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Parent Involvement in Novice Teen Driving: Rationale, Evidence of Effects, and Potential for Enhancing Graduated Driver Licensing Effectiveness

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Abstract

Motor vehicle crash rates are highly elevated immediately after licensure and then decline gradually over a period of years. Young age, risk taking, and inexperience contribute to the problem, but inexperience is particularly important early on. Driving is like other complex, skilled behaviors in which subtle improvements in perception and judgment develop gradually over a period of years. After all, safe driving is more a matter of attention and perception than physical management of the vehicle. Inexperience is particularly linked to driving performance and safety outcomes under certain driving conditions, with driving at night and with teen passengers as the most important cases. Surprisingly, driving outcomes do not appear to be affected by the pre-license training or supervised practice driving. Given the limits of training, safety effects can best be achieved by countermeasures that delay licensure or limit driving novice teen driving under high risk driving conditions while novices gain experience and develop safety competence. The two complementary approaches of Graduated Driver Licensing policies and parent management have been shown to provide safety effects by limiting the driving conditions of novice teenagers. *Impact on Research, Practice, Policy, and Industry:* Advances in GDL and improvements in parent management practices have the potential to reduce crashes and save lives.

Introduction

Crash rates in the United States increase dramatically starting at about age 14 when teenagers begin to ride with other teenage drivers and then to drive on their own, and these rates remain elevated relative to adult levels well into the twenties (National Highway Traffic Safety Administration [NHTSA], 2005). Driving is particularly dangerous during the first year of licensure, with highly elevated crash rates during the first months of independent driving that decline rapidly for about six months and then more slowly for years. The period of high crash rates during the first year of teen licensure has come to be known as the “novice young driver problem.” The best explanation for the high crash risk among novices is that driving competence, as with any complex skilled behavior, is gained only gradually through experience. Professional training and parent-supervised practice driving are necessary and useful for training novices to manage the vehicle and develop an appreciation for the risks involved, but only substantial independent driving experience provides the type of experiences

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and feedback that lead to competent and safe driving. Reducing the novice young driver problem can be done mainly by (1) delaying licensure, thereby reducing exposure for a time and allowing time for further maturation prior to independent driving; and (2) upon licensure, limiting driving to less risky conditions, at least for a time, while novices gain experience and develop competence. Graduated licensing and parent management practices are evidence-based approaches that address these goals and provide safety effects.

This paper emphasizes the role of experience in the development of driving competence, reviews the known effects of parent limit setting on driving outcomes, reviews the effectiveness of the interventions that have been developed to increase parental management, and recommends an increase in programmatic attention to parent management of novice teen driving.

The Novice Young Driver Problem

The rapid decline in crash risks during the first 6 months of licensure (Mayhew, Simpson, & Pak, 2003) is consistent with an effect of learning, suggesting that novices, as their name would suggest, are still learning, although they may have had substantial supervised training and practice prior to licensure. It seems that drivers are not very good, at least not very safe, when first licensed, but get a lot better and safer over time. Exposure, inexperience, young age, and driving conditions help explain the high crash risks among novices. Each of these factors appears to provide independent effects on driving performance and safety outcomes, but these effects are highly inter-related and their independent effects are difficult to sort out.

Exposure

Exposure is the most important factor in crash risk – the more one drives, the greater the risk of a crash (NHTSA, 2005). Exposure, measured as cumulative miles or hours of driving, increases as teens begin to ride with newly licensed drivers and then dramatically with licensure, along with crash rates. The state of New Jersey provides an excellent example of how exposure is associated with crash rates. New Jersey teenagers are not eligible to obtain a license allowing independent, unsupervised driving until age 17. Not surprisingly, New Jersey 16 year olds are much less likely to be involved in a crash than 16 year olds in nearby states where teens can be licensed at 16 and therefore experience much greater driving exposure (Preusser, Ferguson, Williams, Leaf, & Farmer, 1998). However, New Jersey 17 year olds have crash rates that are as high or higher than 17 year olds in neighboring states, presumably because the 17 year olds in each state drive roughly equivalent amounts. While driving mileage increases gradually over time after licensure, obtaining the exclusive use of a vehicle is associated with a large increase in mileage (Williams, Leaf, Simons-Morton, & Hartos, 2006). However, getting a license that allows independent, unsupervised driving provides the most dramatic increase in exposure and is highly associated with an increase teenage crash risk. Of course, not all driving is equally dangerous because crash risk also varies by experience, driver characteristics, and driving conditions (Williams & Ferguson, 2002).

