

THE ROLE OF PARENT FEEDBACK AND VEHICLE STATUS ON SUPERVISED DRIVING IN THE MINNESOTA TEEN DRIVER STUDY

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Summary: This paper provides a brief quantitative and qualitative examination of supervised driving among teens in three study groups of the Minnesota Teen Driver Study. A Control group (N=92) served as the baseline comparison group against which the effects of two treatments were examined. The first treatment group received in-vehicle coaching about risky driving via a Teen Driver Support System (Partial TDSS), whereas the second treatment group received the in-vehicle coaching from the same system, which also reported monitored risky behaviors back to parents (Full TDSS). Overall, there were significant differences in the average number of miles driven by teens in the study groups. Average mileage driven also differed depending on vehicle status (shared vs. unshared). Teens in the Control and Partial TDSS groups who did not share a vehicle drove significantly more miles than teens in the Full TDSS group. Supervised driving patterns across the study groups as well as for shared versus unshared vehicles were also different. In general, the presence of parent feedback appeared to mediate how frequently teens were supervised throughout the study, regardless of vehicle status. However, parents, in general, allowed their teens to drive more frequently in risky conditions at the end of the study compared to the beginning.

OBJECTIVES

Setting limits and monitoring teen drivers' behavior through parental involvement can be a significant contributor to increasing safe driving habits among teens (Simons-Morton, 2007). Parent management during the early phases of independent driving improves safety; however, most supervised practice for teen drivers occurs during their learner permitted period which has shown mixed results on independent teen driving safety (Simons-Morton & Quimet, 2006). In general, parents set fewer limits on risky independent driving conditions (e.g., driving after dark) compared to driving purposes (e.g., school activities; Simons-Morton & Ouimet, 2006). For example, driving on high-speed rural roads to attend a school event is likely more dangerous than driving to a friend's house in town, yet parents are more likely to restrict the latter. Supervision of a teen's driving can be supported by the presence of in-vehicle monitoring (e.g., McGehee et al., 2007) yielding the most safety benefits when paired with parental guidance (e.g., Simons-Morton et al., 2013). Feedback from an in-vehicle system enhances parents' ability to discuss safety and set limits with their teen (Prato et al., 2010; Simons-Morton et al., 2013); however, parents often fail to follow up, check on, or correctly interpret feedback results (e.g., Farmer et al., 2010). Providing frequent, real-time feedback, through text messaging (e.g., Creaser et al., 2011) or weekly emails, might be more useful than an online website that requires a parent to login.

Running on a smartphone mounted on the vehicle's dashboard, Minnesota's Teen Driver Support System (TDSS) provides critical safety information in real-time to the teen driver inside the vehicle and reports monitored behaviors to parents. The system monitors speeding, stop sign violations, provides curve notification, and monitors kinematic driving events (i.e. hard braking and cornering). For this study, additional after-market sensors were included to also capture driver seat belt status, number of passengers, and total vehicle mileage driven (to be compared to the phone's miles for shared vehicles). The in-vehicle system alerted teens when they engaged in speeding, stop sign violations, seatbelt non-use, excessive maneuvers, curfew violations, and the presence of passengers. The TDSS also capitalizes on the important role of parents by immediately sending them reports of risky driving behavior via SMS text messaging, rather than relying on website monitoring, which has been shown to be ineffective in garnering parental attention (Farmer et al., 2010). This study also issued a weekly email to parents summarizing risk events (e.g., speeding) and safe driving behaviors (e.g., 100% seatbelt use).

This paper describes how parents in each of three study groups supervised their teen's driving during a 12-month study using self-reported data and vehicle mileage. The Control group participated in data collection only, while the two treatment groups consisted of an in-vehicle coaching group (Partial TDSS) and an in-vehicle coaching group with supplemental parent reporting (Full TDSS). This analysis considers how sharing a vehicle with a family member might influence amount of driving and supervision while driving. It was expected that parents in the Full TDSS group would exert more supervision over their teen's driving because they had access to near real-time feedback about risky behaviors. It was also expected that the Control group (with no interventions) would experience lower levels or different types of supervision for their driving. It was also expected that shared vehicle status would result in more opportunities for supervised driving compared to teens who did not share a vehicle with another driver.

