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16. Abstract

This study compared alternative seat belt reminder systems and displays to determine which systems and components drivers find to be most effective, attention-getting, annoying, and desirable. Forty-eight individuals who were self-reported seat belt nonusers completed a three-part study. First, participants drove a vehicle along a designated route as they experienced five seat belt reminder systems. Second, while the vehicle was stationary, participants experienced 27 individual auditory and visual seat belt reminder display components. Third, participants described features that they would like to see in an "ideal" enhanced seat belt reminder system. All of the enhanced seat belt reminder systems were perceived to be more effective in encouraging seat belt use than the minimum required reminder, and the systems with more aggressive reminder displays and more frequent repetition patterns were perceived to be the most effective. Sounds were perceived to be more effective than visual displays. System components that drivers considered to be effective also tended to be considered annoying, though drivers' opinions differed on whether effective/annoying systems are desirable or undesirable. Consideration of behavioral aspects of seat belt use, strategies suggested in the literature, and the present findings suggest approaches for more effective design of enhanced seat belt reminder systems.

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Summary

Seat belt nonuse is a serious highway safety problem in the United States. Despite a steady increase in seat belt use rates, nearly one in five front seat passenger vehicle occupants was not wearing a seat belt in 2005 (Glassbrenner, 2005). Individuals who do not wear seat belts are far more likely to be killed or seriously injured in a crash. In fact, more than half of fatally injured passenger vehicle drivers were not wearing seat belts at the time of the crash (National Highway Traffic Safety Administration, 2005).

All passenger vehicles sold in the United States are required to provide a seat belt reminder upon vehicle startup to encourage the driver to use the seat belt. The minimum required reminder, however, expires just 4 to 8 seconds following vehicle startup and provides little motivation for seat belt use (Transportation Research Board, 2003). In an effort to provide more effective seat belt reminders, some automotive manufacturers have implemented enhanced seat belt reminder systems that continue to alert drivers and passengers to use seat belts beyond the initial seconds following vehicle startup. These enhanced seat belt reminder systems may include visual and auditory displays that provide continuous or periodic alerts for a number of minutes or for the duration that the occupant is unbuckled. Some systems sense vehicle status and provide displays accordingly. For example, for some systems, some displays are only activated when the vehicle exceeds a minimum speed.

Although evidence indicates that enhanced seat belt reminders are more effective in eliciting seat belt use than basic reminders (e.g., Westat, 2007; Regan et al., 2006), little is known about the particular system features that are most effective in eliciting seat belt use. Furthermore, ideal enhanced seat belt reminder systems must effectively encourage occupants to use seat belts without causing such great annoyance that consumers reject vehicle models with these systems or take action to disable the vehicles' seat belt reminder systems.

The purpose of the present study was to investigate drivers' reactions to various seat belt reminder systems and individual seat belt reminder display components. Forty-eight individuals who were self-reported seat belt nonusers (including frequent, occasional, and rare nonusers) completed a three-part study. During the first part of the study, participants drove a vehicle along a designated route on public roadways as they experienced five seat belt reminder systems (four prototypical enhanced systems and one basic reminder). The prototypical systems included a range of typical features found in commercially available enhanced seat belt reminder systems. Although participants actually wore seat belts during the drives, the reminder systems were presented as if the seat belts were not in use. At prescribed times during the drives, participants were prompted to rate on a numerical scale the likelihood that they would buckle the seat belt (assuming they were not currently using it), the degree to which the system drew their attention, and the annoyingness of the reminder displays. During the second part of the study, while the vehicle was stationary, participants experienced 27 individual auditory (sound and speech) and visual seat belt reminder display components. For each component, participants rated on a numerical scale the likelihood that they would buckle the seat belt in response to the display, the annoyingness of the display, and the desirability of the display as part of a seat belt reminder system. During the third part of the study, participants answered questions about features that they would like to see in an "ideal" enhanced seat belt reminder system.

Study results show that substantial differences exist between various enhanced seat belt reminder systems and between individual display components in terms of effectiveness in eliciting seat belt use, attention-getting qualities, annoyance, and desirability. All of the enhanced seat belt reminder systems were perceived to be more effective than the basic reminder, and the systems with more aggressive reminder displays and more frequent repetition patterns were perceived to be the most effective. In general, sounds were perceived to be distinctly more effective than visual displays.

Ratings of system annoyance and attention-getting quality were very closely related to ratings of effectiveness. In other words, systems and display components that were rated as highly effective were also rated as highly attention-getting and highly annoying. No display element stood out as dramatically less annoying, given its level of perceived effectiveness, although some displays were superior to others in this regard. When participants' ratings were broken out according to their self-reported frequency of seat belt use (frequent, occasional, or rare), this close relationship was still apparent. However, for a given level of annoyance, frequent users rated displays as relatively more effective than occasional seat belt users, who in turn rated displays as relatively more effective than rare seat belt users. Occasional seat belt users appear to be the most receptive group to motivation to wear seat belts by means of increasing the annoyance of seat belt reminder displays.

Participants were often polarized in terms of system preference. Some participants liked aggressive, attention-getting systems because they like to have the reminder to buckle up. Other participants disliked the same systems because they prefer not to buckle up and prefer not to be reminded. When asked to describe an "ideal" seat belt reminder system, many participants expressed a preference for a system that begins with gentle reminders, but becomes more aggressive over time if the driver (or passenger) does not buckle up. A majority of participants were also amenable to the idea of letting drivers customize their seat belt reminder display as they would customize a mobile phone ring tone.

This study compared alternative seat belt reminder systems and displays to determine which systems and components drivers find to be most effective, attention-getting, annoying, and desirable. Findings indicate that system components that drivers consider to be effective also tend to be considered annoying, though drivers' opinions differ on whether effective/annoying systems are desirable or undesirable. Consideration of behavioral aspects of seat belt use, strategies suggested in the literature, and the present findings suggest approaches for more effective design of enhanced seat belt reminder systems. Future investigations may consider novel displays and display modes, features such as function interlocks, alternative timing and activation algorithms, and other ways to motivate seat belt use.

1 Introduction

1.1 Problem

Although seat belt use rates in the United States have been steadily increasing, many passenger vehicle occupants remain unrestrained. In 2005, observed usage rates were 83 percent for passenger vehicle drivers and 78 percent for front seat passengers (Glassbrenner, 2005). Seat belt use rates are particularly low among crash victims, with 54 percent of fatally injured passenger vehicle drivers being unrestrained (National Highway Traffic Safety Administration, 2005). Since seat belt use demonstrably increases survivability and reduces injury severity in a crash, improvements to seat belt usage rates will have important safety benefits.

One approach to encouraging vehicle occupants to buckle up is to provide them with in-vehicle reminders. However, the reminder system currently required by law is quite minimal and not very effective (Transportation Research Board, 2003). FMVSS 208 requires only an audible reminder of 4 to 8 seconds duration when the ignition is turned on and a warning light for no less than 60 seconds if the driver's seat belt is not buckled. Many automobile manufacturers are now voluntarily installing enhanced reminder systems in their current models. These systems differ considerably from one another in terms of the visual and auditory displays they use, the rules that trigger a display, the manner in which the display changes with time, distance, or speed, the aggressiveness of the system (in terms of urgency and annoyance), and the use of sensing and displays for occupants other than the driver. In addition to currently implemented systems, there have also been a variety of prototypes, experimental concepts, and design recommendations. These enhanced systems range from very simple displays (e.g., flashing icon) to complex, multi-stage systems triggered by driving status (e.g., speed, travel distance) and featuring multiple types of visual, acoustic, voice, and possibly even haptic (tactile) displays, as well as interlocks, delays, or limitations on some aspect of vehicle performance (e.g., gear shifting, speed, entertainment system).

Evidence shows that at least some enhanced seat belt reminder systems can improve seat belt use rates (Ferguson, Wells, & Kirley, 2006; Regan et al., 2005; Williams, Wells, & Farmer, 2002). Fleet management products that include intelligent technologies for sensing seat belt use and providing driver feedback also appear to increase seat belt use rates for commercial vehicle fleets and ambulance fleets (e.g., Levick & Swanson, 2005). Field observations indicate that some reminder systems are more effective than others (e.g., Krafft, Kullgren, Lie, & Tingvall, 2006). In an observational study of over 50,000 vehicles conducted as a separate task within the current project (Westat, 2007), enhanced seat belt reminder systems were associated with about a 3.3-percent increase in front seat occupant seat belt use rate compared to vehicles without such systems, even when controlling for potential confounding factors. This equates to more than a 20-percent reduction in seat belt nonuse.

Although improvements in seat belt use rates appear to result from enhanced reminder systems, there is not yet good evidence concerning *what* works best and *why* a given system may influence occupant behavior. There is also the related concern regarding user acceptance. A system could be made so intrusive or interfering that virtually every driver would use the seat belt (or find a way to defeat or remove the system). However, this would engender problems of consumer rejection. The experience with mandatory ignition interlock systems in the 1970s

reflects the importance of considering the public acceptance aspect along with potential effectiveness (Transportation Research Board, 2003).

Thus there is a need to understand what features of seat belt reminder systems are most effective, why they are effective, and how they relate to annoyance and user acceptance. Based on this, systems or features that are highly effective in promoting seat belt use, while remaining acceptable to the broad range of drivers, can be recommended.

1.2 Task Objectives

The research described here was conducted as a task (Task 2) under a broader project to investigate the effectiveness and acceptability of enhanced seat belt reminder systems. The purpose of the task was to compare driver acceptance and potential effectiveness of different reminder system design features through an experimental study in which these features were systematically manipulated. The findings are intended to shed light upon the relationships among design features, reminder noticeability, driver annoyance, and likely user response. The task focused on adult drivers (19 years or older) who were not full-time seat belt wearers.

This experiment was complementary to the other two tasks conducted under this project. Task 1 was an observational study of drivers. Seat belt use of drivers and passengers was observed at selected locations and, through linking of license plate numbers to DMV records, the presence and type of seat belt reminder system in each vehicle was determined. While Task 1 could quantify differences in occupant seat belt use among vehicles and their associated reminder systems, there were limitations to its ability to determine *why* the systems differed in effectiveness. In contrast to the field observational method of Task 1, the present experiment collected systematic subjective data from participants. Also, since the various displays were experimentally manipulated, it was free from any potential confounds of reminder system characteristics with other characteristics of the vehicles and their drivers.

Task 3 focuses specifically on teen drivers (16 to18 years old). Seat belt use is a particular concern for drivers in this age group, given their high crash involvement rates and relatively low rates of seat belt usage, especially among crash victims (Fell et al., 2005; Insurance Institute for Highway Safety, 2002; Williams & Shabanova, 2002). This age group may also differ from more mature driver groups in terms of what treatments are practical or effective. Since teen drivers are the specific research target of Task 3, the present experiment was aimed at the more general driving population and specifically excluded drivers under the age of 19 from the participant sample.

Task 4 is a synthesis of the findings of Task 1 and the current task. This report will provide a combined look into acceptance and effectiveness.

2 Method

2.1 Overview and Experimental Design

The purpose of this experiment was to investigate the acceptability and potential effectiveness of seat belt reminders as a function of the particular seat belt reminder system or specific system features and parameters. People who were not consistent seat belt users were exposed to a variety of systems and features. They provided ratings or other feedback related to their subjective feelings of acceptability/annoyance and their perceptions of how effective the system would be in inducing them to buckle up. This was not a behavioral study that measured actual seat belt use but rather a user feedback assessment that directly compared alternatives. The study permitted direct comparison of prototypical current systems as well as other possible system features. These data are intended to help in devising systems that optimally balance effectiveness and acceptance.

An automobile was modified so that a variety of seat belt reminder displays (both visual and acoustic) could be presented to the participant, who was seated in the driver's position. The experimental session was comprised of two primary phases. The first phase involved comparison of a set of prototypical reminder systems during actual on-the-road drives. The second portion provided a more rapid comparison of a variety of possible reminder system features, made while the vehicle was stationary.

In the first phase, the participant drove the vehicle on local roads, experiencing five different reminder systems. Although the participant wore a seat belt for safety reasons, the seat belt reminder system behaved as though the drivers were not wearing a seat belt.

Periodically during each drive, drivers rated the likelihood that they would buckle up, how attention-getting the reminder was, and how annoyed they were by the seat belt reminder. At the completion of each drive, they answered further questions about the system.

The second, stationary vehicle phase of the procedure was designed to permit a more efficient evaluation of a wide range of reminder system features and parameters. There were 15 auditory displays and 13 visual displays presented in this phase. In this portion of the experiment, the vehicle was stationary and each reminder display was presented for a short period. This permitted direct comparison of the subjective response to displays that varied on some dimension, such as intensity, location, message, mode, and so forth. After completion of the stationary ratings, several closing questions were presented. These asked participants for their opinions regarding the best ways to present reminders, in visual and auditory modes and for passengers as well as drivers.

Forty-eight participants were included in the experiment, with equal numbers of males and females and equal numbers in young, middle, and older age groups.

Conceptually, the experiment was comprised of two separate designs, since the first phase (on-road drives) and second phase (stationary vehicle) used somewhat different methods and were analyzed independently. Depending on the dependent variable, the first, on-road phase can be described as a three factor or four factor mixed factorial design. The between-subjects factors are participant age category (young, middle, old) and gender (male, female). A within-subjects factor is the prototype reminder system (five systems). For those ratings that were made at

multiple times during the drive, the time of the rating was another within-subjects factor (ratings made at four points during the drive).

The second, stationary-vehicle phase of the experiment can be described as a three-factor mixed factorial design, with participant age category and gender as between-subjects factors and displays (27 different displays) as the within-subjects factor. However, the displays varied on a number of dimensions of interest, such as visual versus acoustic, speech versus non-speech, time-varying versus continuous, and so forth. Subsets of the stimulus set were therefore the subject of planned comparisons to examine the effects of specific display characteristics.

More detailed descriptions of the participants, instrumentation, and procedures follow in the sections below. In addition, further detail may be found in the appendices to this report. Appendix A presents the complete research protocol. Appendix B presents the closing questions that the participants answered. Appendix C describes each of the prototypical reminder systems used in the first phase of the experiment.

2.2 Participants

The participants in the study were 48 individuals who reported frequent or occasional seat belt nonuse while driving. Participants included an equal number of males and females and an equal number of young (ages 19 to 25), middle-age (ages 37 to 59), and older (ages 60 to 85) drivers. Participants were recruited from the Washington, DC, metropolitan area through an advertisement in a local newspaper, advertisements on a community Web site, and flyers at a local college. To minimize the likelihood of false responses, the advertisements specifically requested the participation of individuals who wear their seat belts while driving: (1) almost always, (2) usually, (3) occasionally, and (4) rarely/never. All respondents to the ad were screened over the telephone to ensure that they met the criteria of seat belt nonuse. Participants were assigned to seat belt use categories according to their self-reported percentage of trips as a driver in which they are not buckled for at least some part of the trip. An equal number of participants were categorized as rare seat belt users (up to 20% use; mean of 8%), occasional users (35-75% use; mean of 54%), and frequent users (80% and up; mean of 90%). Participants were also required to have valid U.S. driver's licenses. Participants were reimbursed $75 for their time.