Inexperience and Experience

As noted, the period right after licensure is particularly risky. Among licensed drivers of any age, the least experienced are at greatest risk for crashes (Page, 2001;Mayhew et al., 2003;McCartt, Shabanova, & Leaf, 2003;Organization for Economic Co-operation and Development [OECD], 2006). Based on an analyses of police reported crashes in Canada, crash rates decline from about 120 crashes/10,000 drivers in the first month of licensure to <70 crashes/10,000 drivers after 6 months of independent driving experience (Mayhew et al., 2003). McCartt and colleagues (2003) examined self reported crash rates and found that the crash rate of 2.3/10,000 miles in the first month of licensure, declined dramatically to less than

0.5/10,000 miles at five months and about 1,000 miles. These are hefty and rapid declines. Even after several years of driving, crash rates for teenage drivers remain at least double that of experienced adults (NHTSA, 2005), but the most dramatic declines occur during the first year of licensure.

While there may be great variability in natural ability and eventual performance, expertise in almost any skill-dependent area is defined in terms of number of years (not months) of experience (Durso & Dattel, 2006). In areas ranging from chess to tennis novices are error-prone while experts are able to avoid errors by allocating attention quickly to the important elements and patterns in structured and unstructured problems and then drawing on their immediate access to a huge cognitive store of memorized and automated knowledge about problems and solutions (O'Byrne, Clark, & Malakuti, 1997). These aspects of expertise are also required for driving competence and safely and seem to be reasonably advanced among experienced drivers and lacking among novices. Nearly all drivers develop reasonable competence in time and manage to avoid crashing despite complex traffic conditions. Indeed, the more one drives, the lower ones' crash rate per miles driven, and the less one has driven, the greater the likelihood of crashing, at least until old age (NHTSA, 2005).

Inexperience is a risk factor for crashes mainly because competence for safe driving is largely a mental, rather than a physical activity (Elvik, 2006). Basic vehicle management can be taught in a matter of hours (Lund, Williams, & Zador, 1986;Hall & West, 1996), but competent and safe driving requires perceptual, attentional, and judgment skills, not just motor skills, and these mental skills develop only with years of practice (Groeger, 2000, pp. 75-80). Driving competence develops mainly through extensive feedback obtained from frequent experience with a wide variety of driving situations encountered over a long period of time (Groeger, 2002). While driving is a highly repetitive process, seemingly similar driving situations such as passing through lighted intersections can vary in subtle ways that require the development of sensitive perceptions of when a potential hazard might exist and how to avoid it or prepare in case it should materialize (Groeger, 2000, pp. 132-140). Therefore, driving competence can be expected to advance only repeated practice over a long period of time (Groeger, 2000, pp. 75-80).

Novel, non-routine actions in general require greater executive function than routine actions, and their performance is conscious and controlled rather than automated and responsive. Therefore, managing complex tasks like those involved in driving requires a substantial proportion of available cognitive capacity, particularly during intense learning phases when very little of the driving process has been automated (reviewed by Groeger, 2000, pp. 65-74). Among experienced adults, driving tasks such as acceleration, braking, visual scan, shifting, and the like are largely automated in the sense that performing these tasks does not require conscious attention and imposes relatively little demand on cognitive capacity (McKenna & Farrand, 1999). It is not known how much experience is required for driving tasks to become more or less automated, but compared to older and more experienced drivers, younger and less experienced drivers have been found to employ relatively greater cognitive workload while performing vehicle and traffic management tasks (Patten, Kircher, Ostlund, Nilsoon, & Svenson, 2006). Not only are inexperienced drivers highly occupied cognitively with the tasks of driving, but also they are relatively unfamiliar with certain driving conditions and lack judgment about what constitutes a hazard and how to manage it (Fisher, Pollatsek, & Pradhan, 2006).

Safe driving requires of the driver the ability to maneuver safely in a variety of complex traffic conditions by identifying and reacting to hazards, estimating gap and closing distances, anticipating the actions of other vehicles, signaling intentions appropriately, managing in-vehicle distractions, and otherwise driving in a manner that is inconsistent with crashing

(Groeger, 2000). A long history of research has compared novices with experienced drivers on a variety of driving performance measures. This research has shown that, in general, novices exhibit less frequent and useful visual scanning performance than experienced adults (Mourant & Rockwell, 1972), fail to identify and react to hazards (Pradhan, Fisher, & Pollatsek, 2006), and employ greater cognitive workload (Crundall & Underwood, 1998;Patten et al., 2006) under complex driving conditions.

