I will complement him on ‘You responded well to that situation’ or ‘I’m glad you saw that person getting ready to pull out in front of you and responded appropriately.’ I think catching them doing the right thing builds their confidence. So it’s not always a negative feedback that they’re getting.”

“For me it was like remember how you were in the car the first six months or so. I think that just being patient with them that they are just learning and its kind of very exciting for them and they have to settle into it a little bit, I think. The parents have to settle into it themselves. So I would say patience is definitely a virtue when it comes to your kids driving. Not that I’m particularly patient.”

“I guess the things I tried to do was give him the opportunity to correct mistakes on his own, before I spoke up. I guess not reacting too quickly. Seeing if they’re going to figure out they need to whatever differently. So they learn it themselves instead of increasing the stress while they’re trying to learn how to drive.”

“Just to really be vigilant when you’re in the car with them and to watch them and not to be doing other things. To really pay attention the whole time they’re driving. Not to look away, because the couple times, by golly, that’s when something happens. So, that would be my advice.”

“What I would have done differently, I would have done before the past year. And that is how I would have modeled my own driving. When someone cuts me off in traffic, I will tend to say something as if they can hear me. And sometimes it includes a four letter word. And I do tend to, on the average, especially on the highway, go about 5 over the speed limit. And I realize that I have modeled this behavior for him. That if I do it, it must be the correct way to do it or it must be at least permissible to do it that way. And it just never occurred to me that these issues I’m having with him driving too fast are because his father and I both, this is our habit. And I should have realized before hand. Of course, he’s my first born and I’ll know better with his brother. Yeah, he’s going to do as I do and not as I say. So, I wish I had realized that before he had gotten his permit.”

“I think the tension thing is not necessarily unique to me and [Teen]. It’s really serious; it’s more than just riding a bike. You know when you teach your kid to ride a bike, cars are dangerous and people see that. And cars can be dangerous, and I think the seriousness of the event causes tension and so to expect it and sort of realize that’s going to happen. It helps a lot to just be aware of the tension. It’s just because everybody’s figuring out how to handle the new situation.”

“Talk. Not necessarily all the time when they’re driving, but I guess before, have a plan, we’re going over here, you’re going to the grocery store so its 5 o’clock it’s going to be heavier traffic, kind of give them things they might anticipate. And give them experience to different times, types of driving.”

“I guess just drive more with her. Get as much experience as possible because once you let them loose, they’re not coming back for additional lessons.”

“Not every one has two cars available, but it does make a difference. Although she trained a lot more on my vehicle than my wife’s, I think it was still useful that she got experience on more than one vehicle. It’s not how to drive a Ford Taurus;

its how to drive a vehicle and every vehicle has its own idiosyncrasies. And maybe drive a couple times with a different supervisor. Not just hearing instructions from me but [my wife] and I mixed it up a little bit, and people see different things when you're driving and have different ways of communicating it. One adult might not know everything and it's kind of good to get coached by different people."

"One of the things that we did, which probably a lot of people do, is just to go out to a parking lot before she started Driver's Ed and just let her drive around the parking lot. She came and asked me if she could do that. She said, 'I don't want like Driver's Ed to be like the first time I've ever driven.' I think she was really glad she did that because the first day they had to go out and drive, they put her in the car and they drove right up to Franklin and Columbia Street. One of the busiest intersections and make a left turn; just sort of threw them in. So, I think getting a little practice before that in a less stressful situation is a good thing."

Examples of Good Supervision Practices

In many ways, it proved difficult to pull out a few families that uniformly illustrated good supervision practices. Most parents seemed to try their best in helping their teen learn to drive. Every parent did some things well; likewise, every parent struggled with, or might have improved, certain aspects of their supervision. For example, the parent of the teen who logged the most driving time in our sample – almost five hours per week – had tremendous difficulty encouraging her teen to slow down. There are numerous clips of the parent telling the teen to brake sooner or to slow down on turns, which appear to go unheeded. By comparison, several other parents had ambitious plans for how and when their teen would drive during the learner stage, only to find these plans thwarted by their teen's reluctance to drive. Another parent did a noteworthy job of introducing his teen to new and potentially challenging situations as her skills improved. However, he struggled with communication and had a tendency to lose his temper.