2.3 Instrumentation and Displays

2.3.1 Vehicle and instrumentation

The vehicle used for this study was a 2006 Ford Taurus SEL with automatic transmission. Participants were required to wear the seat belt at all times, so the vehicle's actual seat belt reminder system was always inactive. The vehicle was equipped with visual and auditory display outputs. Displays were controlled by the experimenter in the back seat via a custom software program installed on a laptop computer. Vehicle speed, location, and heading were recorded by the laptop using GPS tracking. The laptop also recorded vehicle ignition status, seat belt reminder system status, and other metrics with time stamps.

The instrumentation permitted presentation of the seat belt reminder displays in two modes: one in which a reminder display algorithm was in effect during a drive and one in which simple displays were presented for a fixed period. During each on-road drive (first phase of the

session), the experimenter selected a particular reminder system. The appropriate algorithm for presentation of displays, incorporating time since ignition and vehicle motion sensing, was then operational for the course of the drive. During the stationary vehicle portion of the procedure (second phase of the session), the experimenter selected a particular display from a menu, and that display was presented for a fixed time period.

2.3.2 Visual displays

Visual displays were temporarily installed on the vehicle's dashboard, center console display, above the rearview mirror, and in front of the passenger (the passenger display was not used for this study). All displays were set in rectangular black plastic boxes 3.8 cm tall, 7 cm wide, and 1.9 cm deep. Each display included a fixed message or icon that was illuminated from behind by color light emitting diodes (LEDs) and surrounded by a black background. Figure 1 shows an example visual display at each of the four locations. The dashboard display was located on the lower left corner of the dashboard, in front of the vehicle's actual seat belt reminder icon. The display included the text "BUCKLE SEATBELT" on the left and a seat belt reminder icon on the right. The text letters were 0.4 cm tall and the icon was 0.8 cm tall. The messages could be illuminated independently or simultaneously with red LEDs. The rearview mirror display was attached to the vehicle's ceiling just above the rearview mirror. The rearview mirror display was identical to the dashboard display, but the text and icon could only be presented simultaneously, not independently. The center console included two displays located in front of the vehicle's sound system display. The upper display presented the text "BUCKLE SEATBELT" and the lower display presented the text "WARNING! BUCKLE SEATBELT." The text letters were 0.8 cm tall. Each display could be illuminated independently with green LEDs. The passenger display was located in front of the passenger seat and above the glove box. The display was identical to the rear view mirror display, except the text message read "PASSENGER" rather than "BUCKLE SEATBELT."

In order to determine the appropriate luminance levels for the visual displays, luminance measurements were taken for dashboard seat belt reminder icons in various passenger vehicles. The luminance of each display was measured using an LMT model L1009 photometer. The meter was placed on a tripod and aimed directly at the surface of the displays from a distance of about 1 meter. A 6-minute (0.1-degree) aperture setting was used. This field of view was sufficiently small to fit entirely within the largest illuminated section of each display. Typical measurements were in the range of 60 to 80 candelas per square meter (cd/m^2). Based on these results, all visual displays used in the study were set to a normal luminance intensity of about 70 cd/m^2. The driver display and the center console display could also be displayed at a high luminance intensity of about 700 cd/m^2. All displays could be illuminated steadily or flashed at a rate of 1 Hz or 3 Hz.

In summary, the following visual displays were available (with the ability to present in combination and in flashing mode, and at higher intensity for some):

- Driver side icon (red)
- Driver side “BUCKLE SEATBELT” (red)
- Rearview mirror icon + “BUCKLE SEATBELT” (red)
- Center console “BUCKLE SEATBELT” (green)
- Center console “WARNING! BUCKLE SEATBELT” (green)
- Passenger side icon + “PASSENGER” (red)

Figure 1. Seat belt reminder displays (clockwise from top left: dashboard display, center console display, passenger display, rear view mirror display)

2.3.3 Auditory displays

Three speakers were installed in the vehicle for use in the study. The main speaker was installed below the dashboard, above the pedals on the driver’s side. The speaker was not visible to participants. A passenger-side speaker was similarly installed below the dashboard, above the passenger’s right foot position. The passenger-side speaker was not used in this study. A third speaker was installed just behind the driver-side seat belt retractor. This speaker was located so that perceptually the sound was localized to the area where the driver would reach for the seat belt.

Speakers were used to present a variety of sounds including beeps, chimes, and male and female voice messages. The full list of sounds is presented in Table 1. All sounds were calibrated using a Quest Model 2800 sound level meter to achieve equivalent peak sound levels. The meter was placed on a tripod atop the driver's seat in the study vehicle with the microphone facing the steering wheel (see Figure 2). The microphone was located 91 cm above the floor of the vehicle and 61 cm horizontally from the front of the speaker. All doors and windows were closed while measurements were being taken and the vehicle's engine was off. The meter operator sat in the back seat to minimize his influence in the acoustic field. Both the peak and "fast" sound level readings were measured, using the A weighting scale. Although the two measures were closely related, the peak A-weighted reading was ultimately used for calibrating and equating the sounds because it most closely matched the subjective perception of equal loudness (a similar finding emerged from more formal psychophysical data from Dahlstedt, 2001). All sounds from the main (driver side) speaker were adjusted to achieve a peak volume level of 78±1 dB(A). This was established as the normal volume level. The sound level for the signal from the seat belt retractor speaker was adjusted to provide a subjectively similar level of loudness to the main speaker signal. Selected sounds were also adjusted to a loud volume setting of 90±1 dB(A).

Table 1. Descriptions of seat belt reminder sounds

Sound	Description
Slow beep	A tonal signal that plays at a rate of 1 Hz, with an on duration of 0.65 second and an off duration of 0.35 second per cycle. The beep is presented for a total of 6 seconds. The sound was sampled from a 2003 Honda Element EX.
Fast beep	The same sound as the slow beep, but played at a rate of 3 Hz with an on-duration of 0.22 second and an off-duration of 0.11 second per cycle. The beep is presented for a total of 6 seconds.
Slow chime	The chime plays at a rate of 0.83 Hz. The sound level of each chime decays over time until the next chime occurs. The chime is presented for a total of 6 seconds. The sound was sampled from a 2002 Chevrolet Cavalier.
Fast chime	The same sound as the slow chime, but played at a rate of 2.5 Hz. The chime is presented for a total of 6 seconds.
High urgency	A rapid, urgent beeping sound that consists of sequential bursts of four pulses, with slightly greater volume on the second and fourth pulses. Each four-pulse burst is 0.4 second in duration, with a 0.1 second pause before the following set of bursts, and the duration of the entire signal is a total of 6 seconds.
Male polite	A male voice that says "buckle seat belt" in a pleasant tone.
Male urgent	A male voice that says "buckle seat belt" in an urgent tone.
Male warning	A male voice that says "warning, buckle seat belt" in an urgent tone.
Female polite	A female voice that says "buckle seat belt" in a pleasant tone.
Female urgent	A female voice that says "buckle seat belt" in an urgent tone.
Practice sound	A sound that alternates between a high tone and a lower tone, with slightly greater volume on the high tone. The sound plays at a rate of 1.2 Hz, with a high-tone duration of 0.5 second and a low-tone duration of 0.32 second. The sound is presented for a total of 2.5 seconds.

Figure 2. Sound level meter positioned on driver's seat

2.3.4 Prototypical reminder systems

Five seat belt reminder systems and one additional demonstration system were devised for the on-road portion of the study. All systems began to operate when the vehicle ignition was turned on. All sounds were presented at the "normal" volume levels (peak of approximately 78 dB(A)) and all visual displays were presented at the normal brightness level (approximately 70 cd/m^2). All flashing visual displays flashed with equal on and off durations during the duty cycle.

The five seat belt reminder systems are referred to here as "prototypical" systems because they are modeled to be typical examples of five general types of systems currently available in various vehicle models. They were not intended to be identical with any specific commercial system but were intended to closely resemble one or more examples of a particular class of reminder system.

The five systems, as well as the demonstration/training system, are described below. Appendix C provides a more detailed specification of the displays and controlling algorithms for each system.

System 1: Basic reminder (no enhanced reminder system)

When the basic system is started, the slow chime plays for 6 seconds and the dashboard seat belt icon appears. The seat belt icon remains on for a total of one minute, then the system becomes inactive. This system is typical of vehicles that do not have enhanced seat belt reminder systems.

System 2: Continuous flashing

When this system is started, the slow chime plays for 6 seconds and the dashboard seat belt icon appears and flashes at a rate of 3 Hz. The icon continues to flash for as long as the driver is unbelted. There is no additional sound.

System 3: Periodic seat belt reminder

When this system is started, the slow chime plays for 6 seconds and the dashboard seat belt icon appears. Once the chime ends, the icon remains on. After 30 seconds of silence, the fast chime plays for 6 seconds and the icon flashes at a rate of 3 Hz, on the condition that the vehicle is moving at a speed of 5 mph or more. This cycle of silence and reminder is repeated twice more,

then all displays become inactive. The total active system time is about 2 minutes if the vehicle remains in motion.

System 4: Aggressive seat belt reminder

This system is similar to the periodic seat belt reminder (system 3), but with some additional features. In addition to the dashboard seat belt icon, there is a seat belt icon and "BUCKLE SEATBELT" text above the rearview mirror and "BUCKLE SEATBELT" text in the center console. When the fast chime is presented, the dashboard seat belt icon and the rearview mirror display flash at a rate of 3 Hz. Unlike the periodic seat belt reminder, this system continues to present reminders until the driver's seat belt is fastened.

System 5: One long reminder phase

This system is the same as the continuous flashing system (system 2), but with the addition of one aggressive auditory reminder phase. Thirty seconds after the vehicle is turned on, if the vehicle is moving at a speed of 5 mph or more, the slow beep sound is presented for 6 seconds and is immediately followed by 24 seconds of the fast beep sound, for a total reminder phase of 30 seconds. The driver seat belt icon flashes at a rate of 3 Hz for the entire time that the system is active.

Demonstration/training system

This system was used for participants to practice making ratings while driving. When the system is started, the slow beep plays for 6 seconds and the dashboard seat belt icon appears. Fifteen seconds after the system is started, the practice sound plays for 2.5 seconds and the dashboard seat belt icon flashes at a rate of 3 Hz during this time. Next there is 45 seconds of silence while the seat belt icon remains on. The system then continues to alternate between the brief practice sound/flashing icon phase and the 45-second silent phase until the system has been on for 5 minutes, at which point the system turns off. This system was designed to be different than the other five systems used in this study yet sufficiently realistic.

2.4 Procedure

Participants were tested individually in sessions that lasted for approximately two hours. Upon arrival, each participant read and signed an informed consent form, then the experimenter checked the participant's license to ensure that it was valid and current. The experimenter then asked the participant about his/her seat belt use patterns and reasons for nonuse. In the first part of the study, participants experienced five prototypical seat belt reminder systems while driving a test car and provided ratings about them. In the second part of the study, participants experienced additional auditory and visual displays in the test car while stationary. All sessions were conducted in summer between the hours of 9:30 a.m. and 4:30 p.m. All sessions were conducted during clear weather or light rain.

2.4.1 On-road ratings of prototypical systems

Participants provided ratings about the seat belt reminder systems while driving a short route on streets surrounding the Westat campus. The purposes for having the participant experience the reminders while driving were: (1) so that they would experience the actual reminder algorithm (some of which included speed-based criteria); (2) so that they had to share attention with the driving task and would not be solely concentrating on the displays; and (3) so that acoustic

reminders occurred in a realistic ambient noise context. The route was a 1.5 mile circuit on roads with light to moderate traffic and speed limits ranging from 30 to 45 mph. A map of the route (from Google Maps) with arrows representing direction of travel and a red circle representing the route starting point is shown in Figure 3. The circuit included three right turns (not including the initial right turn to leave the parking lot) and no left turns. For each reminder system, the driver drove this circuit twice, which took a total of approximately 6 to 7 minutes. Before experiencing the prototypical systems, participants drove one circuit of the route for familiarity. Participants were required to wear the seat belt at all times while driving, though it was made clear to them that the car would react as if they were not wearing the seat belt. Next, participants drove the route with a demonstration seat belt reminder system active for practice in responding to ratings questions. Once it was established that the participant was comfortable with the procedure, the drives with the prototypical systems began. Participants completed five drives, each with a different prototype seat belt reminder system (see Section 2.3.4 for system descriptions). Each participant experienced the systems in a random order.

Figure 3. Map of driving route (from Google Maps)

Each drive began in a parking space in a private lot with the vehicle ignition turned off. The experimenter was seated in the back seat of the car on the outboard passenger side. When the experimenter gave a verbal indication to proceed, the participant turned on the car, backed out of the perpendicular parking space, and made a right turn out of the lot to begin the drive. During each drive, the experimenter asked the participant for four sets of ratings about the current seat belt reminder system. Ratings were sought 15 seconds after the vehicle was turned on, 75 seconds after the vehicle was turned on, 180 seconds after the vehicle was turned on, and 300 seconds after the vehicle was turned on. Each set of ratings included the same three questions: (1) How likely is it that you would have buckled up? (2) How attention-getting is this reminder system? and (3) How annoying is this reminder system? Each question was answered on a 10-point scale where 1 represents the lowest value (e.g., least likely to buckle up) and 10 represents the highest value (e.g., most likely to buckle up).

After the participant provided all four sets of ratings, the participant completed the route and returned to the parking space. The experimenter then asked the participant additional questions about the perceived effectiveness of the system, system desirability, good and bad features of the system, and suggestions for improvements to the system.

In experiencing the drives and making their judgments, the participants were asked to "imagine that you are driving to visit a friend that lives about 15 minutes away." Participants were also asked to imagine that they were alone in the car. This was done to provide a more meaningful context for the judgments of annoyance, acceptability, and effectiveness than the brief (6-7 minutes) circuits with an accompanying experimenter.

The complete research protocol, with instructions for the participant, is provided in Appendix A.

2.4.2 Stationary ratings of additional displays

Stationary ratings of individual displays were made to assess additional displays not used during the on-road drives and to gain feedback regarding displays presented in isolation from other system elements. All stationary ratings were made in a covered parking space to ensure consistent illumination levels between participants and to eliminate sun glare on displays. Auditory and visual displays were presented individually. There were 15 auditory displays and 12 visual displays.