Simons-Morton and colleagues compared selected measures of driving performance assessed on a test track of experienced adults and teens soon after provisional licensure and again after six months. Not surprisingly, after licensure, teens performed worse than adults on visual scan and intersection management measures, particularly when engaged in secondary tasks (Lee, Olsen, & Simons-Morton, 2007;Olsen, Simons-Morton, & Lee, 2006). Six months after teen licensure, teens showed average improvements on these measures, but their performance was not as good as experienced adults (Olsen et al., 2006;Lee et al., 2007). Of particular interest, newly licensed teens demonstrated relatively good performance on routine vehicle management tasks such as speed control and lane maintenance. Novice teen driving performance improved over time, but, under complex driving conditions, it remained deficient compared to experienced adults.

Young Age and the Developmental Imperative

Adolescence is a period of rapid development, such that in a matter of months, certainly over the course of a year, great advances can occur in physical growth, self regulation and emotion control, and in other aspects of maturity (Arnett, 2007). Accordingly, sports teams, academic curricula, and social activities are organized with the developmental age and stage of adolescence in mind. In general, 17 year olds are more mature than 16 year olds because their brains have had one more year to develop (Giedd, 2004), they have developed better self-control (Lerner & Galambos, 1998), social expectations for mature behavior are greater, and they have a lot more experience in a wide range of ways. It should not be surprising, then, that the crash rate for younger novice drivers is higher than for older novices (Maycock, Lockwood, & Lester, 1991;Mayhew et al., 2003) and age is relatively more important in crash likelihood among the youngest drivers (McCartt, Mayhew, & Ferguson, 2005). Indeed, the entire thrust of prevention science is to delay the age of initiation and progression of risky behaviors such as smoking, drinking, marijuana use, and sexual intercourse because increased maturity that comes with age allows older teenagers to better deal with risk situations and with the risk behaviors themselves in ways that would tend to moderate their most negative effects. Similarly, delaying the age of licensure not only reduces exposure to driving, but also increases the likely level of maturity when a teen first begins to drive independently.

Because North American youth can and do get licensed at younger ages than youth in most other Western countries, age is a particular concern. Age may be a more important factor relative to inexperience among younger licensed drivers (McCartt et al., 2005). Mayhew et al. (2003) found that crash rates were higher among novices of younger ages for the first 5 months or so of licensure, at which point crash rates were about the same for each age group and declined at about the same rate. Age may be a relatively more important contributor to serious crashes (Williams, Preusser, Ulmer, & Weinstein, 1995). Meanwhile, in European countries, the typical age of licensure is 18 (17 in England). Notably, crash rates are highest right after licensure and decline rapidly for some months in every country studied, regardless of the age of licensure (OECD, 2006), demonstrating that inexperience and age are independent risk factors. While the pattern is similar in every country with high initial crash rates declining rapidly for a period of months, extent and duration of risks does vary by country somewhat. In the United States, Canada, and Australia, vast countries with relatively inadequate public transportation systems and young age at licensure, crash rates among teens are highest, while

in Norway and Sweden, where licensure typically occurs at age 18 or later, the crash rates for teenagers are much lower (Page, 2001). This research indicates that crash rates are highly sensitive to the age of licensure and that the earlier teens get licensed, the greater the crash risk for the age group.

While there is a great deal of individual variation, in general, risk taking increases greatly from early adolescence to late adolescence (Lerner & Galambos, 1998). Therefore, it is logical to conclude that risky driving behavior may account for some portion of the novice young driver problem (Williams, 2003). Risky driving includes speeding, close following, maneuvering with little gap in traffic, and the like. While this sort of risky driving is not uncommon among drivers of any age, on average, teens are more likely than experienced drivers to drive too fast for conditions, follow too closely, allow too little gap when changing lanes and turning, and violate traffic signs and signals (Jonah, 1986;Williams, 2003;Simons-Morton, Lerner, & Singer, 2005). Speed-related crashes are particularly associated with youthfulness (Williams, Preusser, Ulmer, Weinstein, 1995;Williams, 2003). However, it is not entirely clear the extent to which younger drivers get into more speed-related crashes because of how much they speed or because they are not as good as older drivers at driving while speeding or determining conditions under which speeding is less likely to result in a crash, which is as much a lack of good driving judgment as risk taking. Speeding may be more risky under certain conditions than others, a distinction that novices may not be as good at making as experienced drivers. Also, many teenage drivers do not drive faster than others and on average most drive at only somewhat greater speeds than experienced adults, except under certain driving conditions (Simons-Morton, Lerner, & Singer., 2005). Of course, certain youth (and adults) are more likely to engage in risky driving behavior owing to a propensity for sensation seeking and general risk taking (Jonah, 1986;Bingham, Shope, & Raghunathan, 2006).