Even though each family had strong points as well as difficulties, we will briefly describe the experiences of two families where the nature and quality of parental supervision seemed particularly good.

Family 1. This family consisted of a married couple with two girls. The older daughter had just obtained her permit when they enrolled in the study. The father was the primary supervisor because, in his words, his wife was “*a little apprehensive about it.*” In 38 of the 41 driving clips recorded for this teen, the father was supervising.

During the initial interview, the father was asked about his plans for the learner stage:

“Well, we want her to drive as much as possible. As a matter a fact, one of her girl friends is over this evening, and we have to drive the girlfriend home, so, I’m going to let [Teen] do that. But I personally plan on supervising her in as many different situations as possible, to make sure that she’s comfortable merging onto a highway, driving on a highway, and navigating all kinds of different circumstances. I’m trying to think through as many different things as can be difficult, or problematic, and in a limited capacity at first, put her in these situations and then gradually expose her to it more and more until she has a high level of comfort with them.”

This teen drove quite frequently compared to other teens in the study. She was in the top quartile of all families for average number of hours driven per week (2.20 hours). During interviews, however, the father often expressed dissatisfaction with how much his daughter was driving. The father reported that the main obstacles to getting more practice were: 1) the father frequently traveled for work; and 2) the teen was ill for an extended period near the beginning of the learner stage. When asked how they usually decided when the daughter drives, the father said:

“It depends on who brings it up first. She’ll say, ‘Can I drive?’ And I’ll always say yes. But usually I’ll offer if I’m going out somewhere. I’ll say, ‘Hey, I’m going to

True Value to get some PVC pipe. Do you want to come with me so that you can drive?' Half the time she'll say yes, and half the time she'll want to keep talking to her friends on Facebook."

Over the course of the learner stage, the teen obtained driving experience in a wide variety of settings. One-fourth (25%) of the teen's driving clips were either at night or in rainy conditions. In addition, half the clips (52%) were on roads judged to have moderate or heavy traffic. During interviews, the father often talked about his efforts to have the teen drive in varied conditions:

"We even took some occasions to plan excursions. Like when we were going through the severe drought last year, we said that one of the things that we wanted to do, strategically, was get out and drive in the rain. And so, it's not one of those things you can plan for only in that, 'Hey the next time it rains we need to drive.' So I remember back in the spring it rained and it was like, 'Okay let's go.' And we went out and drove for about 45 minutes in the rain, just so she would understand what happens with a vehicle in the rain and how it feels different."

As another example, the father noted that his daughter felt uncomfortable about merging onto highways. To address this, they spent several hours one weekend driving a loop between two exits, repeatedly getting on and off the highway until his daughter began to feel more comfortable and confident. In general, the father was quite concerned about creating a positive atmosphere in the vehicle while his daughter was driving. As he said, *"I try to remain as relaxed as possible just to keep the atmosphere in the car calm."* In the driving clips for this family, there were no instances of the father raising his voice.

The father also focused on his daughter's acquisition of higher-order skills during practice sessions. He mentioned during interviews that he tried to help his daughter be watchful of other drivers and scan the driving environment.

"I'm trying to find those teachable moments. Anytime that either I'm driving or she's driving, if we see another car doing something wrong, or even right, to use that as an educational experience."

On a few occasions, this was evident in the driving clips. For example, in one clip he encouraged his daughter to look several cars ahead for brake lights or other indications that traffic might be slowing. The father also showed rare insight into how he translates his own knowledge and experience to his daughter: *"As someone who's been driving for 25 years, a lot of it's on instinct now. You think why you do some things, sometimes, and it requires a modicum of thought."*

Finally, the father strongly supported having a year-long learner stage for beginning drivers:

“The only way that you become a good driver is through experience. There’s nothing else that is going to make a driver comfortable behind the wheel. A year allows for a reasonable amount of time behind the wheel, before you experience enough situations and start to think like an experienced driver.”

Family 2. This family also had two children. They enrolled in the study when the older daughter obtained her permit. The mother assumed the role of primary supervisor. She was the supervisor in all but 7 out of the 129 clips recorded for this family. According to the mother:

“She prefers driving with me. Her Dad makes her nervous. Her Dad is, you know, critical, so when her Dad is in the car she gets awful stressed.”