Table 2 provides a list of the 27 displays. The visual and auditory displays are described in further detail in Sections 2.3.2 and 2.3.3, respectively. All auditory and visual displays were presented for 6 seconds except for the voice messages which had durations ranging from 0.8 second to 1.5 seconds. The sequence of the auditory and visual displays was counterbalanced so that half of participants experienced the auditory displays first and half of participants experienced the visual displays first. Within each mode of display, the sequence of the specific displays was randomized for each participant. Participants were instructed to imagine that each display would occur 30 seconds after the vehicle was turned on and then once every minute after that. Participants were presented with each display once, and then answered three questions on a scale from one to ten: (1) Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this seat belt reminder be in getting you to wear your seat belt on those trips? (2) How annoying would this reminder be during driving? and (3) How desirable would it be to you to have a seat belt reminder system like this in your vehicle (keeping in mind that the reminder system would turn off once you buckle your seat belt)?

2.4.3 Opinions of system alternatives

Once the stationary ratings were completed, the participant completed a brief written questionnaire on seat belt reminder system preferences. Questions addressed best designs for auditory and visual seat belt reminders that are effective in getting drivers and passengers to buckle up yet acceptable to drivers, questions about best patterns for reminder presentation, and a question about the possibility of allowing drivers to customize seat belt reminder sounds. The question form is shown in Appendix B.

Table 2. List of auditory and visual displays

Auditory Displays	Visual Displays
Slow chime	Dashboard icon
Fast chime	Dashboard text
Slow chime (loud)	Dashboard icon & text
Slow chime (seat belt retractor)	Dashboard icon (flashing 1 Hz)
Slow beep	Dashboard text (flashing 1 Hz)
Fast beep	Dashboard icon (bright)
High urgency	Dashboard text (bright)
Male polite	Center console
Male urgent	Center console urgent
Male urgent (loud)	Center console urgent (bright)
Male polite (seat belt retractor)	Center console urgent (flashing 1 Hz)
Male warning	Rear view mirror icon & text
Male warning (loud)	
Female polite	
Female urgent	

3 Results

3.1 On-Road Evaluation of Prototypical Reminder Systems

For the five prototypical reminder systems, analyses of variance were conducted for the on-road ratings of effectiveness ("How likely is it that you would have buckled up?"), annoyance ("How annoying is the reminder system?"), and attention ("How attention-getting is the reminder system?"). Each of these analyses included the reminder system and the time of the rating (15, 75, 180, and 300 seconds after vehicle ignition) as within-subjects factors and participant age category, gender, and self-reported seat belt use category as between-subjects factors. Table 3 summarizes the outcome of the three analyses. Detailed analyses results are presented in Appendix D. Tabled data showing the individual means and standard errors for the various factors are provided in Appendix E. For all three measures, the analyses showed statistically significant effects of reminder system, rating time, and their interaction. These factors are shown graphically in Figure 4**,** Figure 5**,** and Figure 6. In general, overall ratings are lowest for the basic reminder and continuous flashing systems and are highest for the aggressive reminder system. However, the pattern of ratings across the four rating times varies with the system. The systems that terminate the enhanced seat belt reminder display at some point during the drive (periodic reminder and one long reminder phase systems) show a steep drop in ratings after the display ends. One interesting difference among the three figures is that while the periodic reminder, aggressive reminder, and one long reminder phase systems are rated similar to one another in terms of effectiveness and attention-getting value at the second rating point (where the strongest reminder is in effect for all three systems), the annoyance rating appears substantially higher for the one long reminder phase system (8.4 versus 6.6, 6.4).

Table 3. Summary results of on-road rating ANOVAs

Factor	Effectiveness	Annoyance	Attention
System	++	++	++
Gender		++	
System*gender		+	
Age category		+	
System*age category			
Gender*age category			
Rating point	++	++	++
System*rating point	++	++	++
Rating point*gender		++	
Rating point*age category			
Seat belt use category	++		
System*seat belt use category	++		
Gender*seat belt use category			
Age category*seat belt use category			
Rating point*seat belt use category	+		++

+$p \leq 0.10$
++$p \leq 0.05$

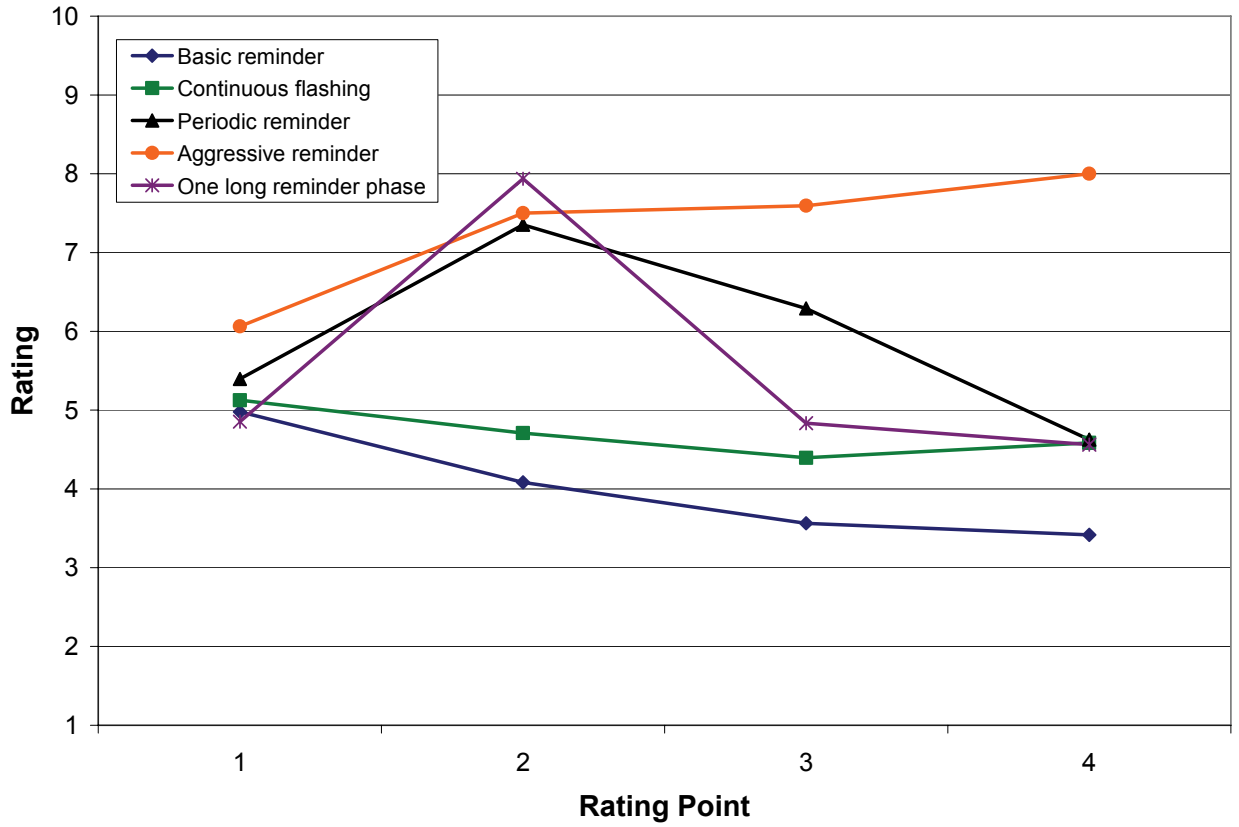

Figure 4. Mean on-road effectiveness rating for five reminder systems

Additional factors are statistically significant in some of the analyses. For the ratings of reminder effectiveness, there is a significant main effect of driver seat belt use category, as well as a system-by-seat-belt-use category interaction. This is expected, since by definition the three seat belt use groups differ in their a priori likelihood of buckling up and the ratings reflect this. For the annoyance ratings, there is a main effect of gender and of its interaction with the rating point. Females rated annoyance higher than did males (with the largest difference at the first rating point). For the ratings of attention, there was a significant interaction of rating point with seat belt use category. The interaction appears due to the fact that the rare users have lower attention ratings than others at the first two rating points (particularly the first rating) but there is minimal difference at the third and fourth rating points.

As might be expected, the group mean ratings for effectiveness, annoyance, and attention are positively and strongly associated with one another. If a given system at a given point in time is seen as highly effective, it is generally also judged as highly attention-getting and annoying. The correlation of effectiveness with annoyance is 0.97, the correlation of effectiveness with attention is 0.99, and the correlation of annoyance with attention is 0.98. Each correlation is based on 20 data points (group mean ratings for each of five systems at each of four points in time). Although these positive relationships are true for the various subgroups of participants, there is an interesting relationship with reported seat belt use. Figure 7 shows a scatterplot of the group mean annoyance ratings and group mean effectiveness ratings, broken out separately for each of the three self-reported seat belt use groups: Rare users (up to 20% use), occasional users (25-

65% use), and frequent users (80% use and up). Each point plotted on the figure represents the mean rating for a single rating point (15, 75, 180, and 300 seconds after vehicle ignition) of one

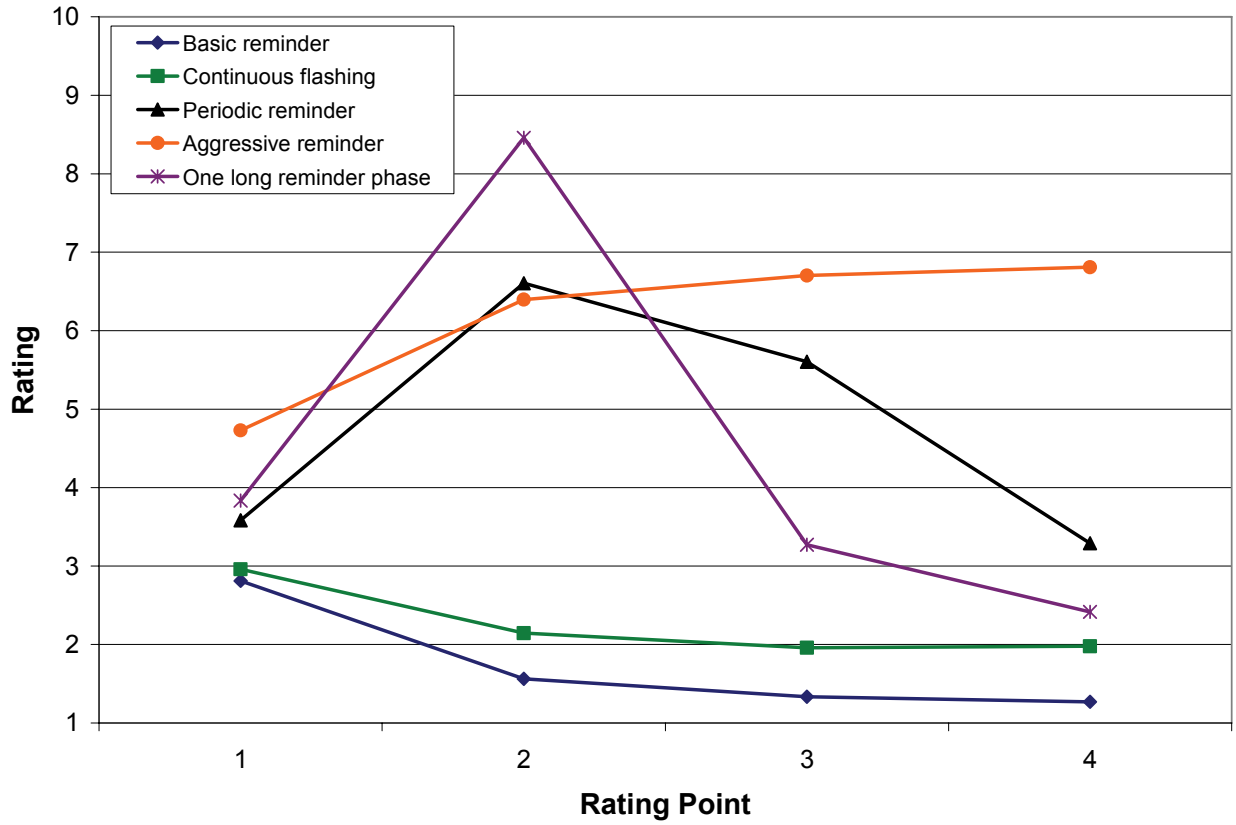

Figure 5. Mean on-road annoyance rating for five reminder systems

reminder system. Linear regression lines are fit for each group, to help illustrate the differences.

Although the range of annoyance ratings is similar among the groups, they separate along the "effectiveness" axis, consistent with the ANOVA finding of no main effect of seat belt use category for annoyance but a significant effect for reminder effectiveness. The figure shows that for a given level of annoyance, a system is judged to be most effective by the frequent seat belt user group and least effective by the rare seat belt user group. The slope of the regression line appears steeper for the occasional seat belt use group than for either of the other groups. At low annoyance levels, this group rates effectiveness much like the rare seat belt user group. At high annoyance levels, this group rates effectiveness more like the frequent seat belt user group. In other words, moderate users show a greater degree of change in judged effectiveness as annoyance increases. A similar relationship exists between participants' mean attention ratings and mean effectiveness ratings when grouped by seat belt use category.

Three additional sets of ratings were collected after completion of each of the on-road drives: effectiveness (for those trips where the participant would not be wearing a seat belt), desirability (of having this type of system in one's own vehicle), and preference (relative to a basic minimal reminder system). Table 4 summarizes the analyses of these ratings. Detailed analyses results are presented in Appendix D. Tabled data showing the individual means and standard errors for the various factors are provided in Appendix F.