Some aspects of risk taking may be understood in the context of inexperience as novices explore the vehicle's potential and their own. Novice teens may experiment with vehicle speed or turning radius, or engage in other risky driving behaviors mainly or in part to find out for themselves what it is like to go at that speed or drive in that manner under particular driving conditions. While experimental speeding certainly qualifies as risk taking, because it increases the risk of crashing, it is also a relatively normal part of the learning process (think of learning to ski or play tennis or chess). While teen drivers may be more likely to speed and engage in other risky driving behaviors, which makes driving more complex, reduces safety margins, and increases the likelihood of a crash, it is not clear the extent to which this behavior is risk taking in the sense of thrill seeking, and the extent to which it is normal learning behavior. This is not to say that such behavior is a good thing, only that trial and error is a predictable and necessary part of learning any complex skilled behavior.

Driving Conditions

As noted, not all driving conditions are equal and this is particularly true for inexperienced drivers. Night driving is a case in point because it is more dangerous per mile than daytime driving for drivers of all ages (NHTSA, 2005;Ulmer, Williams, & Preusser, 1997;Williams, 2003). However, the relative difference in crash rates at night compared to day, controlling for miles driven, is much higher for teens than for older drivers (Williams, 2003). Night driving is challenging for all drivers because visual feedback is so profoundly important for monitoring driving performance (Rockwell, 1972), and low light alters visual acuity and perception (Plainis & Murray, 2002), but may be particularly problematic for novice drivers because they lack experience driving at night and must devote considerable amounts of their cognitive capacity to manage the vehicle. While the visual acuity of young drivers at night tends to be quite good, night driving requires adjustments to the limitations night driving imposes, which can be expected to be better developed among experienced than novice drivers (Plainis &

Murray, 2002). Night driving may be particularly complicated for novices because it often involves teen passengers (Williams, 2003), whose presence increases risk.

As the number of passengers increases, so does the risk of a fatal crash (Chen, Baker, Braver, & Li, 2000;Preusser, Ferguson, & Williams, 1998). This risk is most pronounced among 16 and 17 year olds, present among drivers up to age 29, and absent among older drivers. The presence of teen passengers affects driving performance. Simons-Morton, Lerner, & Singer (2005) observed vehicles exiting high school parking lots, identified the driver and front seat passenger by sex and age (teen or older), and compared them to usual traffic on speed and following distance once they got up to speed on a nearby road. On average, teens drove a little faster and a little closer to the vehicle ahead than usual traffic, but in the presence of a male teen passenger, these risky driving behaviors were much worse for both male and female teenage drivers. In the presence of a female teen passenger, the speed and following behavior of male drivers resembled that of usual traffic. Teen passengers may have several possible effects on teen drivers, including directly encouraging teen drivers to engage in more or less risk. Teen passengers may also alter driver mood, perceived social norms, and acceptance of driving risks. Teen passenger presence may simply compete for teen drivers' cognitive attention, thereby reducing drivers' visual scan and attention to the driving situation, much in the manner that electronic devices are thought to reduce driving performance.

The Limits of Training

A logical conclusion to draw from the preceding discussion about the nature of novice teen driving risks is that better training and more supervised practice prior to licensure might improve independent driving performance. Hence, many teen driving advocates propose improvements in driver education and increases in supervised practice driving prior to licensure. It is logical that if teens lack certain driving performance skills, more and better training would help solve the problem. However, to date, driver education and parent supervised practice driving have not been shown to have any effect on independent driving experience (Mayhew and Simpson, 2002). It may be that the right configuration of driver education and supervised practice driving might produce safety effects, or it may be that these countermeasures may never have independent effects on safety. This is not to suggest that these activities are not valuable. Indeed, they are essential programs that effectively teach novices how to manage the vehicle. However, it may not be reasonable to expect these programs to provide safety effects even if they were greatly altered or extended because of their inherent limitations and because they do not get at the primary causes of the novice young driver problem.

