

The effect on teen driving outcomes of the Checkpoints Program in a state-wide trial

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Abstract

Crash rates among teenagers are highly elevated during the first months of licensure. Parent-imposed driving restrictions on initial driving privileges can reduce exposure to high-risk driving conditions, thus reducing crash risk while teens' driving proficiency develops. This report describes the effect of the Checkpoints Program on driving limits and outcomes. Connecticut teens who obtained a learners permit over a 9-month period were recruited, providing a final sample of 3743 who obtained driver licenses. Families were randomized to the intervention or comparison condition. Intervention families received by mail a series of persuasive communications related to high-risk teen driving and a parent-teen driving agreement, while comparison families received on the same schedule general information on driving and vehicle maintenance. Relative to the comparison group, teens and parents in the Checkpoints Program reported significantly greater limits on high-risk teen driving conditions at licensure, 3-, and 6-months post-licensure; and intervention teens reported significantly less risky driving at each reporting period. By the 12-month follow up teens in the intervention group were significantly less likely than those in the comparison group to have had a traffic violation. However, no treatment group effect was found for crashes. This is the first study to report significant effects on teen driving behavior and performance of education designed to increase parental-imposed teen driving limits.

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1. Introduction

The leading cause of injury and death among adolescents is motor vehicle crashes (Anderson et al., 2004). Crash risks are particularly elevated for teen drivers immediately upon licensure and decline steadily over the first 6 months and 1000 miles or more of licensure (McCartt et al., 2003; Mayhew et al., 2003), but rates remain high among teens and young adults well into their twenties relative to adult drivers (Williams, 2003). Young age and driving inexperience are important interrelated factors related to elevated novice driver crash risk (Williams and Ferguson, 2002), and higher levels of parent supervised practice driving during the learner's permit period do not appear to affect crash rates among newly independent teens (McCartt et al., 2003), probably because supervising parents limit driving

conditions and experimentation and provide substantial vigilance, which teens must learn to do on their own when they begin to drive independently. Indeed, a growing body of research indicates that compared with experienced drivers novice driver visual search and information processing strategies (Chapman et al., 2002) and their ability to safely divide attention between in-vehicle and out-of-vehicle tasks are less developed and adaptable (Olsen et al., 2005), underscoring the fact that vehicle management skills are necessary but not sufficient for safety.

Available research strongly suggests that teens must gain substantial independent driving experience before they become reasonably competent drivers, but the more they drive the greater their risk for a crash. This introduces the dilemma that novices must drive independently to gain proficiency, but the more they drive the greater the crash risk. The general solution to this dilemma is to encourage novices to drive only under less risky driving conditions, thereby reducing their exposure to the highest risk situations while they gain driving experience. The driving conditions that provide the greatest risks include driving

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with teen passengers (Chen et al., 2000; Preusser et al., 1998); at night (Doherty et al., 1998); during inclement weather; on congested, high speed roads (Williams, 2003); without using safety belts (Kahane, 2000); and in combination with drinking or drugs (Zador et al., 2000).

The prevailing policy solution to the adolescent driving dilemma in the United States is Graduate Driver Licensing (GDL) (Williams and Ferguson, 2002), which is designed to restrict novice teen driving under the highest risk driving conditions. GDL has been adopted by most US states and proven to reduce crash rates where evaluated (Shope and Molnar, 2003), however, few states have adopted policies that approach the ideal proposed by the Insurance Institute for Highway Safety (IIHS, 1999). One of the surprising findings about GDL is how popular it is with parents and how little resistance it has faced even from teens (Ferguson et al., 2001). Apparently, parents feel empowered by GDL legislation that facilitates their ability to manage their teens' driving. Clearly, with or without GDL, parents remain the true enforcers of teen driving privileges (Simons-Morton and Hartos, 2003; Preusser et al., 1985).

Most parents impose modest restrictions on their teenagers when they become licensed (McCartt et al., 2003; Hartos et al., 2000), and parental restrictions are negatively associated with risky driving (Hartos et al., 2000, 2001, 2002) and crashes and tickets (McCartt et al., 2003). In general, however, parental restrictions tend to be modest, briefly maintained, and largely unrelated to teen safety (Hartos et al., 2002, 2004). Because some level of parental restriction is common and parents have favorable attitudes toward policy limitations on teen driving, it may be possible to persuade parents to establish and maintain limitations on high-risk driving conditions among novice teen drivers (Simons-Morton and Hartos, 2003).