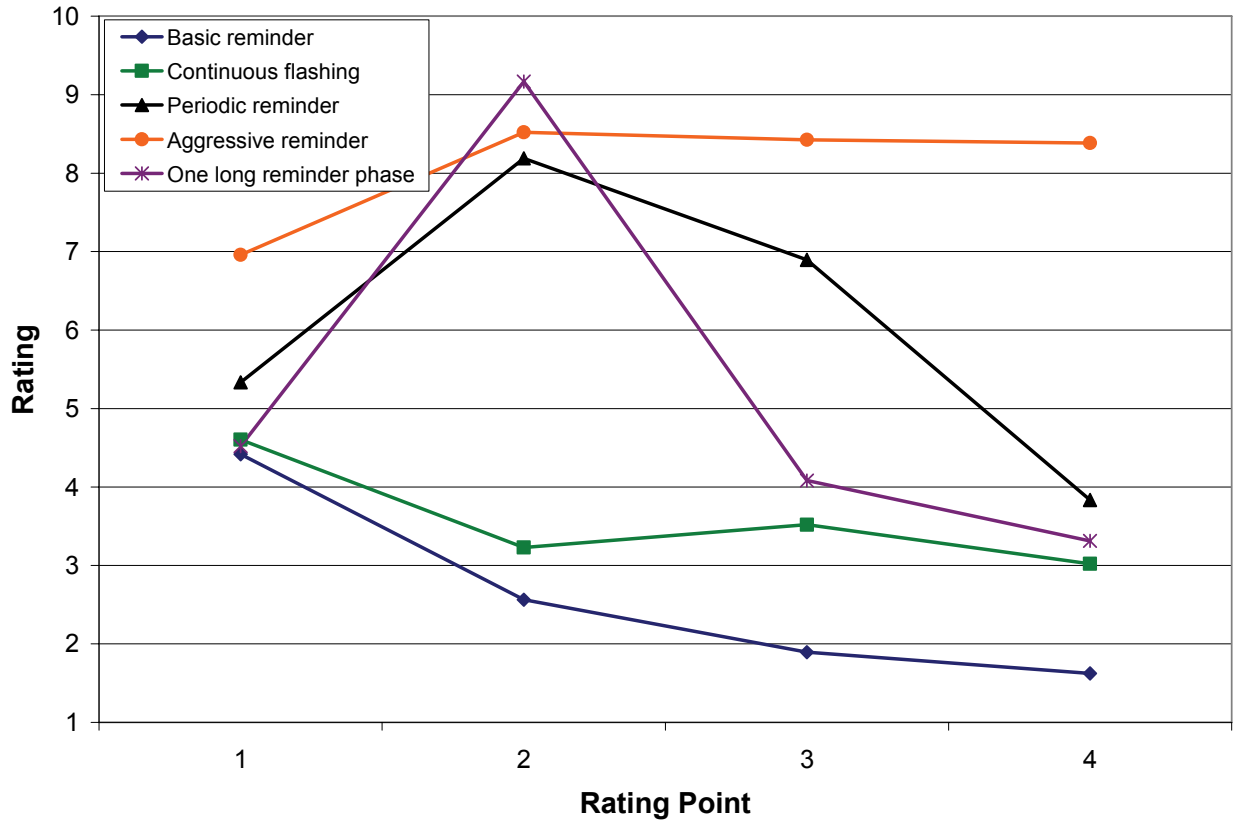

Figure 6. Mean on-road attention rating for five reminder systems

For all three ratings, there was a statistically significant effect of the reminder system. Figure 8 shows the overall group mean ratings for each of the five systems. As can be seen in the figure, the group mean ratings for these three factors tend to be related: the correlation of preference with desirability is r=0.91, the correlation of preference with effectiveness is r=0.89, and the correlation of desirability and effectiveness is r=0.72. However, it should be noted that ratings of preference and desirability were highly polarized. Participants frequently rated a system at one extreme or the other of the scale. Thus the group means are not very representative of *individual* judgments but rather tend to reflect the proportions of participants that strongly preferred (or desired) or strongly dispreferred a given system. This can be seen in the "bubble chart" in Figure 9. The chart is essentially a scatterplot of individual ratings of effectiveness and desirability. However, because all ratings are integers (scale values of 1 through 10), many data points fall on top of one another. In order to see where data clusters, the size of the data point (the "bubble") is proportional to the number of cases that fall at that point. Thus the large bubbles at the corners indicate that in many individual cases, participants used the extreme ends of the scales. The largest cluster is where effectiveness and desirability are both rated "1," and the second largest cluster is where both are rated "10." However, the next largest clusters are for 1/10 and 10/1. Thus the strong correlation seen in the group mean values appears much weaker when individual data are considered. When correlations are based on individual participant data (of the sort shown in the bubble chart), rather than on group mean data, it becomes clear that for each individual, desirability and preference tend to be generally related (r=0.76), but neither desirability nor preference is closely related to effectiveness ratings (r=0.34 in each case).

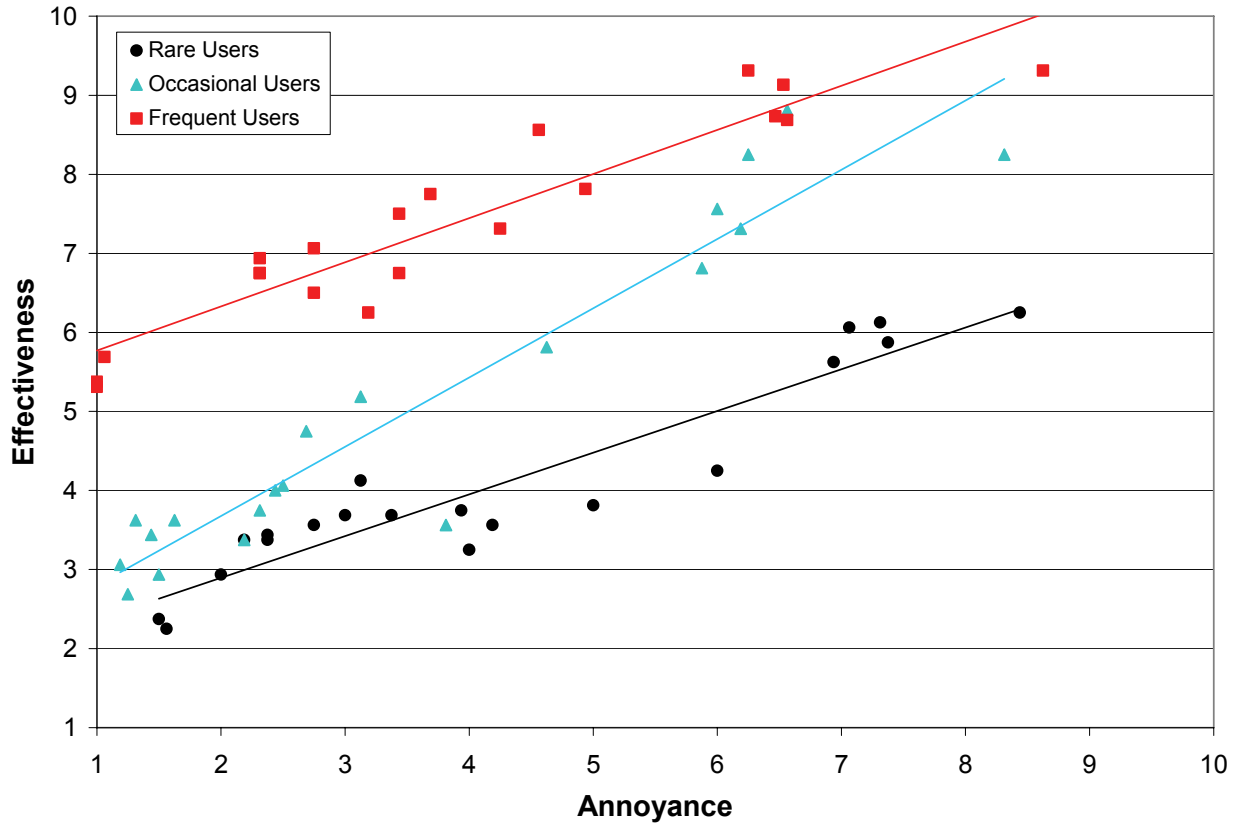

Figure 7. On-road system effectiveness rating versus annoyance rating by self-reported seat belt use category

Table 4. Summary results of post-drive rating ANOVAs

Factor	Effectiveness	Desirability	Preference
System	++	++	++
Gender	+		+
System*gender			
Age category			
System*age category			
Gender*age category			
Seat belt use category			
System*seat belt use category		+	
Gender*seat belt use category			
Age category*seat belt use category		++	+

+p≤0.10
++p≤0.05

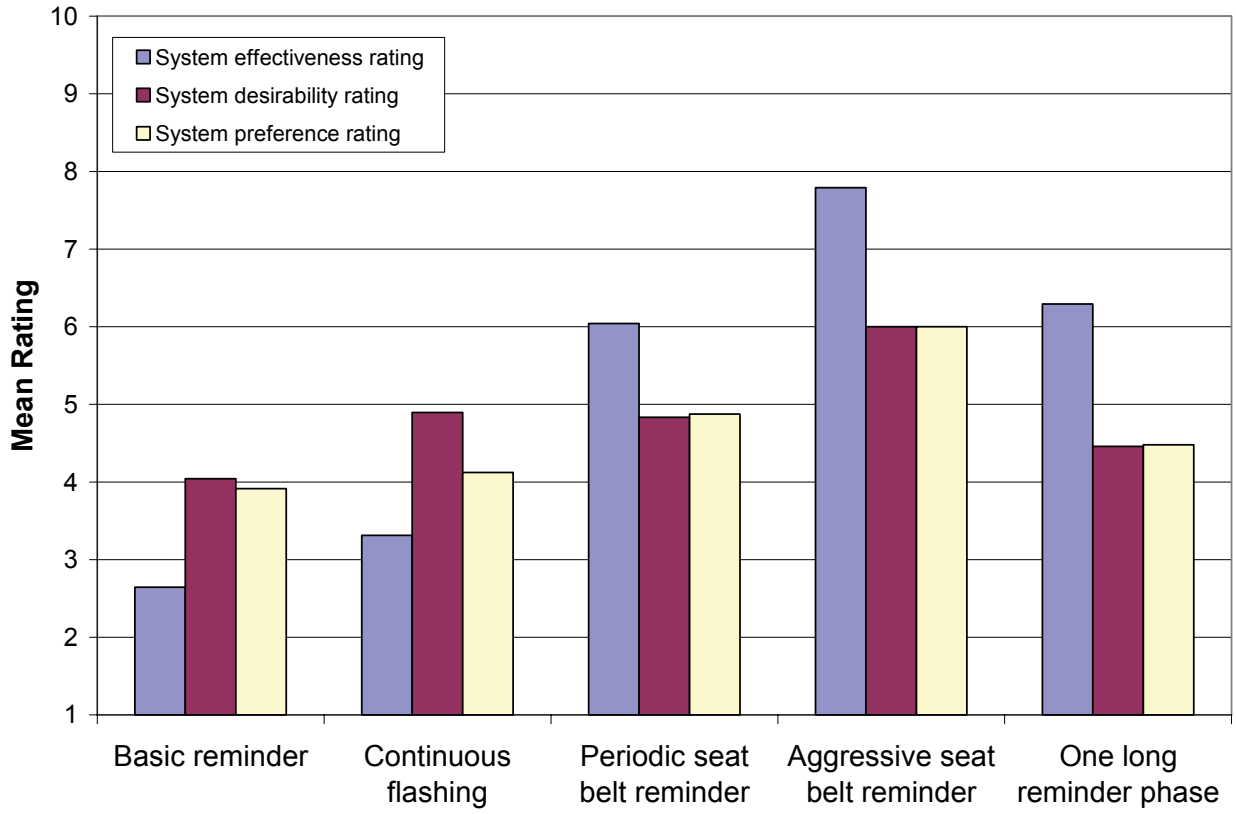

Figure 8. Post-drive ratings for five reminder systems

The relationship of system desirability and annoyance reveal a similar pattern. For each individual, the maximum annoyance rating from the on-road drive was used for this analysis (i.e., the greatest of the four ratings made for each system). Figure 10 shows a bubble chart for this relationship. Here again it is evident that there is a propensity for many people to use the extreme ends of the scales. There is no evident consistent relationship between individual ratings of annoyance and desirability, although the figure makes clear that both minimally annoying and maximally annoying systems tend to be seen as very undesirable.

As Figure 8 shows, the rated effectiveness of a system for getting the driver to buckle up varied substantially among the systems. The basic reminder was rated least effective (2.63), followed by the continuous flashing system (3.30). The periodic reminder and one long reminder phase systems were rated similarly (6.03, 6.27) and the aggressive reminder had the highest-rated effectiveness (7.78). This pattern is similar to the main effect of reminder system seen in the on-road ratings of system effectiveness. Other than the main effect of the reminder system, none of the other factors or their interactions had a significant effect on the system effectiveness ratings. This contrasts with the on-road ratings, where there was a significant main effect of seat belt use category, as well as its interaction with the reminder system. However, this difference is understandable based on somewhat different questions asked at each stage. During the drive, the question was "How likely is it that you would have buckled up?" and as might be expected, rare seat belt users rated their likelihood lower than more frequent users. In contrast, the post-drive question asked "Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your

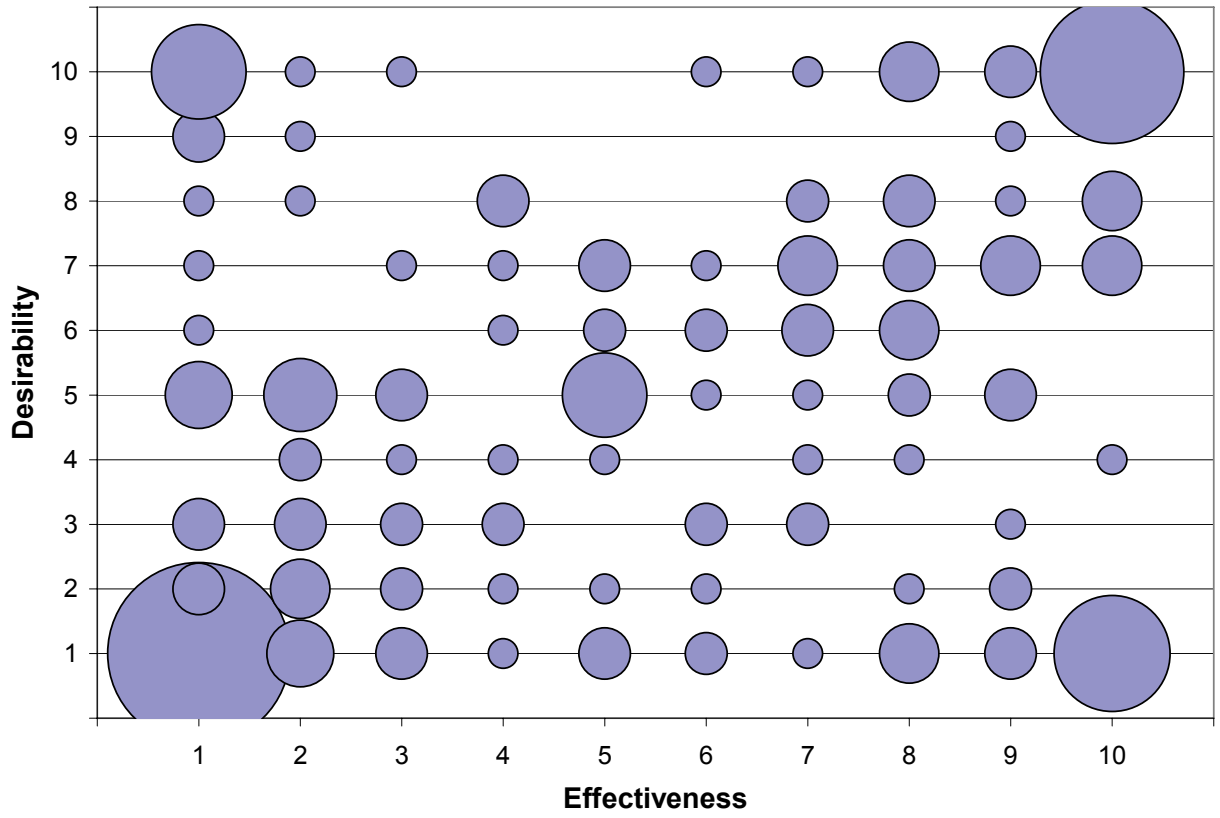

Figure 9. Post-drive ratings of system effectiveness versus desirability by frequency of response (size of "bubble" corresponds to frequency)

seat belt on those trips?" Thus by confining the focus for all participants to those trips where they likely do not wear a seat belt, it essentially equated for initial differences in overall probability of seat belt use. For this question, there was no difference among seat belt use groups in the rated potential of the various systems to promote the driver to buckle up.