Driver Education

Driver education is available in every U.S. state in one form or another, but it is not universally required, and most states provide alternatives for satisfying or opting out of driver education altogether. Nevertheless, most U.S. teenagers take some form of driver education that includes about 30 hours of classroom training and 6 hours of behind-the-wheel instruction, probably not nearly enough for most teens to develop adequate driving skills. Driver education is an essential part of teaching teenagers the rules of the road and vehicle operation, but provides only enough professional driver-supervised training to assure that the novice has developed basic driving skills. If the number of hours of professional training were greatly increased, increases in vehicle management skill of novices might be expected, but these effects might be somewhat limited because instructors would still exert great control over the driver, driving conditions, and the internal vehicle environment. Therefore, upon licensure teens would still have a great deal to learn from independent driving experience.

The lack of effects of driver education on safety outcomes is not due to the failure to look for them. Many studies have been conducted to determine such an effect, but no effects have been found (Vernick et al., 1999;Mayhew, Simpson, Williams, & Ferguson, 1998). In a recent review, Mayhew and Simpson (2002) concluded, "the review of scientific evaluations provided little support for the claim that driver education is an effective countermeasure." Some authors have called for higher order skills training to improve hazard detection and perceptions of risk (Berg, 2006), but there is no professional consensus on what might constitute an ideal driver education program and no studies have demonstrated that instruction improves safety-related driving performance. Indeed, research on the effects of driver education on driving skills and performance is lacking. This is not to say that training is not important, but that the expectation that training will provide safety effects after licensure may not be realistic.

Recently, some driving schools have been offering special courses, sometimes described as advanced skills training, usually devoted to teaching novices how best to manage the vehicle in a skid or to avoid striking another vehicle when stopping is not possible. On the surface this may seem like a good idea to many parents (and what teenager would not like to have the chance to put a car into a skid, just for the thrill of it?), but this approach presents its own set of problems. The premise of these programs is that novices should learn how to maneuver the vehicle so as to avoid a collision in situations where avoidance maneuvers might reduce the likelihood of a crash, as if improvements in vehicle manage might improve safety. The fallacy here is that safety can best be assured by avoiding near crash situations, not by the ability to maneuver the vehicle at the last minute to avoid loss of control in a skid. While useful skills for avoiding near crashes may exist and be teachable, there are no data to suggest this is so, and luck rather than physical skill would seem to the main difference between crashing and not crashing in such situations. Moreover, such training may suggest to teens that they can avoid crashes through last second evasive maneuvering, as found by Katila, Keskinen, Hatakka, and Laapotti (2004), making them less likely to drive so as to avoid such situations. Hence, advanced skills training may actually increase the number of near crash events requiring avoidance measures, which goes against the main thrust of prevention, which is to reduce exposure to such situations. The growth of these programs is a very frightening trend that suggests that the message has not yet been delivered that the requirements for safe driving are not so much physical as mental. Indeed, it has recently been established in the 100 car study that inattentiveness is single biggest predictor of a crash or near crash and that high speed and close following reduce reaction time (Neale, et al., 2006). Therefore, the way to avoid a crash is to pay attention to the road and moderate speed, and headway, and not to plan on avoiding a collision at the last second through evasive maneuvers that may be as likely to make matters worse than better.

Supervised Practice Driving

Surprisingly, there is no evidence that greater amounts of parent-supervised practice driving are associated with better independent driving performance and safety. Certainly, the more supervised practice driving novices receive, the better able they should be to manage the vehicle, the more experience they should have under a wide range of driving conditions, and the more time parents would have to impress their children with the importance of safe driving behavior. Also, given sufficient training, some aspects of driving performance such as visual scanning might improve and become somewhat automated. Moreover, the more supervised practice driving teens are required to have prior to licensure, the longer it takes to get licensed, the older and more mature they are at licensure, and the longer they are not exposed to driving, all of which reduces their risk of a crash (McKnight & Peck, 2002). In the United States, recent changes to licensing requirements in many states have increased the amount of supervised practice driving required, with some states requiring as much as 50 hours (Insurance Institute for Highway Safety [IIHS], 2005). Estimates of how much supervised practice driving teens

obtain range from 20-75 hours (Waller, Olk, & Shope, 2000;Goodwin, Waller, Foss, & Margolis, 2006). However, it is unclear how much or what type of supervised practice is needed. While a certain amount of parent-supervised practice driving is essential, the evidence suggests that usual amounts of supervised practice driving have no effect on crash rates during driving independently (McCartt, et al., 2003;Page, Ouimet, & Cuny, 2004). Only one study has shown a relationship between supervised practice driving and safety outcomes and it was conducted in Sweden where licensure occurs at age 18 or later after several years of supervised practice driving (Gregersen et al., 2000). The effects of supervised practice and older age at licensure could not be sorted out in that study.