METHODS

Participants

Overall, 300 novice teen drivers (recruited before licensure) and 298 consenting parents (2 sibling pairs participated in the study with one parent) were recruited into one of three groups to participate in a 12 month study to collect data on naturalistic teen driving. Participants were placed into either a Control group, an in-vehicle feedback group (Partial TDSS), and a group who received in-vehicle feedback and notification to parents when risky behaviors were documented (Full TDSS). There were 18 communities from which participants were recruited. Communities were matched on criteria such as median household income, population size, and commuting rates in sets of three with one community in each set assigned to each study group, resulting in six communities per group. Approximately 10-20 teens were recruited from each community (range 8-23). None of the three groups were informed about the existence of the other study groups until they were debriefed at the end of the study period.

The final teen sample consisted of 274 teens and one consented parent/guardian per teen (see Table 1). Participants were assigned to either the Control (N=92), Partial TDSS (N=92), or Full TDSS (N=90) group based on their recruited community. There were no statistically significant differences in gender or mean age between groups ($p>0.05$). Approximately 1/3 of each study

group consisted of teens who did not share a vehicle with another driver (See Table 2). Parents/guardians consisted of 203 females and 69 males ranging in age from 31-62 (see Table 3). There was a statistically significant difference in the number of male participants in the Full TDSS group compared to the Control and Partial TDSS groups ($\chi^2=8.09$, $p=0.018$).

Table 1. Teen sample age and gender descriptives

	N	Mean Age (<i>SD</i>)	Males	Females
Control	92	16.02 (0.15)	43	49
Partial TDSS	92	16.04 (0.29)	42	50
Full TDSS	90	16.03 (0.18)	45	45
Total	274	16.03 (0.22)	130	144

Table 2. Teens' vehicle status (shared vs. unshared)

	Unshared	Shared
Control	36	56
Partial TDSS	31	61
Full TDSS	31	59
Total	98	176

Table 3. Parent/guardian sample age and gender descriptives

	N	Mean Age (<i>SD</i>)	Males	Females
Control	92	45.91 (5.63)	22	70
Partial TDSS	91	46.76 (5.52)	15	76
Full TDSS	89	46.18 (5.59)	32	57
Total	272	46.29 (5.57)	69	203

Data Collection

Data for each participant begins on day 1 and is grouped by each 7-day period, resulting in 52 weeks of data for participants who completed the study. Variables related to risky driving behavior (i.e., speeding) were identified a priori and were collected by a smartphone data collection application. The one exception was Total Miles, which represented all miles driven by the instrumented vehicle each week regardless of whether the phone software was active. This was the only data collected by the in-vehicle unit. For final analyses, data were aggregated either by 4-week time periods or across the entire study depending on the analysis.

Measures

Electronic surveys were sent to participants to query demographics, self-reported frequency of driving, self-reported supervised driving by parents or other adults, and perceptions of driving risks in the previous month. Surveys were administered to teens and parents at Enrollment, Month 1, Month 6, and Month 12.

RESULTS

Survey data indicated that mothers and fathers were fairly equally represented across the groups as the primary parent doing the teaching during the learner driver phase (see Table 4). Parent and

teen self-reported rates of parental supervision in the first year of driving were compared between groups as well as by whether teens had access to a vehicle as a primary driver (unshared vehicle) versus having to share a vehicle with another family member (shared).

Table 4. Teens’ self-reported driving instruction prior to licensure (who taught teen to drive)

	Mother	Father	Female Guardian	Male Guardian	Older Sibling	Other Adult	Equal Time Mom and Dad
Control	51%	45%	1%	0%	0%	1%	1%
Partial TDSS	46%	51%	1%	1%	1%	2%	1%
Full TDSS	42%	56%	0%	1%	0%	1%	6%
All	47%	50%	1%	1%	0%	2%	3%

Parent-Reported Supervision of Teens’ Driving

The survey data indicated that the frequency of supervision of the teens’ driving was dependent on their vehicle status, with teens who shared a vehicle having parents who reported supervising their driving more frequently (see Figure 1). Interestingly, parental supervision in the Full TDSS group was lowest at Month 1 (17%) compared to the Control (31%) and Partial TDSS (31%) groups for shared vehicles, but was higher than the other two groups for Month 1 (13% versus 9% for Control and 3% for Partial TDSS) for unshared vehicles. Frequent supervision dropped across all groups, regardless of vehicle status, from Month 1 to Month 12. Shared vehicle status showed that some teens at Month 12 were still receiving more frequent supervision than teens with unshared vehicles. It is not surprising that vehicle status plays a role in supervised driving as sharing a vehicle with a parent increases the opportunities for supervised driving to occur.