At the outset of the learner stage, the mother was asked about her plans for her teen’s driving:

“My plan is to give her as much time behind the wheel with me as possible. We’ll start mostly around town, but next weekend we may have an opportunity for her to drive on highway 40. And after she’s gets confident with the minivan, my plan is to switch over to the Mini Cooper so she can learn how to drive a standard.”

She clearly followed through on plans to give her daughter practice. This teen spent an average of 3.53 hours driving each week – fourth most of any teen participating in the study. The mother reported her daughter was almost always eager to drive, and by the end of the learner stage she commented: *“She’s driven every time she’s had the chance.”*

The driving took place in a wide range of settings. Approximately 25% of the driving clips occurred in darkness or rain (and on one occasion in a heavy downpour). During interviews, the mother frequently talked about making sure her daughter had experience in these conditions. In addition, the family made a number of long-distance trips where the daughter helped with the highway driving. As the mother intended, her daughter also spent considerable time driving the car with a standard transmission over the course of the learner stage.

This mother was notable in the amount of time and effort she devoted to making sure her daughter developed confidence. For example, there is a sequence of video clips relatively early during the learner stage where the daughter practices a particular turn four different times. In each clip, they talk about how the turn went and the mother asks, *“Do you want to try it again?”* Although the mother focused primarily on vehicle handling issues during interviews, she was also conscious of her daughter’s development of higher-order skills. For example, during one interview she mentioned:

“I want her to be aware of what is happening with other drivers. She’s not the only one out there and I think that’s where kids really get into trouble, they’re so focused on themselves they don’t realize that other drivers have an impact on

what happens to them. So it's developing that awareness that I'm going to work really hard on."

Although she was generally pleased with her daughter's progress, she was occasionally concerned about her attention and concentration. This led her to comment on one occasion:

"I'm still struck how teenage brains are not really quite developed, and I wonder if we're asking too much to have a teenager driving. It just requires so many things to do at once. [Teen] can only process one thing at a time. We had her friend in the car – she really couldn't listen to the conversation and my direction at the same time."

The mother was observed raising her voice in only two clips (once to alert her daughter to a red light). Over time, she felt she learned when to give her daughter feedback, when not to give feedback, and how the feedback should be couched. As one example:

"It's a lot better if I say, 'There's a pedestrian over there to the right' than "Watch out for the pedestrian!" Or if I say, "the cars are stopping up ahead," that's better than saying, "Stop! There are cars up ahead!"

Finally, here is her advice for other parents:

"I would just stress driving as much as possible, while you're in the car. I don't know how many parents I've talked to, lately, who say, 'Oh no, I just haven't given my child much of a chance.' Or 'We're in no hurry.' You know they're going to get their license whether you – I guess they need your permission – but you know they're going to push for it. If you're not going to take the time and give them every opportunity then they won't have your input. So, I'd say just continue to stick 'em in the driver's seat as much as possible. The best thing you can do is to do that while you're in the passenger seat. Lots and lots of opportunity and lots and lots of patience."

DISCUSSION

To date, there has been almost no research on the nature and quality of parental supervision during the learner stage of graduated licensing. This study was designed to be a first step in advancing our understanding of this issue. Some of the major findings from the study are discussed below.

Driving with a Parent Is a Safe Environment for Teens to Obtain Driving Experience

Several studies suggest the learner period is a safe environment for learning to drive (Gregersen et al., 2003; Mayhew et al., 2003). The findings of the present study support this and help to explain why. None of the 52 teenagers in the present study were involved in a collision during the year-long learner stage. Moreover, most of the driving clips recorded by the in-vehicle cameras did not involve high g-forces, and less than 1% of the clips were judged to be “very serious.” In a small number of clips, it appeared parent intervention helped to prevent a crash.

In general, parents did several things to create a safe driving environment for their teen. At the outset of the learner stage, most parents were able to articulate some sort of plan for their teen’s driving. Most commonly, parents wanted to be sure their teen practiced a lot, or they planned to control their teen’s practice, starting in less demanding settings and gradually working toward more challenging situations. During practice sessions, parents nearly always paid attention rather than engaging in secondary tasks such as operating a cell phone, reading, or eating. Seat belt use by both parents and teens was nearly universal. Although music was playing during about half of all driving clips, the music volume was rarely judged to be high enough to distract the teen. Finally, even though many parents reported feeling nervous while their teen was driving, obvious tension and raised voices were apparent in only a small percentage of driving clips.

