



## RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,  
RESEARCH & INNOVATION

## TECHNICAL SUMMARY

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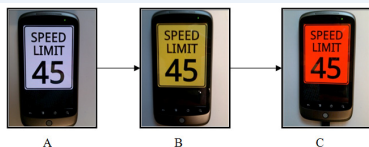
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### Principal Investigators:

Max Donath, Janet Creaser,  
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University of Minnesota

### PROJECT COST:

\$500,000



The system displays speed limits using white signs when the vehicle is traveling within the speed limit, and yellow or red signs when it exceeds the speed limit by less or more than 5 mph.

# Improving the Safety of Teen Drivers with Monitoring Technologies

## What Was the Need?

Motor vehicle crashes are the leading cause of teen deaths in the United States. One promising method for reducing these crashes is the use of graduated driver licensing programs, which restrict teen drivers from behaviors such as night driving or unsupervised driving until they have gained more experience. These licensing programs can be difficult to enforce, so researchers have developed monitoring technologies that can be used to increase compliance and improve teens' driving by alerting them to risky behaviors in real time. One such technology is the Teen Driver Support System, or TDSS, designed by the Intelligent Transportation Systems Institute at the University of Minnesota. TDSS software can run on a teen's smartphone while it is mounted on the car dashboard. This technology uses the phone's built-in accelerometer and GPS to monitor compliance with speed limits and STOP signs, hard braking and cornering, driving location and time of day, number of passengers and seat belt use. During use, the TDSS also restricts the phone's text messaging and calling features.

If the system detects risky or illegal driving behaviors, it alerts teens with visual and auditory messages, and if these warnings are ignored, it alerts parents via text message. Parents also have ongoing access to a Web-based report of the teen's recent and historical driving behaviors, allowing them to track improvements and engage their teens in conversations about their driving.

The TDSS is currently in prototype form, and research was needed to evaluate the usability of its functions and interface so that they could be optimized before further field testing.

## What Was Our Goal?

The purpose of this study was to evaluate how teens and parents perceived the usability of the TDSS.

## What Did We Do?

Researchers began by recruiting 30 teen-parent pairs to participate in the usability study. Teens (16 to 17 years old) had possessed driver's licenses for less than two years, and since beginning driving had been involved collectively in 13 at-fault crashes and several traffic violations.

Researchers introduced parents and teens to the TDSS via a short presentation and took them on a 10-minute demonstration drive in which one researcher drove a vehicle along a predetermined route while another explained its reminders and warnings.

After the demonstration, parents returned to a conference room to review a parental summary website, while teens accompanied by a researcher drove a 30-minute route involving town and rural roads with an active TDSS to experience how the system worked during regular driving. Parents and teens then completed demographic, driving behavior and usability questionnaires that included questions about the system's various functions and interfaces as well as the system as a whole.

*The Teen Driver Support System is designed to reduce teen car crash fatalities by providing real-time, in-vehicle feedback to teens about risky driving behaviors and immediately communicating with parents if these behaviors continue.*

*“This system has the potential to significantly improve the driving safety of teens by reducing crashes and fatalities.”*

—Susan Sheehan,  
ITS Program Manager,  
Mn/DOT Office of Traffic,  
Security and Operations

*“This is the only technology of its kind to provide such in-vehicle coaching to teens on a wide variety of driving behaviors as well as the ability for parents to monitor their teens’ driving in real time.”*

—Janet Creaser,  
Research Fellow,  
HumanFIRST Program,  
University of Minnesota

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The system's visual feedback interface is designed around simple, easy-to-understand graphical elements. Teens preferred these visual messages to auditory alerts, which could be distracting.

### What Did We Learn?

Most teens said the TDSS could help them learn to drive more safely. They rated all but one of the functions favorably, reporting that recommended curve speeds were too low and least likely to be obeyed. Some teens also thought that STOP sign and speeding thresholds were too low, and found some auditory messages distracting, preferring visual messages.

Teens' biggest concern about the system was privacy. They liked that they could prevent parental notifications by modifying their behavior in time, but they also indicated that these notifications were critical to motivating them to change their behavior. While most teens thought the system would have a positive effect on their discussions with parents about driving, some worried it could become a source of conflict.

Parents were very positive about the TDSS and its potential to improve the driving habits of their teens. While they had favorable opinions of most functions, they considered the passenger reminder feature less reliable because it could not distinguish authorized from unauthorized passengers. Parents did not consider most system functions to be an invasion of their teen's privacy and said they would pay a nominal monthly fee for it.

### What's Next?

Researchers plan to conduct a large-scale field test of the TDSS during which teens will be evaluated while using the system in daily driving for several months. Before this test, researchers recommend redesigning the current system based on parent and teen feedback from this study. Specifically, some messages should be shortened or eliminated to reduce distraction, and thresholds for speeding and other factors should be modified for the best balance of usability and safety. Researchers also recommend updating the parental website to include more access to informational tools they can use to better discuss driving risks with their teens.

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*This Technical Summary pertains to Report 2011-13, “Usability Evaluation of a Smartphone-Based Novice Teen Driver Support System (TDSS),” published June 2011. The full report can be accessed at <http://www.lrrb.org/PDF/201113.pdf>.*