Our research group has conducted a series of studies designed to test the efficacy of the Checkpoints Program to increase parent management of novice teen driving. Two previously-conducted, small randomized trials have shown that it is possible to increase parental restrictions on teen drivers for up to 12-months post-licensure (Simons-Morton et al., 2003, 2005). The present study is a large, state-wide, randomized trial that is the first test of the effectiveness of the Checkpoints Program with respect to teen driving performance. In previous analyses of data from the present study, we demonstrated that exposure to the intervention increased perceived risk and expectations at licensure and changes in these cognitive variables mediated parent-imposed driving restrictions (Simons-Morton et al., 2006). The purpose of this study is to determine if there were significant treatment group differences on driving limits, risky driving, traffic violations, and crashes through 12-months post-licensure.

2. Methods

2.1. Participants

Data are from a randomized longitudinal trial in which teens less than 16 years 6 months and parents were recruited at offices of the Connecticut Department of Motor Vehicles after teens successfully obtained a learner's permit. At the time the

study was conducted (2001–2004), Connecticut required teens to hold the learner's permit for 6 months prior to testing for a license (4 months with completion of an approved driver education course). As shown in Table 1, of 4920 parent-teen dyads approached 4503 (93%) agreed to participate, and 4295 (95%) of these completed baseline surveys and were randomized to treatment conditions (2140 intervention; 2155 comparison). Of the 4295 dyads that completed baseline surveys, 3743 teens (87%) obtained a driver's license within 12 months of eligibility and were included in follow-up assessments. This report includes data from all five waves of data collection (i.e., baseline, license, 3-, 6-, and 12-months post license). The population of largely white (89%) middle class parents (median household income <\$70,000) included 63% mothers and 37% fathers. Among teen participants, 62% were younger than 16 years 1 month at permit and 59% were in the 10th grade.

2.2. Procedures

Study participants were recruited at all 11 full-time Connecticut Department of Motor Vehicle (DMV) offices and at one of the two part-time DMV offices that provide driver licensing services. Teens between 16 years 0 months and 16 years 6 months who successfully tested for a learner's permit and a parent were recruited and randomized to the intervention or comparison group. Over the study period, intervention families received by mail a videotape, a series of newsletters and a driving agreement designed to increase parental management of teen driving. Comparison families were mailed standard information about driving and vehicles, so that both groups received on the same schedule the same number of newsletters of similar design and quality. Parents and teens completed 25-min telephone surveys about teen driving at permit (baseline), license, 3, 6 months (teens only), and 12 months after license. Parental consent and teen assent were obtained according to procedures approved by the Institutional Review Board of the National Institute of Child Health and Human Development.

2.3. Checkpoints intervention

The goal of the Checkpoints Program is to increase limits on teen driving under higher-risk conditions. The delivery of the persuasive educational materials was timed to reflect the driving experience of the study participants. Soon after recruitment, families in the intervention group received a video, followed by a series of eight newsletters delivered by mail while the teen held a learner's permit. These materials were designed to establish the risks of teen driving, normative expectations for parental restrictions, and the benefits of adopting the Checkpoints Parent-Teen Driving Agreement as an effective means of reducing driving risks (Rogers and Prentice-Dunn, 1997). Just prior to the time teens were eligible to obtain a driver's license, intervention families were mailed a copy of the parent-teen driving agreement, which is designed to encourage parents to strictly limit teen driving under specific high-risk conditions, such as at night and with teen passengers, and to gradually allow more driving privileges as teens gain driving experience and show responsible driving

Table 1
Families involved in the Checkpoints Program: numbers and percentages

Status	Dyads						Teens						Parents						
	Total		Intervention		Comparison		Total		Intervention		Comparison		Total		Intervention		Comparison		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Eligible	4920	100																	
Recruited	4503	93																	
Declined	368	7																	
Participation	4503	100																	
Participated	4295	95																	
Did not	208	5																	
Baseline survey	4295	100	2140	50	2155	50	4295	100	2140	50	2155	50	4295	100	2140	50	2155	50	
Survey	4109	96	2056	48	2053	48	4259	99	2127	50	2132	50	4145	97	2069	48	2076	48	
No survey	186	4	84	2	102	2	36	1	13	0	23	0	150	3	71	2	79	2	
License status							4295	100	2140	50	2155	50							
Got licensed							3743	87	1868	43	1875	44							
No license							552	13	272	6	280	6							
License survey	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	
Survey	3101	83	1529	41	1572	42	3277	88	1617	43	1660	44	3184	85	1571	42	1613	43	
No survey	642	17	339	9	303	8	466	12	251	7	215	6	559	15	297	8	262	7	
3-month survey	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	
Survey	2798	75	1368	37	1430	38	3002	80	1474	39	1528	41	2918	78	1435	38	1483	40	
No survey	945	25	500	13	445	12	741	20	394	11	347	9	825	22	433	12	392	10	
6-month survey							3743	100	1868	50	1875	50							
Survey							2874	77	1411	38	1463	39							
No survey							869	23	457	12	412	11							
12-month survey	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	3743	100	1868	50	1875	50	
Survey	2463	66	1202	32	1261	34	2630	70	1292	35	1338	36	2656	71	1292	35	1364	36	
No survey	1280	34	666	18	614	16	1113	30	576	15	537	14	1087	29	576	15	511	14	