There are a number of reasons that the safety benefits of parent-supervised practice driving are likely to be limited, regardless of amount and duration. When supervising their novice teen drivers, parents can be expected to maintain a high priority on safety, guiding the teen through certain driving situations, anticipating and warning of hazards, keeping internal vehicle environment free from distraction, and otherwise co-driving (Simons-Morton & Ouimet, 2006;Groeger, 2000, p. 96). Not surprisingly, parent supervised practice driving is very safe (Mayhew et al., 2003;Gregersen, Nyberg, & Berg, 2003), relative to the early period of independent driving when teens must first deal on their own with complex driving situations, often in the presence of in-vehicle distractions such as teen passengers and electronic device use.

While nearly everyone becomes a relatively competent driver in time, it appears that a lot of learning occurs during at least the initial 6 months or so of independent driving largely without continuing instruction and apparently regardless of the amount of pre-license supervised practice driving. Moreover, there are no clear guidelines on how parents should teach their teens, it is unclear how capable parents are at teaching driving skills and what types and amounts of supervised practice novices should have, it is unknown how much and what types of parent supervised practice teens experience prior to licensure, and the few efforts to increase the amount and type of supervised practice driving have not been shown to increase or improve supervision or safety outcomes (Chaudhary, Ferguson, & Herbel, 2004;Goodwin et al., 2006). The real advantages of an extended period of required parent-supervised practice driving, aside from its tendency to delay licensure, might be the increased opportunity for parents to emphasis attention to the road and inculcate favorable attitudes toward safety.

Effective Countermeasures

Graduated Driver Licensing (GDL) is a policy innovation now widely accepted in the United States, Australia, Canada, and other countries. Typically, GDL policies increase the period of the learner's permit. In the United States, GDL also restricts driving among novices under certain conditions such as night driving, thereby limiting exposure to the most dangerous driving conditions while teens gain experience and develop safe driving competence (Williams & Ferguson, 2002). GDL programs have effectively reduced motor vehicle crashes where adopted (Shope, Molnar, Elliot, & Waller 2003), and these policies enjoy wide public support (Waller et al., 2000;Williams, Ferguson, Leaf, & Preusser, 1998). However, the provisions of GDL range considerably from state to state, with some much stronger than others (IIHS, 2005). While driver education and GDL policies are institutionalized in most U.S. states and tacitly recognize the importance of parent involvement in teaching and managing novice teen drivers, parent involvement is not truly a systematic part of these programs. Nevertheless, GDL is largely dependent on parents to enforce its provisions (Foss & Goodwin, 2003).

Parents play an important role in the management of young drivers by determining when teens can test for a permit or license, supervising practice driving, enforcing GDL provisions (Beck, Shattuck, Raleigh, & Hartos, 2003), granting access to a vehicle, and setting additional limits

on their newly licensed teens (Simons-Morton & Hartos, 2003). Two lines of research are instructive with respect to the importance of parent involvement. The first examines the extent to which parent limits improve driving outcomes. The second set of studies examines the effects of interventions to increase parent limit setting.

The Effects of Parent Limit Setting

A number of observational studies have examined aspects of parent limit setting on novice teen independent driving outcomes. The research indicates that most parents set at least modest limits on their newly licensed teenagers, although these limits tend not to be strict or to be maintained for long (Hartos, Eitel, Haynie, & Simons-Morton, 2000). A recent review by Simons-Morton and Ouimet (2006) concluded that risky driving, traffic violations, and crashes are lower among teens whose parents set limits on their initial driving privileges. Several studies have found that teens whose parents imposed more strict limits on teen passengers and night driving reported less risky driving behavior (Hartos, Eitel, & Simons-Morton, 2002;Hartos, Eitel, & Simons-Morton, 2001) and fewer traffic violations and crashes (Simons-Morton, Hartos, Leaf, & Preusser, 2006a;McCartt et al., 2003). Parental limit setting was found to be higher in a state with GDL than in a state without GDL (Hartos, Simons-Morton, Beck, & Leaf, 2005). Parents and teens are not always in agreement on what the rules are, with parents generally perceiving stricter rules than teens (Beck, Hartos, & Simons-Morton, 2005). Hartos and colleagues (2004) conducted in-depth interviews with teens and parents and found that limit setting and enforcement was a relatively fuzzy activity, with parents and teens not always clear about what the rules were or the consequences of violations. It would seem that parent limit setting provides safety effects but could be greatly enhanced and improved. Given the rapid advance in technology for monitoring driving behavior, parents may be better able to manage their novice teen's driving if vehicles were equipped with such devices. However, at present, few of these devices are in general use and research is lacking on the efficacy of these devices in community settings.