While the post-drive desirability and preference ratings show a statistically significant effect of the reminder system, the systems differ far less dramatically on these ratings than for rated effectiveness. The range of the mean ratings is only about 2 rating scale units, or well less than half the range of the system effectiveness ratings. As Figure 8 shows, the aggressive reminder system has the highest ratings and the basic reminder has the lowest ratings. The only significant factor other than the main effect of the reminder system is that the desirability ratings show an age-by-seat belt use category interaction for the desirability rating (this same factor was of borderline significance [p=0.07] for the preference rating). The primary differences underlying this interaction are that for the rare seat belt users, the young participants have substantially higher ratings than do the middle age and older rare seat belt use groups; while among the occasional users, the middle age group has substantially higher ratings than the young and old groups.

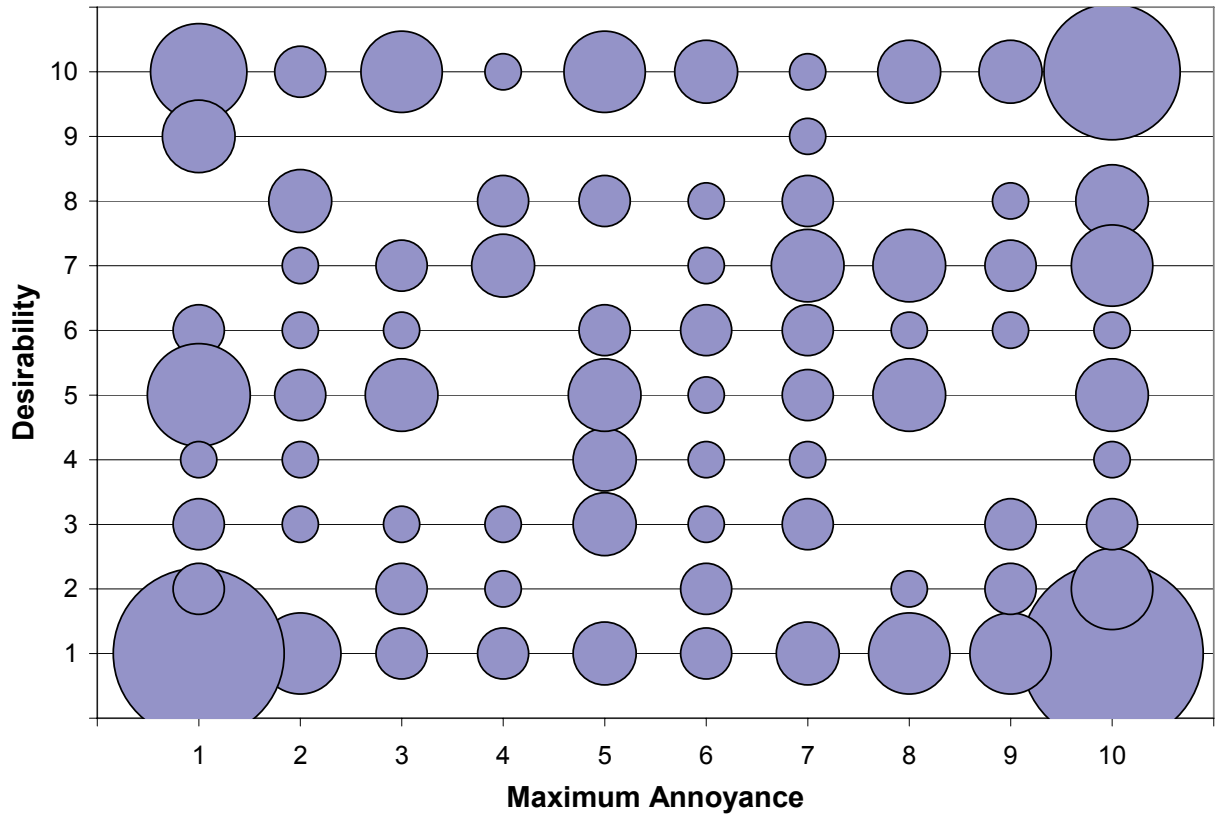

Figure 10. On-road maximum ratings of annoyance versus post-drive ratings of system desirability by frequency of response (size of "bubble" corresponds to frequency)

Another post-drive question addressed participants' willingness to remove the hypothetical reminder system. Given the premise that their car dealer or mechanic could legally uninstall the reminder system (leaving only the basic reminder), the participant indicated whether he or she would prefer to keep the system, remove it only if the uninstallation were free, or pay to remove it. If they indicated willingness to pay, they indicated the maximum amount they would be willing to pay. Table 5 summarizes the responses. For each reminder system, the table shows the percentage of the 48 participants who would choose to keep the system, remove it if free, or be willing to pay to remove the system. For those participants that would not choose to keep a given system (remove if free and pay to remove, combined), the final column shows the mean cost they were willing to pay (with a value of $0 for those who would only remove if free). There are only relatively small differences in the distribution of choice options for the various reminder systems and the difference is not statistically significant (chi square=8.01, df=8). The mean maximum willing payment was highest for the aggressive reminder system, but the several researchers testing the participants shared a concern that the use of the dollar-based cost scale by some participants was questionable, so great confidence should not be put on this measure.

As might be expected, self-reported rare seat belt users were more willing to remove the seat belt reminder systems than were frequent and occasional seat belt users. Across all five systems, the rare seat belt users indicated willingness to pay to remove in 41 percent of cases and willingness to remove only if it were free in 16 percent of cases. This contrasts with values of 26 percent and 19 percent for the occasional users and values of 2 percent and 24 percent for the frequent

users. Given the group differences in willingness to remove reminder systems, separate chi square analyses were conducted on each seat belt use group. None of these test results were significant. Thus it appears that while people are differentially willing to remove seat belt reminder systems, based on their self-reported seat belt use, there are not substantial differences in their willingness to remove particular systems.

Table 5. Proportion of participants that would keep, remove if free, or pay to remove each seat belt reminder system and the mean maximum payment for those who would not keep it

System	Would keep	Remove if free	Would pay	Mean payment
Basic reminder	67%	10%	23%	$68
Continuous flashing	56%	21%	23%	$46
Periodic reminder	56%	8%	35%	$72
Aggressive reminder	56%	10%	33%	$81
One long reminder phase	52%	10%	38%	$62

In the post-drive evaluation, participants were asked to indicate things that they liked or disliked about the reminder system they just experienced and if there were any improvements they wanted to suggest. Table 6 summarizes categories of reported likes and dislikes for each reminder system. The table shows the frequency with which each category of response was cited among the 48 participants. Generally these comments did not add much insight to the information obtained in the ratings, with the comment usually reflecting one of the rating dimensions (e.g., too annoying, not attention-getting). The fact that there are multiple responses in every cell of the table reflects the lack of consensus on preference, as described above. Among the highest frequency responses were the dislike of the basic reminder and the continuous flashing systems because they were not attention-getting or effective, and a dislike of the one long reminder system because it was annoying or because of the timing/frequency. The recommended improvements to systems were generally just suggestions to address the dislikes (e.g., make more attention-getting).

Table 6. Summary of likes and dislikes for each on-road system

Attribute	Basic reminder	Continuous flashing	Periodic reminder	Aggressive reminder	One long reminder phase
Like: Attention getting/effective	2	5	13	13	12
Like: Not annoying	14	13	8	9	3
Like: Type of display/sound	5	8	13	13	8
Like: Timing/frequency	8	5	6	13	16
Dislike: Not attention getting/effective	22	20	6	5	5
Dislike: Annoying	2	4	12	15	21
Dislike: Type of display/sound	3	12	5	9	6
Dislike: Timing/frequency	2	5	17	10	20

3.2 Stationary Vehicle Evaluation of Displays

In the stationary vehicle portion of the experiment, participants rated each visual or acoustic display for effectiveness, annoyance, and desirability. Analyses of variance were carried out for each of these measures, summarized in Table 7. Detailed analyses results are presented in

Appendix D. Tabled data showing the means and standard errors for the various factors are provided in Appendix G.

Table 7. Summary results of stationary vehicle rating ANOVAs

Factor	Effectiveness	Annoyance	Desirability
Display	++	++	++
Gender	+		
Display*gender	++		
Age category			
Display*age category	++	++	
Gender*age category			
Seat belt use category	+		++
Display*seat belt use category			
Gender*seat belt use category			
Age category*seat belt use category			
Display*age category*gender			
Display*gender*seat belt use category	+	++	
Display*age category*seat belt use category	++		
Gender*age category*seat belt use category			

+p<0.10
++p<0.05

For the ratings of display effectiveness, there was a significant main effect of display and the display-by-gender and display-by-age interactions were significant as well. The main effect of gender approached statistical significance. Figure 11 shows the group mean effectiveness rating for each display. The means range from 2.83 (dashboard icon) to 7.31 (slow chime, loud) on the ten-point rating scale. As seen in the figure, there is little overlap of the acoustic (left side of figure) and visual (right side of figure) displays in terms of effectiveness. Only the highest-rated of all of the visual displays (center console urgent – flashing) reached the level of the lowest rated acoustic displays.

The main effect of gender (which was not statistically significant at the alpha=0.05 level) was that males rated effectiveness somewhat lower than females (4.21 versus 5.63). Given that there are 27 displays, the significant display-by-gender interaction may be difficult to interpret, but the primary basis appears to be that males and females differed only slightly in their ratings of the visual displays (3.86 versus 4.14) but more substantially for the acoustic non-speech (4.93 versus 7.26) and speech displays (4.65 versus 6.51). The display-by-gender interaction also suggested that there were less pronounced differences among age groups for the visual displays than for the auditory displays, where the middle aged group generally rated effectiveness the highest and the older group generally rated effectiveness the lowest.

In order to assess the effects of various display attributes, several new variables were created to code differences among the displays, such as loudness, display mode, and so forth. The list of attribute variables is shown in the left column of Table 8, and the next column indicates the levels of the attributes in the comparison. A statistical model was created using the SAS statistical software routine “Proc Mixed” to predict effectiveness ratings. Variables for participant and stimulus (display) were included as random effects factors while age, gender, self-reported seat belt use, and the new attribute variables, were included in the model as fixed

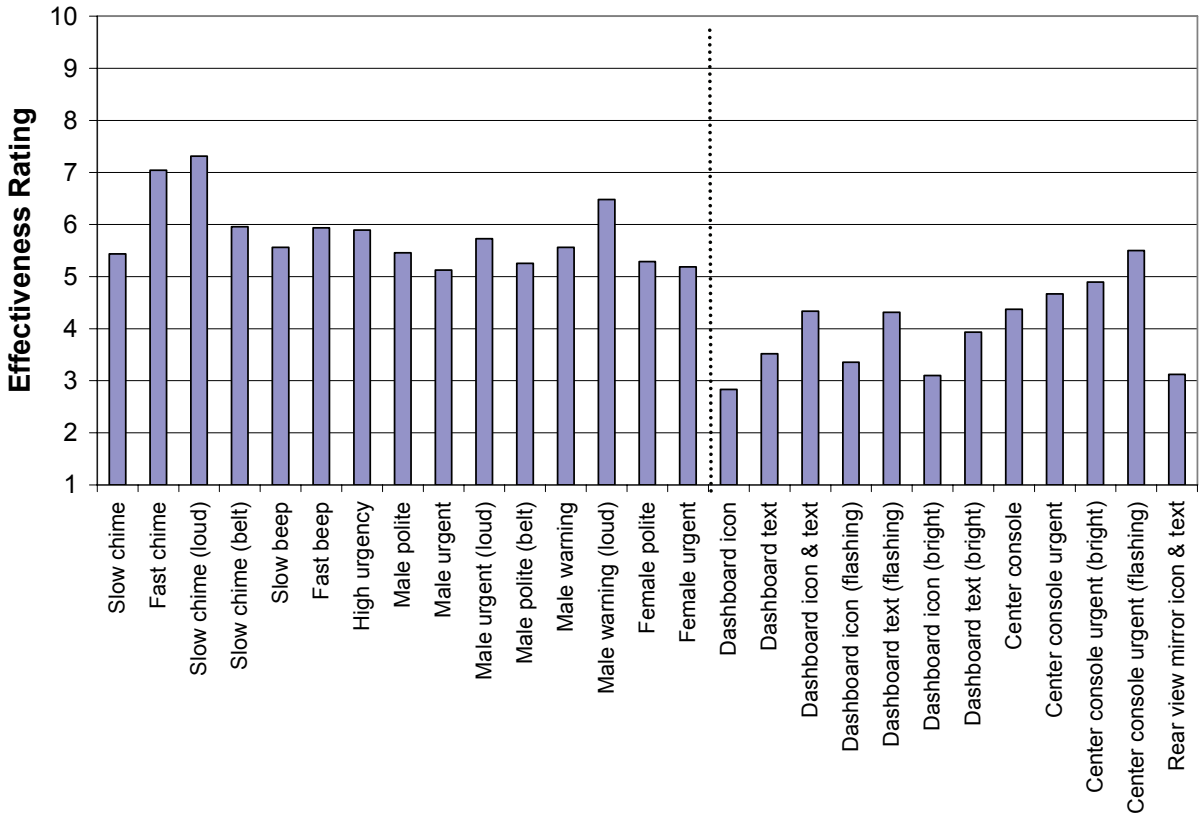

Figure 11. Mean stationary ratings of display effectiveness

effects factors. The model incorporated the two- and three-way interactions of age, gender, and seat belt use. The statistical significance of each attribute in the model is shown in the "significance" column. The significance column titled "effectiveness" shows the findings of the model for the ratings of display effectiveness. The other two significance columns show the findings for the ratings of annoyance and desirability, which are discussed further below.