behavior. The agreement is designed to help parents establish teen driving rules, consequences for violating rules, and markers of experience and success. After teens obtained a driver's license, intervention families received nine follow-up newsletters over the next 6 months that encouraged them to maintain limits on teen driving.

2.4. Measures

Parent-imposed teen driving limits were reported by both parents and teens at license, 3-, 6-months (teens only), and 12-months post licensure. *Teen passenger limits* were assessed by asking how many teen passengers ("no limits" to "no teens") were allowed. *High-speed road limits* were assessed by asking the types of roads ("no limits" to "neighborhood only") teens were allowed to drive. *Night driving limits* were assessed by asking how late ("no limits" to "by 9 p.m.") teens were allowed to drive on weekend nights. Separate *composite scores for driving limits* were derived for parent and teen at each time point by adding the scores for teen passenger limits, high-speed road limits, and night driving limits. Higher scores reflect stricter limits.

Driving outcomes were reported by teens at 3-, 6-, and 12-months post-licensure. *Risky driving* was assessed by asking teens many times they drove in the past 7 days and of those times, how often they performed 19 risky driving behaviors.

Items included the following: drove 20 or more miles per hour over the speed limit; purposely tailgated or followed another vehicle very closely; switched lanes to weave through slower traffic; and cut in front of a vehicle to turn. Cronbach alphas for these items were .90 at 3 months, .91 at 6 months, and .89 at 12 months. Scale scores were used for risky driving at each time point by adding the scores across the 19 behaviors and dividing by the number of trips they reported making as the driver in the past 7 days, thus, producing an average number of risky driving behaviors per trip. Teens also reported the number of times over their first 12 months of driving they were stopped by law enforcement for a *traffic violation* and the number of *crashes* in which they were involved as the driver.

2.5. Analysis

Chi-square and *t*-test analyses were used to determine differences in family demographics between teens in the intervention group and those in the control group after licensure, and between teens who completed surveys and those who did not. Chi-squares and *t*-tests were conducted to assess treatment group differences for driving limits (teen passenger limits, night driving limits, high-speed road limits, and composite scores for driving limits) at license, and 3, 6, and 12 months; for risky driving at 3, 6, and 12 months; and for tickets and crashes over the first 12 months of licensure.

3. Results

3.1. Survey completion

Similar numbers of parents and teens completed surveys at license, 3, 6, and 12 months in the intervention and comparison groups (see Table 1). Families in the two treatment groups were comparable on demographic variables. However, families who did not complete license or follow up interviews were more

likely to have male teenagers, older teenagers at license, divorced parents, less-educated parents, younger parents, and minority status.

3.2. Driving limits and treatment group

Table 2 shows driving limits at each time point as reported by teens and their parents. The range for each variable is presented along with the means and standard deviations for each group and