All of these behaviors likely helped to promote a safe driving environment for the teen. Nonetheless, there are several other areas where it appears parents could potentially improve the quality of their supervision.

Teens Appear to Be Driving Less During the Learner Stage than Previously Assumed

Little is known about how much driving practice teens obtain while they have a permit. Measures of driving used in previous studies are generally quite weak – typically parents are asked to provide a global estimate of driving covering the entire learner period. For example, McCartt, Hellinga and Haire (2007) interviewed 300 parents in each of three states as teens applied for a restricted license. Parents were asked to estimate the number of weekly hours of driving practice their teen obtained while he/she had a permit. Reported weekly practice was highest in Rhode Island (11 hours),

followed by North Carolina (9 hours) and Minnesota (6 hours). If these estimates are accurate, teens in Minnesota would have had 156 hours practice over the six month learner period. Teens in Rhode Island would have had 286 hours practice. Teens in North Carolina – which has a 12 month learner period – would have had 468 hours practice. These estimates seem highly unrealistic, especially considering no U.S. state currently requires more than 60 hours of supervised practice.

One goal of the present study was to obtain a more accurate assessment of the amount of driving actually done by teenagers during the learner stage. Although this study also relied on self-report, it offered two key advantages over previous research. First, we asked parents to report on their teen's driving during a small window of time – just the past week. Second, the questions were preceded by a discussion of the past week's driving. This was designed to focus the parent's attention directly on the teen's recent driving experience.

Overall, the average amount of weekly practice reported by parents in this study is noticeably lower than what has been reported previously (Goodwin et al., 2006; McCartt et al., 2007; Waller et al., 2000). Across all interviews, parents reported their teen drove an average of 3.21 days and 1.60 hours during the week prior to the interview. Average weekly driving was fairly constant over the course of the learner stage, although there was a noticeable increase in practice just prior to the teen being eligible for a license. Extrapolating across the entire 12 month learner stage, it appears teens drove an average of approximately 85 hours during the year-long learner stage.

Although parents reported many different obstacles to obtaining practice, the most common was the busy schedules of both parents and teens. Most of the teenagers in the study were involved in multiple activities both in and out of school. This made it quite difficult to find time for the teen to drive. Many parents anticipated that summer would be the best time for driving, since the teen would be out of school. However, teen summer schedules involved travel, camps and various other activities, with the result that they actually drove *less* during the summer. Teens' lack of interest in driving was another commonly mentioned obstacle by parents. A few weeks or months into the learner stage, a number of teens began declining opportunities to drive as the "novelty wore off." This was something parents had not anticipated, and they were unsure how to encourage their teen to do more driving.

It is currently not known how much supervised driving experience is needed to reduce subsequent crash rates among newly licensed teens. Although 85 hours seems like a substantial amount of time, the only study that links amount of practice driving with subsequent crash risk found that a group of drivers who averaged 118 hours of supervised driving experienced a lower crash rate than those who accumulated 40 hours (Gregersen et al., 2000). It is encouraging, however, that many parents seemed to recognize the importance of their teen obtaining a substantial amount of driving practice. This was reflected in parents' stated plans for the learner stage, their frustration about the difficulty in finding enough time for practice, and their advice for other parents of beginning drivers.

Driving Practice Is Relatively Homogeneous

Although many parents were concerned about the amount of practice their teen obtained, a distinct minority of parents seemed cognizant of the need for substantial experience in a wide variety of settings/conditions. At the outset of the learner stage, only a quarter were planning to ensure their teen practiced driving in many different types of conditions. Findings from both the interviews and in-vehicle cameras suggest teens did much of their driving in residential neighborhoods and relatively light traffic. Teens drove less frequently in more challenging settings such as highways, inclement weather, darkness, heavy traffic, or country roads.

Given busy family schedules, the majority of practice seems to have been done at the time of day, and along the routes, the family normally traveled. Although this is understandable, the result is that experience was obtained within a relatively narrow – and generally benign – range of driving conditions. In most cases, “typical family travel” holds few opportunities for teens to drive in more challenging conditions. For novice drivers to obtain experience driving in the full range of conditions they will confront as a licensed driver necessitates either special trips or a concerted effort to vary normal driving routes.