As the table indicates, a number of display attributes significantly affected the ratings of effectiveness. The display mode was significant, with visual displays rated lower than auditory displays, as discussed above. Loud displays were rated more effective than normal volume displays, and fast sound patterns were rated more effective than slow patterns. The particular type of sound (chime, beep, "high urgency") was of borderline significance. Voice messages were not sensitive to the gender of the speaker, the urgency of the tone, or inclusion of the "warning" term. For visual displays, flashing displays were rated more effective than steady ones but brightness was not a significant factor. The location of the visual display was significant, with center console displays more effective than dashboard displays. Text displays were seen as more effective than icons.

The various displays also differed substantially in annoyance, as seen in Figure 12. The display was the only statistically significant main effect factor for the annoyance ratings. There was a significant display-by-age group interaction. The group mean ratings ranged from a low of 1.79 (dashboard icon) to a high of 8.81 (slow chime, loud), so that the group means covered most of the ten-point rating scale range. As with the effectiveness ratings, there was minimal overlap of the visual and acoustic displays, with the highest-rated visual display just reaching the level of

Table 8. Significance of display attributes for stationary vehicle ratings of effectiveness, annoyance, and desirability

Attribute	Comparisons	Effectiveness significance	Annoyance significance	Desirability significance
Display mode	Sound/voice/visual	++	++	
Volume	Normal/loud	++	++	
Sound location	Driver dash/seat belt retractor			
Voice gender	Male/female			
Voice tone	Normal/urgent			++
Voice warning	Warning/no warning statement			
Auditory rate	Slow/fast	++	++	
Sound type	Chime/beep/high urgency	+	++	++
Visual flash	Steady/flashing	++	++	
Brightness	Normal/bright		++	
Visual location	Dash/console/rear view mirror	++		++
Visual type	Icon/text/icon + text	++	++	
Text message	Normal/urgent		++	

+$p<0.10$
++$p<0.05$

the lowest-rated acoustic display. The display-by-age group interaction appears to be due to the older age group generally providing the lowest annoyance ratings for the auditory displays but with smaller and less consistent differences among age groups for the visual displays.

The findings of the effects of various display attributes on annoyance ratings are summarized in Table 8 (column titled "Annoyance significance"). As with the effectiveness ratings, there was a significant effect of the mode, with visual displays clearly less annoying than acoustic ones. For acoustic displays, there were significant differences for volume, auditory rate, and type of sound, so that greater annoyance was associated with louder and faster signals. For visual displays, there was more annoyance associated with flashing and bright displays, and with text as opposed to icons. The urgent text message in the center console (WARNING! BUCKLE SEATBELT) was rated as more annoying than the text message without the warning component.

For the desirability measure, the main effects of the display and participants' seat belt use category were significant. While the desirability ratings of the displays varied, any systematic pattern of differences is not as evident as for the other ratings. Figure 13 shows the group mean desirability rating for each display. The absence of substantial differences is evident, with the means only ranging from just under 3.0 up to 4.75 rating scale units. Rare seat belt users gave the lowest desirability ratings (mean of 3.32) while frequent seat belt users gave the highest ratings (mean of 4.58).

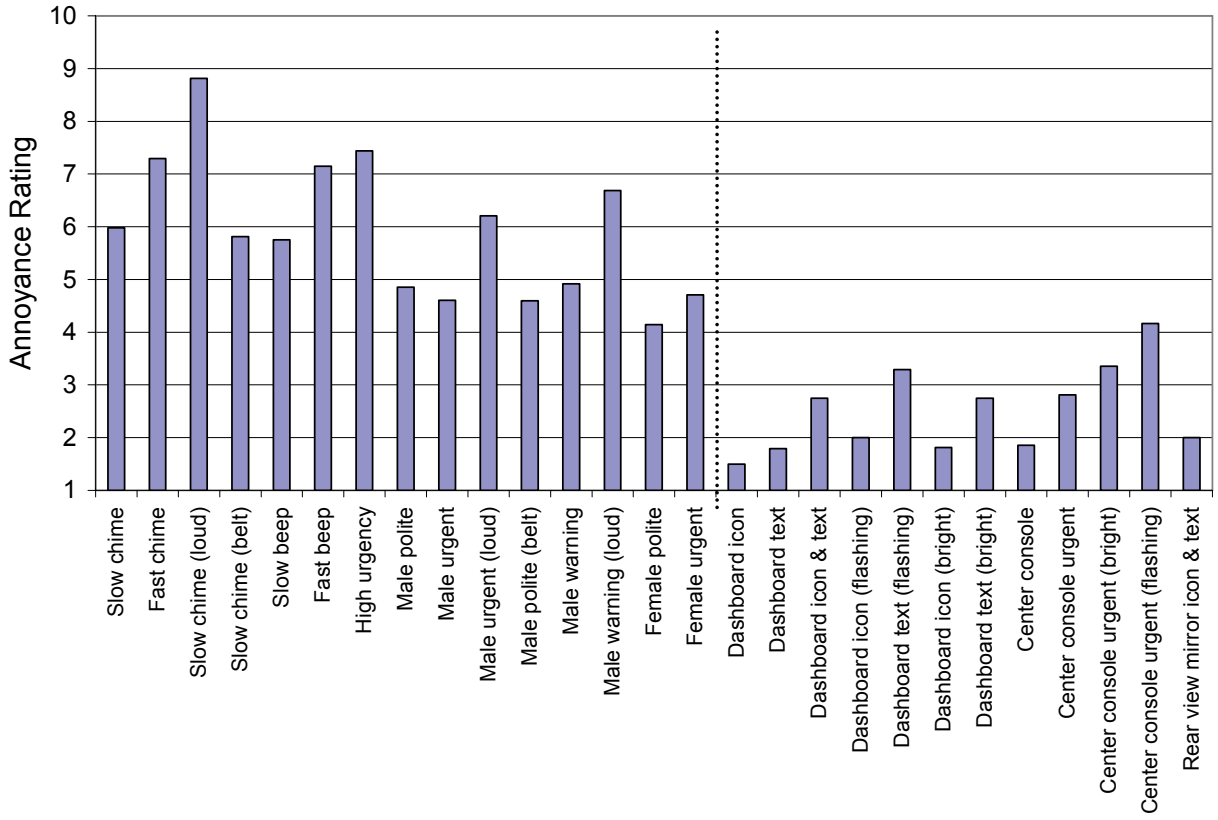

Figure 12. Mean stationary ratings of display annoyance

The findings of the effects of various display attributes on desirability ratings are summarized in Table 8 (column titled "Desirability significance"). The only attributes that were statistically significant were voice tone (polite more desirable than urgent), sound type (high urgency sound rated least desirable), and visual location (center console more desirable than dash). The relationship among the group mean ratings of effectiveness, annoyance, and desirability for the stationary vehicle ratings are shown in the scatterplots in Figure 14.

As the first panel shows, there is a strong relationship between the effectiveness and annoyance ratings (r=0.94). Annoyance and desirability are only weakly related (r=-0.31) while effectiveness and desirability are unrelated (r=-0.02). Figure 15 shows the effectiveness versus annoyance scatterplot broken out by seat belt use category. Regression lines fitted to each seat belt use group's data help clarify the differences. This is analogous to Figure 7 for the on-road ratings. As with the on-road ratings of systems, the three seat belt use groups separate along the effectiveness dimension, although they overlap considerably along the annoyance dimension. Although the main effect of seat belt use category just failed to be statistically significant in the stationary vehicle ratings ANOVA, this apparent difference, together with the parallel on-road data, indicates that for rare seat belt users, a greater level of annoyance is required to achieve a given degree of effectiveness.

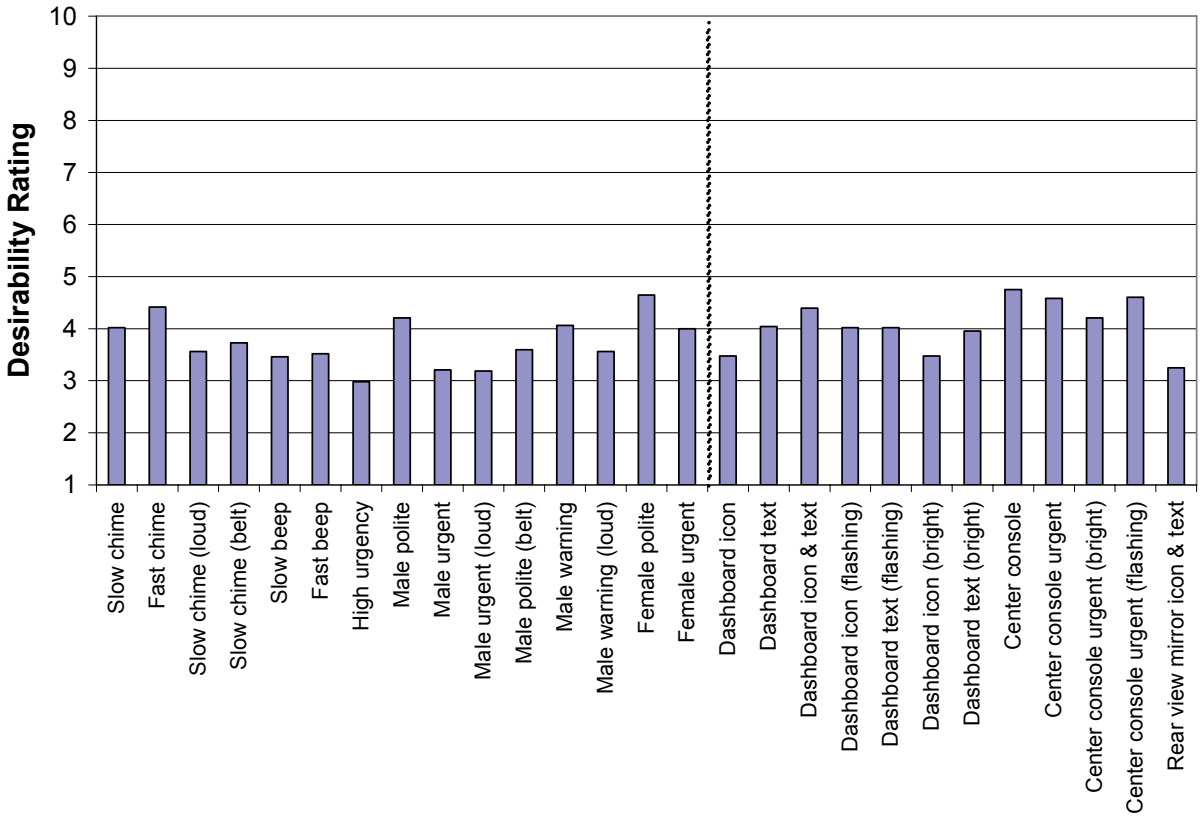

Figure 13. Mean stationary ratings of display desirability

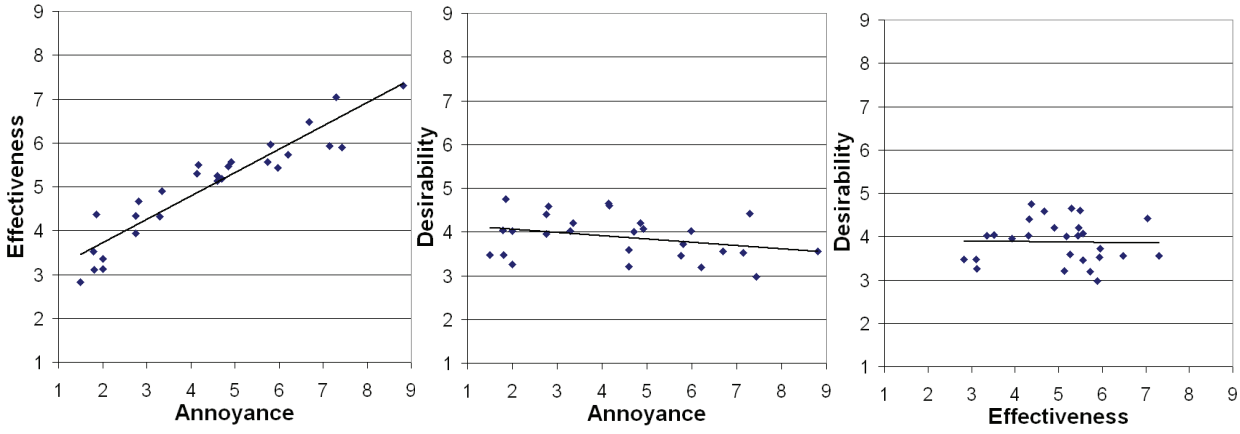

Figure 14. Scatterplots of relationships of mean ratings of effectiveness, annoyance, and desirability of displays

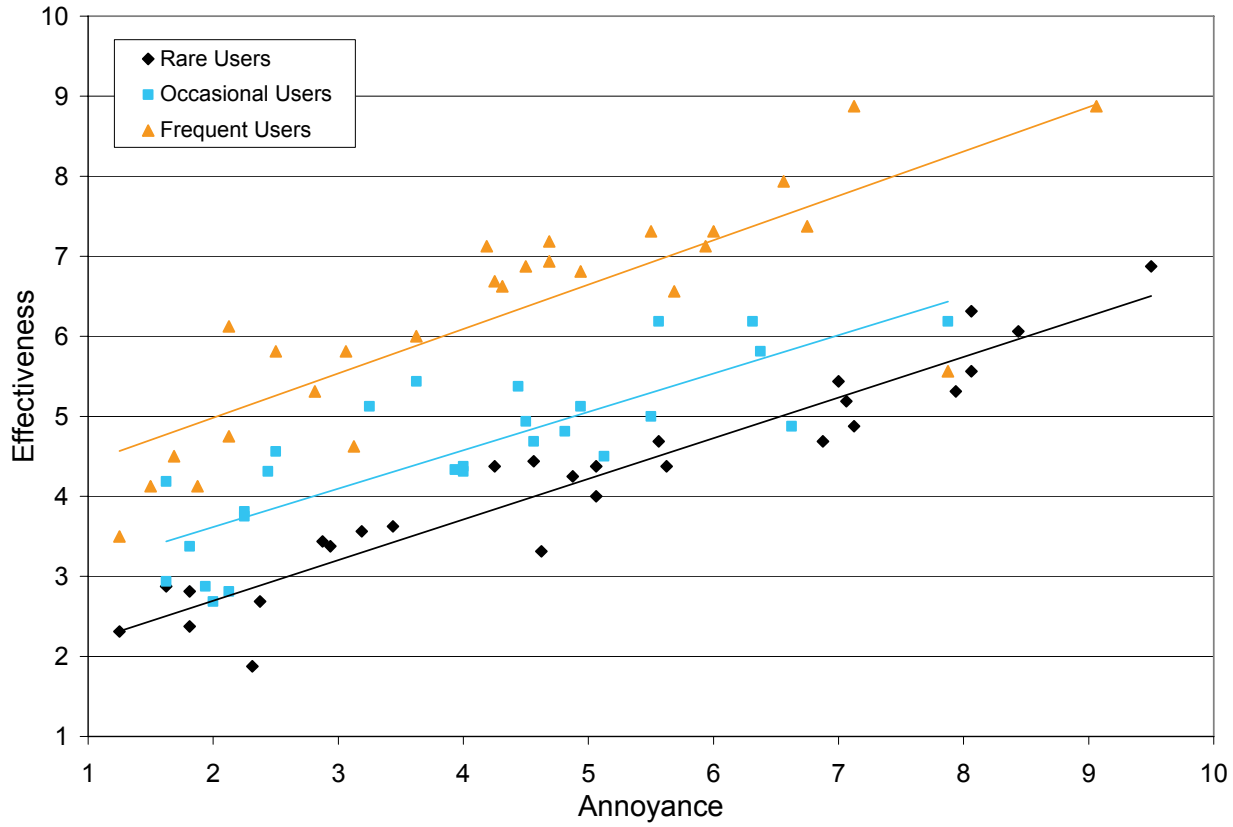

Figure 15. Stationary ratings of effectiveness versus annoyance by self-reported seat belt use category