Table 2
Treatment group differences: unadjusted means and *t*-test results

Variables ^a	Range	Intervention group			Comparison group			<i>t</i>
		<i>N</i>	<i>M</i>	S.D.	<i>N</i>	<i>M</i>	S.D.	
Teen Passenger limits								
Teen, license	0–4	1582	2.01	1.38	1624	1.85	1.41	3.23
Teen, 3 months	0–4	1464	1.46	1.29	1520	1.40	1.28	NS
Teen, 6 months	0–4	1411	1.17	1.21	1463	1.08	1.21	2.02
Teen, 12 months	0–4	1286	.89	1.11	1336	.91	1.13	NS
Parent, license	0–4	1547	2.64	1.10	1581	2.57	1.08	1.92
Parent, 3 months	0–4	1425	2.19	1.11	1475	2.15	1.13	NS
Parent, 12 months	0–4	1281	1.62	1.10	1358	1.66	1.11	NS
Night driving limits								
Teen, license	0–4	1546	1.93	1.23	1597	1.71	1.23	4.85
Teen, 3 months	0–4	1456	1.45	1.08	1507	1.34	1.06	2.78
Teen, 6 months	0–4	1409	1.19	.99	1462	1.09	.97	2.84
Teen, 12 months	0–4	1281	.78	.87	1319	.78	.89	NS
Parent, license	0–4	1498	2.34	1.18	1549	2.25	1.20	2.24
Parent, 3 months	0–4	1419	1.80	1.08	1467	1.77	1.08	NS
Parent, 12 months	0–4	1280	1.14	.92	1355	1.14	.93	NS
High-speed road limits								
Teen, license	0–4	1589	.98	1.20	1634	.75	1.11	5.58
Teen, 3 months	0–4	1469	.73	1.06	1523	.55	.97	4.85
Teen, 6 months	0–4	1411	.55	.95	1463	.43	.87	3.59
Teen, 12 months	0–4	1291	.36	.76	1333	.31	.73	NS
Parent, license	0–4	1556	1.99	1.22	1596	1.82	1.28	3.79
Parent, 3 months	0–4	1435	1.51	1.25	1483	1.35	1.29	3.53
Parent, 12 months	0–4	1292	.90	1.14	1364	.81	1.11	1.93
Composite driving limits								
Teen, license ^b	0–12	1528	4.89	2.78	1581	4.32	2.69	5.78
Teen, 3 months ^b	0–12	1446	3.63	2.46	1496	3.27	2.36	3.96
Teen, 6 months ^{b,c}	0–12	1409	2.91	2.25	1462	2.60	2.18	3.84
Teen, 12 months ^{b,c}	0–12	1275	2.04	1.95	1315	2.00	1.94	NS
Parent, license ^{b,c,d}	0–12	1490	6.97	2.50	1535	6.62	2.45	3.84
Parent, 3 months ^{b,c,d}	0–12	1409	5.50	2.41	1459	5.28	2.39	2.45
Parent, 12 months ^{c,d}	0–12	1270	3.65	2.21	1349	3.61	2.22	NS
Risky driving^e								
Teen, 3 months	0–11.50	1339	2.38	2.09	1347	2.52	2.06	–1.82
Teen, 6 months	0–12.08	1262	2.62	2.11	1322	2.81	2.23	–2.27
Teen, 12 months	0–12.80	1120	2.76	2.37	1135	2.95	2.46	–1.85
Traffic violations								
Teen, over 12 months ^f	0–7	1474	.40	.80	1528	.46	.84	–2.09
Involved in crashes								
Teen, over 12 months ^g	0–8	1474	.47	.71	1528	.48	.72	NS

NS: non-significant; all other *p*'s < .05 unless otherwise indicated.

^a Parent reports not collected at 6 months.

^b Limits more strict for female than male teens (*p* < .05).

^c Limits more strict for nonwhite than white (*p* < .05).

^d Limits more strict for younger teens (*p* < .05).

^e Risky driving greater for males than females at all time points (*p* < .01).

^f Violations greater for males than females (*p* < .01).

^g Crash involvement great for females than males (*p* < .05).

assessment period. The means for parent and teen reports for teen passenger limits, night driving limits, high-speed road limits, and composite scores for driving limits were relatively low. Neither parents nor teens reported the strictest possible limits at license, and limits reported by both parents and teens were highest at license and declined steadily through 12 months. In addition, parents reported significantly greater limits for teen passengers, night driving, high-speed roads, and composite limits at license, 3, and 12 months than did their teens (all p 's < .05; not shown). No treatment differences in reported miles driven were found.

As shown in Table 2, there were treatment group differences on each of the specific limits, which varied by teen and parent report and reporting period. Limits on teen passengers differed significantly by treatment group at license and 6 months for teen reports, and at license for parent reports. For night driving limits, teen reports at license, 3, and 6 months differed significantly by treatment group, and parent reports differed significantly at license only. Scores for high-speed road limits differed significantly by group at license, 3, and 6 months for teen reports and at license, 3, and 12 months for parent reports.

All teen and parent composite scores for driving limits differed significantly by treatment group through 6-month limits, with intervention group parents and teens reporting stricter limits than comparison group parents and teens. In addition, composite scores for driving limits were more strict for female than male teens for both teen and parent reports and at each time point, except for 12-month parent reports (all p 's < .05). Composite driving limits were stricter for non-white than white at 6- and 12 months for teen reports and at each time points for parent reports. Whereas teen reports did not differ by age at license, parent reports at each time point did, with younger teens at license having stricter limits than did older teens.