In addition to the limited number of naturally occurring opportunities, parental discomfort may have played a part in the limited range of conditions to which parents exposed their teenager. After six months of supervised driving, approximately half of parents continued to report they would *not* be comfortable with their teen driving unsupervised in several different conditions, suggesting they were still seeing errors or other evidence that their child was not yet ready to handle challenging settings. Even after a full year of supervised driving, one in three parents still did not consider their teen ready to drive unsupervised in heavy traffic or on a highway. Tellingly, parents did not seem to recognize they might have done something about this by ensuring the teen obtained more experience driving in such conditions.

We cannot effectively tease apart whether lack of opportunity or parent discomfort was the central factor behind teens’ limited experience in more challenging settings. Parent comments during interviews suggest both played a role. However, what seems clear is the need for teens to obtain more experience driving in a variety of conditions/settings. There is probably some benefit to accruing large amounts of time behind the wheel during “routine trips,” but this is unlikely to prepare teens fully for the wide range of driving conditions and potentially dangerous situations they will encounter, eventually, once they begin driving unsupervised. Ideally teens would get substantial experience in the full variety of driving conditions with a parent in the vehicle, before they confront these conditions on their own.

To a limited degree, states have attempted to incorporate the need for varied practice as part of their licensing requirements. For example, 38 states now require teens to

obtain some supervised night driving experience during the learner period (IIHS, 2010). Although it is unrealistic for state licensing requirements to cover the full range of potentially important conditions in which novices need practice, there are ways in which states can work toward institutionalizing appropriately varied practice. Some states have begun to require parents to attend formal meetings as one of their responsibilities in the young driver licensing process. This presents an opportunity, if structured and implemented wisely, to effectively encourage parents to ensure their teenager is exposed to a greater range of driving conditions than naturally occur in the family's routine travels. Parents in the present study seemed well aware that "lots of driving experience" is key to learning. What they did not seem to grasp is the importance of "appropriate" experience. Mandatory parent sessions might be an effective approach for conveying a few key points to parents, such as the need to ensure driving experience in a wide variety of settings.

Parent Instruction Focuses on Vehicle Handling Rather than Higher-Order Skills

To become safe drivers, novices must learn not only the "basics" of handling a vehicle, but also a number of higher-order skills such as visual scanning, hazard perception, judgment and good decision making. There were several indications in the present study that parents seem to equate driving with vehicle operation, rather than complex higher-order perceptual and cognitive skills needed to safely negotiate in traffic. For instance, some parents considered their teen's experience with "Go Karts" or riding mowers to be relevant to driving. Moreover, when approaching licensure, some parents focused heavily on their teen's ability to perform certain skills such as 3-point turns, parallel parking, or parking more generally. That the sample of highly educated parents in this study did not attend to the more cerebral aspects of driving is quite revealing. It suggests that a substantial effort to help all parents recognize the need to help their teenager develop a cognitively sound orientation to driving may be difficult to achieve.

The findings from the present study suggest that learning to handle the vehicle occurs within a short period of time. Many parents reported their teen seemed comfortable behind the wheel after just four weeks of driving. There was also a noticeable decrease in the number of events recorded by the in-vehicle cameras during the first few months of driving. Moreover, some parents reported their teen seemed to become "overconfident" a few months into the learner stage, as evidenced by driving faster, leaving shorter following distances, etc. These findings are consistent with previous research suggesting that novice drivers learn to manage a vehicle relatively quickly (Hall & West, 1996). Simons-Morton and his colleagues have also reported indirect evidence of overconfidence emerging among teens a few months after they begin driving unsupervised (cf., Hartos, Eitel & Simons-Morton, 2001).