Interventions to Increase Parent Limit Setting On Novice Teen Drivers

Other research has focused on methods for increasing parent limit setting. Several studies have been conducted to evaluate programs designed to increase parental management of novice teen drivers, as shown in Table 1. The Checkpoints Program has been found to be effective in each of three randomized trials. The first of these studies included a brief intervention conducted in one Maryland licensing office (Simons-Morton, Hartos, & Beck, 2004). Teens and parents were recruited at the time of teen provisional licensure. Each week was randomized to either the intervention or comparison condition. The families in the comparison condition received materials relevant to driving, but not to safety. Families in the intervention condition viewed a videotape in the waiting room and were provided with the Checkpoints Parent-Teen Driving Agreement and encouraged to negotiate and adopt the agreement right away. Intervention effects on increased parent limit setting were found through 9 months post-licensure (Simons-Morton, Hartos, & Beck, 2003). In the two other studies, families were recruited and randomized at the time of teen permit. Comparison families were mailed driving-relevant materials, while intervention families were mailed messages about teen driving risks and the relative advantages and normative nature of parent limit setting using the Checkpoints Parent-Teen Driving Agreement. Both studies demonstrated treatment effects on parent limit setting during the first 12 months after licensure (Simons-Morton, Hartos, Leaf, & Preusser, 2005;Simons-Morton, Hartos, Leaf, & Preusser, 2006b,c). Effect sizes on limit setting were modest, but in the larger of the two studies, intervention teens reported significantly less risky driving and fewer traffic violations (Simons-Morton et al., 2006b). In related research, the Checkpoints Program was shown to have significant effects on risk perceptions, expected limits, and outcome expectations for parent limits, which significantly mediated limit setting (Simons-Morton et al., 2004).

The only other randomized trial on this topic, conducted by Haggerty and colleagues (2006), evaluated the effect of home visits on novice teen driving outcomes with families who had been participating in the Raising Health Children Program since the children were in elementary school. The program, entitled “Safe Drivers Wanted” consisted of two intervention sessions, one just before teen licensure and one after, were designed to help families improve decision making skills related to driving and to specify family expectations in the form of written contract and a plan for monitoring compliance with these expectations. Controlling for numerous possible confounders in the analyses, the researchers reported an effect on the development of driving rules and adoption of a written contract. Further, compared to students in the comparison group, the students in the intervention group reported significantly fewer risky driving behaviors, including drinking and driving and riding with someone who had been drinking.

The relatively few studies conducted on this topic suggest that it is possible to increase parent limit setting on novice teen driving and that doing so improves driving outcomes. Families participating in these studies reported high levels of satisfaction with the interventions (Hartos, Nissen, &, 2001;Simons-Morton, Hartos, et al., 2005;Haggerty et al., 2006). While these efficacy studies provide a sound base, no effectiveness trials have been conducted and it is unclear the extent to which similar interventions could be developed into programs for broad scale implementation.

Discussion and Conclusion

The high rate of crashes during the first years of independent driving provides a compelling rationale for GDL provisions that set limits on the highest risk driving conditions among novice teenage drivers. Indeed, establishing a sound GDL policy is the single most important thing a state can do to reduce young driver crashes. However, despite the impressive safety effects of GDL, improved licensing policies alone will not fully resolve the young driver problem. Indeed, most if not all GDL provisions currently in place are not as strict as the data would suggest they should be. As argued earlier in this paper, novice drivers are neither accomplished nor safe for at least several years and thousands of miles of independent driving. The novice young driver problem is complicated and no one factor fully explains the very high crash risk of young drivers, but inexperience is the certainly one of the most important factors because safe driving competence is largely a matter of judgment and attention and less a matter of physical vehicle physical management skills. The data strongly suggest that novices for some period of time should not drive at night, with teen passengers, while using electronic devices, on high speed roads, or in otherwise complex driving situations so that they can develop competence and judgment through experience. GDL is a highly effective policy because it applies to all teens in a state and may suggest to parents and teens that novice teen driving may impose considerable risk. However, GDL policies vary from state to state and most are rated as acceptable, but few if any are rated good (IIHS, 2005). As the safety benefits of GDL policies become even better established, additional restrictions are likely to be adopted by some states. GDL is a policy innovation that has diffused rapidly (Simons-Morton & Winston, 2006), but it is unclear how rapidly and the extent to which additional GDL provisions, such as teen passenger and electronic device use, might become part of routine practice. Like other secondary enforcement policies, GDL policies are not well enforced (Goodwin & Foss, 2004), nor would it be desirable from a civil rights point of view for police to be allowed to stop young drivers to determine their licensure status.