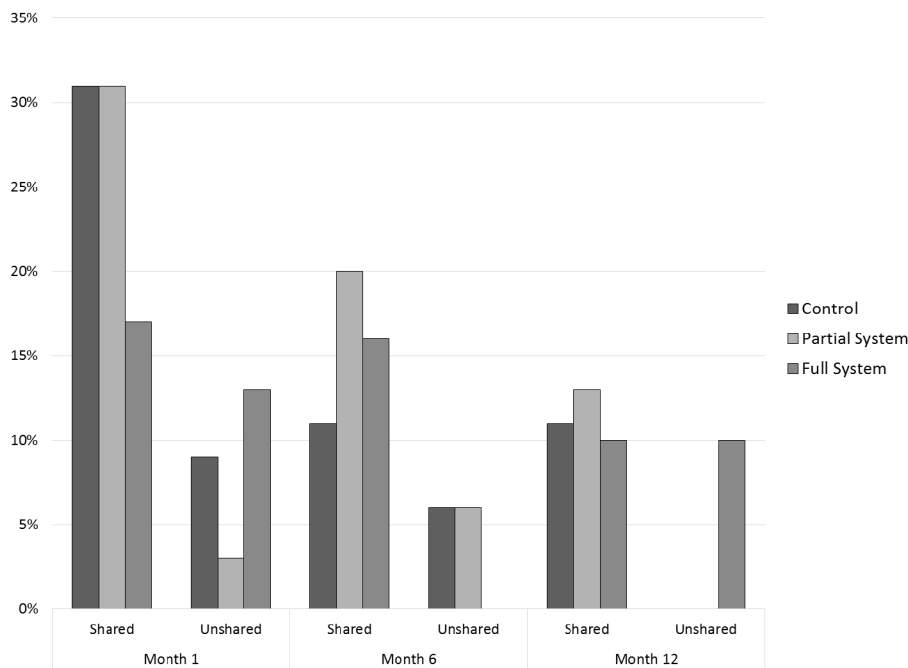


Figure 1. Percentage of parents reporting how frequently they supervised their teen’s driving more than 50% of the time in the previous month for study group and by vehicle status

Teen-Reported Unsupervised Driving for Conditions and Purposes

Across all groups, teens were least restricted from driving unsupervised on high-speed roads (speed limit greater than 55 mph) and driving with one teen friend as the only passenger. For these two conditions at Month 1, at least 50% of teens in all groups reported engaging in these two behaviors very often. In Month 12, teens in all groups reported driving unsupervised in all conditions very often compared to Month 1, including driving after dark, without telling a parent who they are riding with, without telling a parent when they would return, in bad weather, and between 9 p.m.-midnight. This suggests that teens were given increased freedom over when and with whom they drove over the first year.

Teens were also surveyed about how frequently they were allowed to drive unsupervised for certain purposes (e.g., to and from work and school, to go to evening/weekend school activities, to run family errands, to friends' houses, go out on weekend nights, or go to entertainment places). Responses to driving purposes were fairly consistent between groups. Participants primarily reported driving for the purposes of going to and from school, and going to and from work very often compared to all other purposes. In Month 12 teens reported driving for specific purposes more often than they did in Month 1.

Influence of Study Group and Vehicle Status on Mileage Driven

Vehicle status and study group also played a role in how many miles teens drove. Mileage driven was aggregated across the entire study period for each group and a between-groups analysis of variance (ANOVA) for study group and for vehicle status was conducted. The Control group ($M=75.96$; $SD=42.24$) drove, on average, significantly more miles over the study time period than the Partial TDSS ($M=57.97$; $SD=36.14$) and Full TDSS groups ($M=50.86$; $SD=35.69$), $F(2,271)=10.497$, $p<0.001$. It is possible, however, that these lower rates of driving in the Partial TDSS and Full TDSS were a result of an imposition of greater driving limits due to greater parental awareness through the presence of the feedback system. There was no statistically significant difference between the Partial TDSS and Full TDSS group for mileage driven across the study.