By contrast, higher order skills that are involved in recognizing inherently dangerous settings, making good judgments and especially translating understanding into specific driving behavior may take years to fully develop (Steinberg, 2005). In the present study, there was relatively little evidence parents spent much time focusing on their teen's

development of these higher order skills. During interviews parents rarely discussed, or evinced an awareness of, the cognitive aspects of driving. Rather, they tended to focus on errors with vehicle handling (e.g., braking, turns). The findings from the in-vehicle cameras bear this out. Because the cameras were triggered by changes in g-forces, they sometimes captured instances where the teen made some kind of driving error. Hence, they provided an opportunity to see what parents said to their teens during potentially “teachable moments.” In these situations, parents usually responded with some form of basic instruction (e.g., “you need to brake sooner”). Rarely did they provide more thoughtful kinds of instruction that might help the teen to understand what the parent understands (e.g., “I try to look a few cars ahead for brake lights, so I know when I need to slow down”). It is possible this type of higher-order instruction was more common during the latter part of the learner period when the cameras were no longer in the vehicles. Alternately, this type of instruction may have occurred during “quiet” periods of driving when the camera was unlikely to be triggered. However, the fact that instances of higher-order instruction were relatively rare in both the driving clips and interviews suggests this was not a primary focus of most parents.

Given most states now mandate a learner stage allowing only supervised driving for six months or longer (IIHS, 2010), parents have an excellent opportunity to help their teen develop the higher order skills necessary to be a safe driver. Based on findings of the present study, it appears many parents are not taking full advantage of that opportunity.

It Will Be Challenging to Develop Effective Guidance for Parents

During the past decade, numerous materials have been developed to assist parents as supervisors. Unfortunately, it has proven difficult to change parents’ supervisory behaviors (Chaudhary et al., 2004; Goodwin et al., 2006; Hartos & Greenspan, 2007). Findings from the present study help illustrate why this is the case.

First, supervising a novice teen driver is a highly complex task. It requires parents simultaneously to be a driving instructor, mentor, role model and psychologist. Even if parents know what they want to convey to their teen, effective communication is surprisingly difficult. Teens can be quite sensitive when first learning to drive, as evidenced by teen appeals for their parents to “stop yelling” at them (when parents barely raise their voice). Moreover, there clearly are substantial differences between families. Not all teens are eager to drive – in some families teens frequently refuse to drive. By contrast, other teens display a tendency from the beginning to drive in a manner that makes their parents’ uncomfortable. It likely will be difficult for guidance materials to take into account the complexities of the parental role as a supervisor and the substantial differences between families.

It is also important to consider that parents of many teenagers have extremely busy schedules. Despite good intentions, they have limited time to devote to the process of supervising their teen. Because of this, guidance materials will need to be brief and emphasize a few key concepts. For example, priority might be given to how parents can

help their teen develop the higher order cognitive skills essential to driving, moving them toward being a “wise” driver rather than simply a “skilled” driver. Most materials currently available to assist parents tend to encourage them to emulate driving instructors, with *de facto* lesson plans to focus on basic vehicle operation. The latter risks encouraging parents to see their task as getting teens through the initial, very brief, stage where they are obviously rank amateurs. This kind of guidance contributes to the same mistake parents already seem to make, failing to devote attention to developing a deeply ingrained wisdom about driving that results in intuitive, but adaptive, behaviors characteristic of safe drivers. These can only be developed over time, with appropriate practice.

Most guidance materials currently available to parents give little or no attention to what should be done over the long-term to take advantage of the GDL requirement that teens practice driving for at least 6 months, focusing instead on the beginning stage of driving, when basic skills are largely lacking. By failing to lay out a strategy, of a type and magnitude that parents can reasonably be expected to pursue, materials to guide parents fail to achieve the benefit available from the requirement of a lengthy practice period. Simply accumulating hours of driving may produce some benefit, but much more than that is desirable and appears to be possible. Unlike the past, when most parents expected to have only a few weeks to introduce their children to driving, GDL provides the opportunity for them to instill not merely the ability to drive, but the inclination to drive judiciously as well.

In sum, if parents are adopting a “driving instructor” role for a few weeks then shifting to passive mode, without using the remaining time to instill broader principles of good judgment, accurate hazard perception and level-headed decision making, then they need to be pointed toward a different approach. This new approach will need to emphasize how they should use the last many months of supervised driving to focus on a driving orientation that promotes safety rather than merely obtaining practice.

Limitations of the Study

The present study has a number of limitations that should be recognized. These include:

- Limitations of the sample
- Potential for participant reactivity
- Limitations of the study design

Limitations of the sample. The objective of this study was to learn as much as possible about how parents approach and manage their teens’ driving during the learner stage of GDL. The extensive and open-ended nature of discussions with each participating family, as well as installation and frequent need to download data from

cameras, precluded a large sample size.¹ Additionally, many of the study participants were highly educated and relatively affluent.