The scatterplots in Figure 14 (left panel) and Figure 15 are useful for identifying particular displays that fall far from the regression line. This means that the level of effectiveness is either greater or less than one would expect based on how annoying a display is. In order to maximize consumer acceptance, it would be desirable to find displays that achieve high effectiveness with relatively little annoyance. Given the strong negative correlation between annoyance and effectiveness ratings, it is not surprising that there are relatively few substantial deviations from the regression lines in these figures. However, a few points are of interest. In Figure 14 (left panel), which presents group mean data for the entire sample of participants, the four rightmost data points bear mention. The data point for the fast chime (annoyance=7.29, effectiveness=7.04) lies above the regression line, and while comparable to the fast beep and the high urgency sounds in terms of annoyance, it is rated more effective than these. The rated effectiveness is comparable to that of the loud chime, but it is rated as less annoying. Thus if the group of participants is considered as a whole, the fast chime appears to be the most promising alternative among displays at the high effectiveness/high annoyance end of the spectrum. However, when the participant sample is partitioned by reported degree of seat belt use, there is not a great deal of consistency in outliers from group to group. For the rare seat belt users, no points stand out as being particularly highly effective, given their level of annoyance. The flashing dashboard text fell somewhat below the regression line (annoyance=4.63, effectiveness=3.31), indicating it is not a particularly promising display for the rare seat belt user group. The rear view mirror display also fell below the regression line, but was of such low-

rated effectiveness (1.88) that it matters little. The group of occasional seat belt users is of particular interest since these individuals may be most influenced by an improved reminder system. Two auditory and two visual displays stood out as noticeably above the regression line: center console urgent-bright (annoyance=3.25, effectiveness=5.13), center console urgent flashing (annoyance=3.63, effectiveness=5.44), male warning voice (annoyance=4.44, effectiveness=5.38) and loud male warning voice (annoyance=5.56, effectiveness=6.19). For the frequent seat belt users, the fast chime was rated particularly effective (annoyance=7.13, effectiveness=8.88), and was comparable in effectiveness to the loud chime (annoyance=8.88, effectiveness=9.06), while being much less annoying. The center console display (annoyance=2.13, effectiveness=6.13) and the female polite voice (annoyance=4.14, effectiveness=7.13) were also above the regression line. In contrast, the high urgency sound was seen quite negatively by this group, being rated quite high in annoyance while being rated only moderate in effectiveness (annoyance=7.88, effectiveness=5.56).

3.3 Participant Comment and Opinion

At the conclusion of the session, participants provided answers to four questions. The first concerned options for the best way to provide visual reminders and the second concerned options for the best way to provide auditory reminders. The third question asked participants for their opinions on letting people customize seat belt reminder sounds as they would customize ring tones on a mobile phone The fourth question asked participants to describe the "very best" seat belt reminder system for when a driver does not buckle up. The final question asked participants to describe the "very best" seat belt reminder system for when a front seat passenger does not buckle up.

The most frequently chosen best way to present a visual reminder was a system in which the visual reminder gets progressively brighter or flashes faster as time goes on. The auditory presentation chosen most frequently was a voice message that comes on periodically, followed closely by a non-voice sound that comes on periodically. In describing their ideal seat belt reminder system, participants generally mentioned features that were presented to them in the study. Several respondents indicated a preference for a voice auditory reminder. More original suggestions include having the voice mention fines and other penalties that could be incurred when a seat belt is not worn or a reminder that becomes progressively ruder by first having a voice ask to "please buckle up" then "buckle up" and then if the driver is still unbelted to proceed with annoying beeps. The ideal reminder system for the front seat passenger was usually described as having a visual display appear in front of the passenger or on the center console to either indicate that the passenger is not buckled or to request the passenger to buckle. Some suggestions also included a display placed in front of the driver to alert if the passenger is unbuckled. A novel suggestion was that of a voice reminder to specifically ask the passengers to buckle or to indicate which passenger is not buckled. In addition, in response to a question explicitly asking about the idea of customization, participants frequently indicated a desire to be able to customize their reminder sound. Of the 48 participants, 60.4 percent responded favorably to the idea, 27.1 percent negatively, and 12.5 percent were undecided or unclear.

4 Summary and Implications

4.1 Summary of Key Findings and Implications

This section highlights some of the key findings from the study. Findings from the on-road drives with various reminder systems and the stationary vehicle comparisons of auditory and visual displays are summarized separately. The findings highlighted here are selected from the many detailed results presented in Section 3 and are meant to indicate broad outcomes and items that may be key considerations for seat belt reminder system design.

4.1.1 Relationship of subjective measures

- As anticipated, there was a strong positive relationship among perceived effectiveness, annoyance, and attention-getting. Systems or displays judged highly likely to get the driver to use the seat belt were also judged to be most annoying. There were some displays that appeared to be relatively effective, or relatively ineffective, given their degree of annoyance, but for the most part these were minor deviations.
- The details of the relationship between subjective effectiveness and annoyance are related to the seat belt use practices of the participants. For a given degree of annoyance, frequent seat belt users consider the system or display more effective than do occasional seat belt users, who in turn consider it more effective than do rare seat belt users. There is some indication (from the on-road comparison of systems) that occasional seat belt users show a somewhat steeper function in the annoyance/effectiveness relationship; that is, their likely use of a seat belt is more strongly influenced by a given change in annoyance than is that for the frequent or rare seat belt users.
- The relationship of preference or desirability for a system or display to its subjective effectiveness and annoyance is weaker and more complex. For some individuals, highly effective/annoying systems or displays were rated as most desirable/preferable, while for other individuals, such systems or displays were least desirable/preferable. There was much more consensus among participants regarding what was effective and annoying than regarding what was desirable or preferable.

4.1.2 Key findings from comparison of prototype reminder systems

- The five reminder systems clearly differed from one another, both for judgments made during the drives and for judgments made after completing the drives.
- The "continuous flashing" system was not judged much differently than the basic system (where the steady icon terminated after a minute), both during the drive and for post-drive ratings. The other three reminder systems, which all included enhanced auditory elements as well as visual elements, were rated considerably more effective and annoying. This finding is consistent with the observational study findings reported in Westat (2007), which recorded the actual seat belt usage of occupants in vehicles with seat belt reminder systems of known characteristics. Systems with sound were more effective than those with only a visual icon.
- The on-road ratings were sensitive to the display elements that were in effect at about the time of the rating. Effects for sustained elements were maintained, and "carry over" effects from terminated elements were not evident later in the drive.

- For the on-road ratings of attention-getting, there was a seat belt use-by-rating point interaction, such that rare seat belt users found the initial displays less attention-getting than other seat belt use groups. This suggests that rare seat belt users are relatively insensitive to the initial displays typical of seat belt reminder systems and require some more conspicuous or assertive early reminder.
- The aggressive seat belt reminder system, which continued to cycle auditory and visual displays throughout the drive, clearly stood out as the most subjectively effective system when all four rating points were considered. It was also the most highly rated in terms of desirability and preference, though this was not a consensus among all participants.
- The scatterplots of annoyance versus effectiveness of on-road ratings showed only minimal overlap in effectiveness ratings for frequent seat belt users and rare seat belt users (Figure 7). In other words, the most effective seat belt reminder displays for the rare seat belt users were rated about the same as the least effective displays for the frequent seat belt users. To achieve moderate subjective effectiveness for the rare seat belt user group, annoyance levels must be quite high, and are perceived as very high by the frequent and occasional seat belt users.

4.1.3 Key findings from comparisons of display elements

- The set of auditory and visual displays that participants experienced while the vehicle was stationary varied considerably in terms of rated effectiveness and annoyance, and these two attributes were strongly correlated. There was minimal relationship of these two factors with the group mean ratings of desirability.
- Auditory displays (sounds and speech) were rated as more effective and more annoying than visual displays. There was very little overlap among the display modes, with only the most effective/annoying visual display (center console, urgent, flashing) achieving the levels of the least effective/annoying auditory displays.
- The group mean ratings of the effectiveness of auditory displays did not vary as greatly as the ratings of annoyance. Twelve of the fifteen auditory displays were rated between 5 and 6 on the 10-point scale for effectiveness, with a maximum of 7.3. The comparable range of annoyance ratings was 4.2 to 8.9. Except for the loud speech messages, the voice messages generally were rated as less annoying than the sounds.
- Loud displays were rated as more effective and annoying than normal volume and fast patterns were rated as more effective and annoying than slow patterns.
- For voice messages, no evident effects were seen related to the speaker's gender or tone (polite versus urgent).
- As a group, the visual displays were at best judged as moderate in effectiveness, with group mean ratings ranging from 2.7 to 5.7 on the 10-point rating scale. This is consistent with the findings from the comparisons of the on-road systems, where the visual-only enhancement was not very effective.
- The center console visual display location appeared more effective than the dashboard location. However, it should be noted that the center console display also had a larger character size than the dashboard display and characters were green rather than red. The design of the experiment precluded any further parsing of the influence of design features on participants' ratings.
- Flashing displays are more effective than steady displays and flashing appears to be a somewhat more effective way to enhance the display than increasing the brightness.

- Text displays were rated as more effective and more annoying than icon displays.
- No pronounced main effects of age and gender on ratings were observed, but age and gender appear more substantially related for auditory displays than for visual displays.
- In terms of rated desirability of the display, there was not good consensus between subjects and no display stood out as exceptional. The group mean ratings across all 27 displays had a range of only 1.9 units (2.8 to 4.7) on the 10-point scale. However these group means obscure strong opinions (extremes of the rating scale) for individual participants. The group mean ratings of desirability showed little association with the group mean ratings of annoyance or effectiveness.
- The overall rated level of desirability for the displays was lowest for the rare seat belt users and highest for the frequent seat belt users.
- As was the case for the reminder system ratings, details of the relationship between subjective effectiveness and annoyance for the displays were related to the seat belt use practices of the participants. For a given degree of annoyance, frequent seat belt users considered the display more effective than did occasional seat belt users, who in turn considered it more effective than did rare seat belt users.

4.2 Annoyance versus Acceptability Trade-Off

A key issue in the development of an optimal seat belt reminder system is the trade-off of annoyance versus acceptability. Effectiveness, attention-getting ability, and annoyance are strongly interrelated. Undoubtedly, if annoyance and user acceptance were ignored, a highly intrusive reminder scheme could be developed that would result in rapid and reliable buckling by nearly all drivers and affected passengers. However, such an extreme would suffer problems of public and political acceptability. Therefore it is important to identify reminder system strategies for enhancing seat belt use that maximize public acceptance. The willingness of a "typical" user to accept a particular system is not necessarily the crux of the problem. A small but vocal minority who find a system objectionable could damage public or political acceptability. Furthermore, highly annoyed people might remove or somehow defeat reminder systems, resulting in less protection overall.

The strength of the positive correlations among subjective effectiveness, annoyance, and attention-getting value was very high. For the ratings of the prototypical systems, the correlations among these factors ranged from r=0.97 to 0.99. For the stationary vehicle ratings of alternative displays, the correlation of annoyance and effectiveness was r=0.94. The relationship of effectiveness or annoyance to preference for a system or feature was much weaker. For the post-drive ratings of the prototypical reminder systems, the correlation of group mean effectiveness with group mean desirability was r=0.72, but even this correlation obscured the polarization seen in the desirability ratings. When the correlation was based on individual rather than group mean ratings, it dropped to r=0.34. For the group mean stationary vehicle display ratings, desirability correlated with effectiveness at r=-0.02 and with annoyance at r=-0.31. Thus there is not a particularly strong relationship of annoyance or effectiveness to preference in group mean data, and the group mean data itself obscures strong positive or negative feelings held by individual participants.

Annoyance, of itself, does not determine whether a particular individual will find a given system acceptable or not. Since annoyance can motivate compliance, many participants rated relatively annoying systems as quite desirable. Others reacted quite differently, rating the more annoying

systems as undesirable. Figure 10 shows the relationship between the annoyance and desirability ratings for the ratings of the five on-road systems. The figure is in the form of a "bubble chart." For each of the five systems, each participant provided a value for system desirability (rated after completion of the drive) and a value for annoyance (the maximum of the four on-road annoyance ratings). Each of the 240 data points (5 systems, 48 participants) is shown in the bubble chart. Since all of the values are integers between 1 and 10, there are many overlapping data points. The bubble chart varies the size (area) of each circle in the figure to correspond to the number of values at that coordinate. Thus the smallest circles indicate one data point and a circle with three times the area would represent the location of three data points. This chart gives an immediate visual impression of where ratings tend to cluster. Highly annoying systems show a large cluster of very low desirability ratings, yet also a substantial number of very high desirability ratings. Minimally annoying systems also show a large cluster of low desirability ratings, presumably because they are seen as ineffective. It is also evident in the figure that data points are spread throughout the diagram. There is no clear systematic relationship of annoyance and desirability, beyond clustering at the corners of the figure.

Complicating the issue further, those drivers most in need of a seat belt reminder, and most likely to experience reminders, may be those least accepting of enhanced reminders. In the stationary vehicle ratings of reminder displays, there was a significant effect of seat belt use on desirability ratings, such that the less likely participants are to wear seat belts, the lower they rate the desirability of a warning display. For the post-drive ratings of the desirability of the various reminder systems, the seat belt use category-by-reminder system interaction ($p=0.085$) did not reach the alpha=0.05 significance level. The nature of the interaction was that the rare seat belt users desired the basic reminder (no enhanced reminder component) more than did the frequent seat belt users, but desired the more assertive systems (aggressive reminder and one long reminder phase systems) to a lesser degree than the consistent seat belt users. Rare seat belt users also reported much greater willingness to have the hypothetical reminder systems removed from their vehicles, if legal. Furthermore, as Figure 7 and Figure 15 illustrate, rare seat belt users require a system or display to be considerably more annoying in order to achieve a given level of effectiveness.