For the Unshared vehicle data, the differences were more pronounced between the Control and Partial TDSS groups compared to the Full TDSS group. There was a statistically significant difference in average mileage between the Control ($M=92.35$; $SD=50.92$) and Partial TDSS ($M=79.98$; $SD=40.00$) groups compared with the Full TDSS group ($M=48.19$; $SD=23.60$), $F(2,95)=10.35$, $p<0.001$, but no difference between Control and Partial TDSS, which differs for total group mileage. When just the Shared Vehicle data are considered, the differences between groups are similar to overall group mileage, with the Control group ($M=65.42$; $SD=31.82$) driving statistically significantly more miles on average than the Partial TDSS ($M=46.78$; $SD=28.35$) and the Full TDSS groups ($M=52.26$; $SD=34.71$), $F(2,173)=4.58$, $p=0.012$. It is also possible that geography or community characteristics unrelated to the study (i.e. the geographical layout or driving culture influence greater driving) affected mileage in the groups, but the data regarding unshared vehicle mileage appears to offset this assumption because the differences in mileage between the Control group and Partial TDSS group disappear when teens do not share a vehicle with another family member.

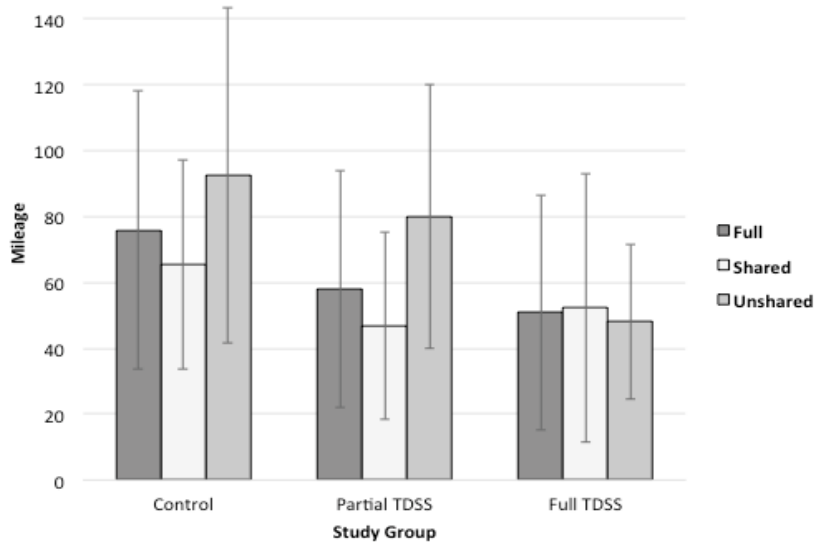


Figure 2. Mileage differences of shared and unshared vehicles

CONCLUSIONS

The reported frequency of supervised driving combined with the mileage differences of the Full TDSS group between Shared and Unshared Vehicles indicated that parents in the Full TDSS group might have 1) limited how frequently their teens drove regardless of vehicle status and, 2) when they did let their teens drive, they engaged in less frequent supervised driving early on, possibly due to knowing the system would report behavior. Because only one parent per teen was consented into the study, subjective data related to parental feedback is potentially missing from another parent or adult who continued to be involved in supervising or managing their teens' driving. There were significantly more male parents consented into the study for the Full TDSS group and the utilization of system feedback could vary by gender. However, the Full TDSS group also reported fathers were more frequently involved in teaching teens to drive (56% vs. 51% for Partial TDSS and 45% for Control group). At the end of the study, it was determined that many parents reported answering survey questions using input from the non-consented parent. The results of this study also found that teens were less restricted for certain risky driving conditions (e.g., on highways) early after licensure, compared with for purposes, as expected from previous research (e.g., Simons-Morton, 2006).

Overall, teens sharing a vehicle with another family member drove fewer miles, on average, than those who did not share a vehicle. This can be attributed to the fact that teens who did not share a vehicle naturally would have more access than a teen with a shared vehicle. However, there appears to be an effect of having the Full TDSS feedback system, particularly for teens with Unshared Vehicles, in reducing the average number of miles driven in this group regardless of vehicle status. The average mileage of the Full TDSS group was not statistically different depending on vehicle status (e.g., shared vs. unshared). In contrast, teens in the Control and Partial TDSS groups who did not share a vehicle with a parent or sibling drove, on average, *more* miles than when they shared a vehicle with someone else. This indicates a potential effect of the

system in encouraging parents to more frequently limit their teen's driving throughout the entire study period.

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