Perhaps most significantly, as with any study involving volunteers, self-selection bias must be considered. Of the eligible families who visited the DMV to apply for a permit, approximately 20% ultimately participated in the study. Undoubtedly there were many reasons why families declined to participate, but the single greatest contributing factor to participant loss was an unwillingness to have the camera installed in the vehicle. Information about families who declined to participate in the study is limited. We do know families who completed the initial interview, but who declined to have the camera installed in their vehicle, did not differ from study participants on the teen's sex, whether the mother or father served as the primary supervisor, whether the parent was a first-time supervisor, or the type of vehicle driven by the teen. However, it is not known whether participants and non-participants differed in other potentially important ways. Neither a low response rate, nor a demographically atypical sample is, of itself, necessarily an indicator of sample bias as is often assumed (Groves, 2006). Nor is comparability on the kinds of factors listed above evidence of non-bias. The critical issue is whether non-participants differ from participants in the central behaviors, knowledge, and orientations studied. Unfortunately, as is nearly always the case in sample studies, it was not possible to determine whether this is the case here.

In addition, parent and teen behaviors during the learner stage are likely influenced by certain licensing requirements. For example, North Carolina has a longer learner stage than most states (12 months). With this additional time, parents in North Carolina may feel less pressure than parents in states with a shorter learner stage to ensure their teens practice.

For all of these reasons, it is important to be cautious in generalizing findings from this study to other families, especially those who live in states with different climates, different driving environments, or different licensing requirements. Additional research on parental behaviors during the learner stage of licensing is needed both to replicate the present findings and to determine whether they characterize other socioeconomic groups and families that live in other geographic locations.

Participant reactivity. In most field studies of behavior, there is a potential to inadvertently influence participants. Knowing that a researcher is observing or recording may change how individuals behave or respond to questions (the so-called "Hawthorne effect"). In the present study, a close relationship was established with parents over the course of the year-long permit stage. To reduce the likelihood of influencing them, a conscious attempt was made during all contacts with parents to avoid providing advice, encouragement or other support that might alter their behavior as supervisors. Nonetheless, it is unlikely that regular telephone interviews with a researcher had no

¹ Nonetheless, the study involved a larger sample than any other U.S. study of teenage drivers to date that uses in-vehicle technology to observe or measure behaviors. Studies in Virginia, Iowa and Minnesota have involved samples between 18 and 42 drivers (e.g., McGehee et al., 2007). Several groups are currently undertaking larger studies.

effect whatsoever. Parents occasionally made statements such as, “You ask me about highway driving every time we talk, so I decided I finally needed to get her out on the highway...” or, “We went out and drove yesterday so you’d have something to see on the camera...” In all likelihood, any effect that resulted from participation in the study *increased* parental involvement or activity; that is, if anything parents would have provided more practice, paid greater attention to the nature of their supervisory activities, and focused more heavily on what they were doing as a result of participating in the study.

There is also the concern about reactivity to an in-vehicle camera. Again, a number of steps were taken to reduce the likelihood of this. There was no indication of camera recording activity (i.e., all lights on the camera were disabled), no feedback was provided based on recorded information, and cameras were rarely discussed during interviews. In interviews with parents after the cameras were removed, most parents reported they forgot about the camera within a few days after installation. Parents were seldom observed looking at the camera when it was recording and the camera was rarely a topic of discussion on the recorded video clips. Also, most parents reported their teens seldom, if ever, mentioned the camera to them. Given that driving requires considerable attention to a complex and continually changing environment, it is not surprising that a small, quiescent camera attracted little attention.

Limitations of the study design. One limitation of the study design is that the cameras did not provide full representation of all driving experiences during the year-long learner stage. Because cameras were removed after four months and moved to other vehicles, in a cost-saving effort, we have no in-vehicle data from the latter two-thirds of the learner stage. It seems likely that the behavior of parents and teens was different during the latter part of the learner stage. However, judging from the steady decline in recorded clips over the first four months of the learner stage, it is also possible that relatively few clips would have been recorded by month 12. Finally, it should be noted that some teens drove more than one vehicle during the period when the camera was installed. For these teens, it was not possible to collect data on every trip taken.

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