A major effect of GDL may be to increase and extend parental management of novice teen drivers, or at least help increase parents' perceptions of risk and establish an environment that would encourage and empower parents to increased and extend limits on their novice teen driving (Simons-Morton & Hartos, 2003). As reviewed in this paper and elsewhere (Simons-

Morton & Ouimet, 2006), it has been adequately demonstrated that parent limit setting is effective and that it is possible through usual educational means to improve parent limit setting. Logically, additional improvements in safety could be expected if more parents could be encouraged to establish strict limits on novice teen driving. At present, increased parent management of novice young drivers is implied by GDL policies and strongly endorsed by policy statements on the subject (Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence, 2006), but there are few, if any, formal state programs to increase parental involvement. From a safety point of view, more should be expected of parents, but from a mobility point of view, it is understandable that most parents currently exercise relatively passive management practices. If parents are to be better involved in the solution to this problem transportation professionals as well as parents and teens must develop a better appreciation of the importance of inexperience and the crucial role of parents in reducing the crash risk of novice young drivers. Moreover, there is a need for further development and evaluation of state and national programmatic efforts to increase parent management of novice teen drivers. *Impact on Research, Practice, Policy, and Industry:* Advances in GDL and improvements in parent management practices have the potential to reduce crashes and save lives.

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Table 1

Interventions to increase parental driving supervision and management of independent driving

Study	Design, Sample, Purpose	Results
Independent Driving		
Simons-Morton, Hartos, Beck, 2003,2004	Design: Randomized trial with assessment at license, 1, 4, and 9 months N = 658 parent-teen dyads Purpose: Test the efficacy of the Checkpoints Program (video, parent-teen driving agreement, personal admonishment) delivered at time of teen licensure at DMV Intervention: Brief, personalized intervention at time of licensure; families viewed the video, were given the Driving Agreement, and encouraged to negotiate an agreement immediately	With Checkpoints Program • More strict driving limits - Night driving → 1 month - Passengers and high speed roads → 4 months - Overall limits → 9 months • Parents 3 times more likely to report adopting and maintaining a parent-teen agreement
Simons-Morton, Hartos, Leaf, Preusser, 2005	Design: Randomized trial with assessments at baseline, licensure, 1, 3, 6, and 12 months post-licensure N = 469 parent-teen dyads recruited at time teen obtained a learner's permit Purpose: Evaluate the efficacy of the Checkpoints Program Intervention: Persuasive newsletters and video mailed at 4-6 week intervals (learner's permit to 6 months post-licensure) designed to increase perceived risk and adoption and maintenance of the Driving Agreement	With Checkpoints Program • More strict driving limits → 12 months • Predictors of driving limits - Teen and parent expectations (+) - Male gender (+) - Limits at license (+)
Simons-Morton, Hartos, Leaf, Preusser, 2006a,2006b	Design: Randomized trial with assessments at baseline, licensure, 1, 3, 6, and 12 months post license N = 3743 parent-teen dyads recruited at time of teen permit Purpose: Test the effectiveness of the Checkpoints Program on teen driving outcomes (recruitment at permit) Intervention: Persuasive newsletters and video mailed at 4-6 week intervals (learners permit to 6 months post-licensure) designed to increase perceived risk and adoption and maintenance of the Driving Agreement	With Checkpoints Program • Driving limits (+) • Risk perceptions (+) • Outcome expectations (+) • Expected Limits (+) • Lower driving outcomes[a] at 12 months and indirect effect through limits[b] - Risky driving [a–b] - Violations[a–b] - Crashes[b]
Haggerty, Fleming, Catalano, Harachi, Abbott, 2006	Design: Randomized trial with assessment pre and post-licensure during 11-12th grade N = 924 teens followed since 2nd grade in Raising Health Children Study Purpose: Test the effectiveness of the Safe Drivers Wanted Program Intervention: Two home visits, one prior to licensure and one after licensure, with decision making skills training for parents and youth	With Safe Driver Wanted Program (+) Driving rules (+) Participating in setting driving rules (+) Written contract (+) Driven under influence of alcohol (−) Ridden in a car with other youth who had been driving (−)

DMV = Department of Motor Vehicles.