3.3. Driving outcomes and treatment group

Teenagers reported a range of 0–13 risky driving behaviors per trip. The following risky driving behaviors are ordered according to the range of percents of teens reporting them at each time point: went through an intersection when the light was yellow or just turning yellow (86–90%); exceeded the speed limit in residential or school zones (76–80%); drove 10–19 miles per hour over the speed limit (61–69%); read, ate, talked on a cell phone, put on makeup, physically interacted with passengers, or other such activities while driving (59–73%); went through a stop sign without stopping completely (49–59%); switched lanes to weave through slower traffic (46–55%); purposely tailgated or followed another vehicle very closely (21–26%); cut in front of a vehicle to turn (21–26%); drove in a way to show off to other people (16–18%); drove without wearing a seat belt (16–21%); raced another vehicle, even just for a short distance (16–18%); made an illegal U-turn (18–22%); and drove after drinking alcohol or using illegal drugs (7–9%).

As shown in Table 2, the average number of risky driving behaviors per trip were 2.45 (S.D. = 2.08) at 3 months, 2.72 (S.D. = 2.17) at 6 months, and 2.85 (S.D. = 2.42) at 12 months. As indicated in Table 2, teen reported risky driving behaviors differed significantly by treatment group at 3, 6, and 12

months, with comparison group teens reporting more risky driving behaviors than did intervention group teens. In addition, males reported more risky driving behaviors at each time point than did females (all p 's < .01), but reports did not differ by race/ethnicity or age.

Shown in Table 2, teens reported a range of 0–7 traffic violations ($M = .43$, S.D. = .82). Overall, 29% of teens (875 out of 3002) reported being pulled over by the police for a traffic violation one or more times during their 1st year of licensure. As indicated in Table 2, traffic violations differed significantly by treatment group. Of the teens with traffic violations, 54% were in the comparison group. Also, comparison group teens reported earlier violations than did intervention group teens (not shown). Males reported almost twice as many violations as females ($p < .01$).

Teens reported 0–8 crashes ($M = .47$, S.D. = .72) over 12 months. Overall, 38% of teenagers (1128 out of 3002) reported being involved in one or more crashes as the driver during their first year of licensure. As shown in Table 2, being involved in crashes did not differ by treatment group. Overall, female teens reported significantly more crashes than did males ($p < .05$), but crashes did not differ by treatment group, race/ethnicity, or age at license.

4. Discussion

This research examined the effects of the Checkpoints Program on parent-imposed teen driving limits and driving outcomes through the 1st year of teen independent driving. Relative to the comparison group, intervention parents reported greater limits through 3-months post-licensure and teens reported greater limits through 12-months post-licensure. Significant treatment group differences favoring the Checkpoints Program were also found for teen risky driving behavior and traffic violations. This is the first study to demonstrate effects on driving outcomes of a behavioral intervention to increase parental management of novice teen driving.

The treatment group effects on teen driving limits are consistent with those previously reported for similar types of interventions, confirming the findings of two previous small studies (Simons-Morton et al., 2003, 2005). The findings from this large, state-wide study confirm the findings from previous trials that it is possible through passive persuasion methods to increase and maintain parent-imposed driving limits. Because there was no treatment difference in the amount teens reported driving, the intervention effect was due to limits on driving under certain risk conditions. The modest effects of intervention on teen passenger limits (significant at license and 6 months among teens and only at license among parents) and night driving (significant among teens through 12 months but only at license among parents) are disappointing because these are the two highest-risk conditions. The inconsistency in reports of parents and teens is also a concern because the Checkpoints Program was designed to increase communication between parents and teens about driving privileges through adoption and use of the Checkpoints Parent-Teen Driving Agreement. While parent-teen driving agreements or contracts would appear to be a good way for parents to estab-

lish and maintain driving limits and parents seem to like them (Hartos and Simons-Morton, 2001), a great deal more needs to be learned about how to improve their effects, how parents use these agreements, and how novice teens negotiate new driving privileges.

Among the study strengths are a large, state-wide sample, randomized design, and second generation intervention. However, generalization of the results is limited by the sample being drawn from a single state with a relative high average income. While the results are promising, additional research is needed to determine how best to improve the effectiveness of programs to increase parental management of novice teen driving, particularly limits on teen passengers and night driving. Because intervention effects were greatest at licensure, with limits gradually declining over the 12-month assessment period, interventions should emphasize initial driving restrictions.

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