From the various perspectives of design, consumer appeal, and public policy, there is a question of how to deal with creating seat belt reminder systems that are effective yet broadly acceptable. Several general strategies may be noted.

One approach is to identify system features that provide the most gain in effectiveness for a given increment in annoyance. However, the very strong correlation seen in this study between effectiveness and annoyance limits this approach. Some display alternatives appear better than others (e.g., fast chime preferable to loud chime), but these are relatively small benefits. There have been lines of research that attempt to identify stimulus features that may optimize gain for a given degree of annoyance (e.g., Marshall, Lee, & Austria, 2007) and perhaps more effective seat belt reminder displays could be identified. In general, however, this appears to be only a partial answer to the problem.

Another possibility is to allow drivers to select or customize their reminder sound(s). This might result in more acceptable reminders and perhaps even more personally salient ones. It is interesting to note that when asked about the option of customizing the reminder sound, participants were in favor of the idea (about 60% thought it a good idea, 27% thought not). However, there are some concerns with this approach. It could conceivably lead to some abuse

of the system, such as some drivers not wearing their seat belts because they want to hear the sound or display it to others. It could lead to some people to select sounds of low salience that could be easily ignored, if there were not constraints on what could be customized. Since a customized display is also by definition not a standardized one, it could also lead to confusion if an unfamiliar driver is operating the vehicle. However, since the current enhanced reminders also are not standardized from vehicle model to vehicle model, this may not be a new concern. Some form of reminder display customization may be an interesting idea to explore, especially for rare seat belt users, but its potential effectiveness is unclear.

Another approach is to design the system so that the increase in annoyance is incremental and the greatest levels of annoyance are only experienced after longer periods or more serious conditions of seat belt nonuse. This strategy is explicit in some proposed model approaches (discussed in Section 4.4) and evident in some current reminder algorithms.

A final consideration related to user acceptance is whether the driver should have latitude to disable the reminder system, or some aspect of it, for either individual trips or indefinitely. It might also be possible to disable the seat belt reminder system for a particular driver, in the same way that some current vehicles store in memory preferred seat positions for multiple drivers. Presumably this would most often be taken advantage of by consistent, intentional non-users of seat belts or by occupants who deliberately wish to not use a seat belt for a particular trip. System design options might include the ability to disable all, or only some part, of the system (e.g., highest level of warning); long-term or individual trip decisions; choice of seat locations to exclude from warning; and the means of disabling the system (difficulty; owner, driver, or dealer). The European New Car Assessment Programme (Euro NCAP) seat belt reminder assessment protocol (described in Section 4.4) specifically states "To avoid the danger that dedicated non-users would try to tamper with the system, it should be possible for it to be deactivated. Long term deactivation would cover this requirement. The system could also incorporate short term deactivation for individual journeys."

Of course, there are additional strategies to enhance seat belt use in addition to reminder systems. For example, there could be vehicle adaptations when the driver (or passenger) is sensed to be unbelted, such as ignition interlock (previously tried, Transportation Research Board, 2003), transmission shift delays (Van Houten, Malenfant, Austin, & Lebbon, 2005), lockouts of entertainment systems, speed limiters, and so forth. Other approaches might involve changes in legislation, enforcement, and adjudication. Public education is another approach. While these other approaches may have merit, the present study explicitly focuses on the reminder system strategy.

4.3 Behavioral Aspects Related to Reminder System Design

There are some aspects of motorist behavior that may be important to consider in the development of a seat belt reminder system. Although these behaviors were not addressed in the empirical research of this project, some selected behavioral considerations are raised here so that they may be explicitly recognized in seat belt reminder system development.

The timing and sequence of seat belt-related actions is one consideration. Some observational data from Malenfant and Van Houten (2005) describes the behavior of 1600 drivers in two geographic areas (Pinellas County, Florida, and Halifax, Nova Scotia). While the generality of findings from these two locations is not known, no other comparable data was identified.

Slightly less than one-third (31.4%) of the observed drivers buckled their seat belts before turning on the ignition. About 45 percent of drivers buckled after turning on the ignition but before placing the vehicle in gear, and slightly less than one-fourth (23.5%) of the drivers buckled up after putting the vehicle into gear. Roughly 80 percent of those who buckled after putting the vehicle into gear buckled after the vehicle began to move. The paper is somewhat ambiguous as to whether these percentages just reflect the proportions of those drivers who were actually observed to ultimately buckle their seat belts or the proportion of all drivers regardless of whether they were ever observed to buckle up (non-bucklers in the "after motion" group). The study also recorded latencies to buckling. For those drivers who buckled after turning on the ignition but before putting the vehicle in gear, the latency from ignition to buckling was a mean of 6.1 seconds and an 85th percentile value of 8.0 seconds. For those drivers that buckled the seat belt after engaging the vehicle in gear, the latency was timed from engaging the gear, not ignition. The mean latency from gear shift to buckling was 12.6 seconds and the 85th percentile was 19.9 seconds.

These observational data may have implications for reminder system design. The current FMVSS 208 requires only an audible of 4 to 8 seconds duration when the ignition is turned on and a warning light for no less than 60 seconds if the driver seat belt is not buckled. Since only about a third of drivers buckle up before turning on the ignition, for most drivers the reminder display may be perceptually lost in the clutter of displays, sounds, and driver and passenger actions that may accompany start up. Furthermore, the normal time it takes many drivers to buckle their seat belts means that they typically buckle the seat belt after the seat belt reminder has terminated. Therefore the display does not serve as a reminder on those occasions when the driver forgets or has his or her normal routine disrupted. Malenfant and Van Houten (2005) do not give a complete set of response latencies from ignition on time, since those drivers who engage the gear shift first had their latencies timed from that event. For the 45 percent of drivers who buckled their seat belts after ignition but before gear shift, the mean latency was 6.1 seconds and the 85th percentile was 8.0 seconds. For the approximately 23 percent who buckled up after gear shift, the latency from gear shift to seat belt buckling had a mean of 12.6 seconds and an 85th percentile of 19.9 seconds. If we add an estimate of about 2 seconds as a typical time between ignition on and gear shift, then the latency from ignition for these drivers would be in the range of 14.6 seconds for the mean and 21.9 seconds for the 85th percentile. Taken together, all of these data suggest that the initial reminder display should extend beyond 8 seconds, or that a new display should occur shortly after 8 seconds, and also another reminder should occur at around 20 seconds. This would help address the occasions of nonuse that are due to forgetting or distraction from routine. Drivers rarely buckle the seat belt more than 20 seconds after ignition or gear shift, so it may be assumed that drivers who have not buckled up by this point, despite a salient reminder, probably are intentionally not using their seat belts. More aggressive reminders are therefore probably required to address this group.

Another behavioral aspect is that some vehicle occupants link their seat belt use to trip characteristics. While for many people seat belt use is consistent, for others it is situation dependent. In particular, surveys (e.g., Boyle & Vanderwolf, 2004) and focus group research (e.g., Westat, 2005) indicate that many decline to use seat belts on short, lower speed, and familiar trips. Perhaps related to this, national occupant protection use data indicate lower seat belt use rates on surface streets (81%) than on freeways (88%) (Glassbrenner, 2005). Thus an important aspect of addressing nonuse of seat belts is with relatively short trips on surface

streets. Reminder system strategies that employ sparse, widely-spaced displays, or make more aggressive warnings speed-dependent, may not be fully effective for these trips.

The question may be asked more generally, what should reminder signal intensity be linked to: time, speed, distance traveled, or some combination of these? We do not know which trip attributes are linked most closely to behavioral aspects of non-use of seat belts.

Another behavioral aspect involves the social dynamic of the interaction among vehicle occupants. Seat belt use rate varies as a function of the presence, number, and characteristics of passengers, in a manner that interacts with the age and gender of the driver (e.g., Nuyts & Vesentini, 2005; Williams & Shabavona, 2002). For some conditions, passengers increase the rate of seat belt use. However, under other conditions, particularly for teen peers or groups of males, seat belt use rates may be lower with passengers. One observation from Nuyts and Vesentini (2005) is that whatever the general trend of influence, "drivers and passengers often behaved the same. They both wore or did not wear a seat belt." Some research has documented the reluctance of vehicle occupants to comment on the safety-behavior of other occupants, and in particular of passengers to say something to the driver (Ulleberg & Must, 2005). It should be kept in mind that seat belt reminder systems will operate within this social context, and in turn may influence it. Reminder displays that are perceivable by all occupants may provide an opportunity for communication among them and a justification for prompting seat belt use. Displays that specify the unbelted user(s) might promote this. However, social stigma or annoyance of all occupants might also limit consumer acceptance. The general point here is that the social dynamic of occupant interaction should be given consideration in the design and evaluation of reminder systems. Effects on seat belt use and acceptability seen for individual drivers may not be representative of various passenger situations.

A final behavioral issue concerns the prevalence of driver use of carry-on technologies that may distract attention from seat belt reminder systems or perceptually mask reminder signals. This includes cell phone use, text messaging, portable media players, and other devices that the driver might use at the time he or she enters the vehicle. Although objective data on the occurrence of such activity is not available, there is certainly an increase in the prevalence of these devices. Individuals engaged with such devices might be overrepresented among nonusers of seat belts, based on consideration of age and risk-taking propensity, but objective data are unavailable. In considering the design of seat belt reminder systems, it may be prudent to include consideration of vehicle occupants who may be engaged with distracting or masking technologies. For example, although auditory signals were found to be more attention-getting and potentially more effective than visual displays in this study, redundant non-auditory signals (visual, tactile) might help to address occupants distracted by technology use.

4.4 Consideration of Systems Suggested in the Literature

This section specifically discusses three seat belt reminder system descriptions presented in the published literature. These are not commercially available vehicle systems, but rather more comprehensive considerations of effective system requirements. The first is the Euro NCAP seat belt reminder assessment protocol. This document provides general system requirements, rather than a single specific design. It is noteworthy because of its role in new vehicle ratings for the European market. The second system is a proposed "optimal" design recommended by researchers at the University of Michigan Transportation Research Institute (UMTRI) (Eby, Molnar, Kostyniuk, Shope, & Miller, 2004) in work sponsored by Toyota Motor North America.

It is important because it is a comprehensive system based on findings from project surveys and focus groups as well as available literature and has a clearly spelled out rationale. The final system is the TAC SafeCar project conducted in Victoria, Australia. This reminder system was part of a suite of ITS systems incorporated in a field demonstration study. Although the driver sample was relatively small, this was a controlled experimental study and the reported improvements in seat belt use were substantial. The three seat belt reminder systems provide examples of alternative approaches for dealing with user acceptance issues.

4.4.1 Euro NCAP seat belt reminder assessment protocol

Euro NCAP provides for consumers independent safety ratings of new vehicles, thereby providing an incentive to manufacturers to incorporate safety features in excess of those mandated by law. Established in 1997, the program is now backed by five European governments, the European Commission, and motoring and consumer organizations in every EU country. Euro NCAP awards points for various safety features in each vehicle, one of which is the seat belt reminder system (Euro NCAP seat belt reminder assessment protocol, 2004). The goal of the Euro NCAP seat belt reminder recommendations is to promote the use of seat belt technologies that encourage seat belt nonusers to buckle while at the same time not annoying persons who always wear their seat belts. The system should not be so annoying as to cause users who never wear their seat belts to disable the system. The recommendations are in somewhat general terms, leaving details and options up to the manufacturer. The protocol for assessment describes three levels of reminder signal: initial, intermediate, and final. Of these, only "final" is a requirement. The initial signal is recommended, and the intermediate signal is just described. The details of the signal features such as engagement criteria and general signal specifications are listed in Table 9.

For front seat positions, the signal must have both audio and visual components. Recommended signals are the use of a "loud and clear" voice message or prominent text message on an LCD screen. Progressive or stepped audio is also recommended. Visual signals should stay on the entire time that a seat is occupied and a seat belt is not in use. The audio signal must be "loud and clear." The visual signal must be clearly visible to the driver, without the need for the head to be moved from the normal driving position. Rear seating signals need only be visual and must be easily visible to the driver. Rear seat passengers should be able to see the signal that is relevant to them. Recommendations for deactivation of the system are included in the protocol. Short term single journey deactivation should be allowed, but must be more difficult than just bucking the seat belt and then unbuckling it. This system must reactivate if the ignition is switched off more than 60 seconds. There is also a provision for long term deactivation but it must require a sequence of operations that could not be done accidentally or by guessing. Instructions for long term deactivation should not be provided in the owner's manual.

Table 9. Euro NCAP seat belt reminder assessment protocol
(chart is adapted from Euro NCAP seat belt reminder assessment protocol, 2004)

Type of system	**No system engaged** *Car not started* *0 seconds* *Start of trip*	**Initial system** *Car started or vehicle begins to move*	**Inter-mediate signal**	**Final signal** *The engine has been running for 60 (90) seconds, or the car has been in motion for 60 (90) seconds, or the car has been in motion for 500 (1000) metres, or speed ≥ 25 (40) km/h* *May be delayed if "sophisticated" intermediate signal is used. Delay thresholds are in ().*
Driver and front seat passenger	No signal	<u>If driver not belted:</u> audio or audio/visual	Optional Suggest text message or voice message	<u>If driver not belted:</u> audiovisual signal required At least 90 sec duration <u>If signal not continuous:</u> Gaps > 1 sec in signal cannot occur more than every 5 sec Gaps < 1 sec can occur to allow for flashing visual or beeping auditory signals If gaps in signal >3 seconds, that time is not included in the duration time No gap can be greater than 25 sec
Rear seated passengers	No signal	<u>If passenger is not belted:</u> visual signal required within 5 sec, audiovisual when seat occupancy information is available At least 30 sec duration <u>If visual signal not continuous:</u> Gaps > 1 sec in signal cannot occur more than every 5 sec Gaps < 1 sec can occur to allow for flashing visual signal If gaps in signal >3 seconds, that time is not included in the duration time No gap can be greater than 25 sec	Not required	Not required

4.4.2 UMTRI proposed "adaptive" system

UMTRI recommended an "optimal" seat belt reminder system in their report entitled *Developing an optimal in-vehicle safety belt promotion system* (Eby et al., 2004). The project was funded by Toyota Motor North America to promote understanding of seat belt reminder systems and to suggest improvements to existing systems. UMTRI developed the recommendations based on the results of a literature review, nationwide telephone survey, and focus groups. Based on their findings, they proposed an optimal seat belt reminder system structured on the logic that the system should be adaptive to the features that are most effective for different driver groups. They distinguish five driver groups: full-time users, part-time users due to comfort/convenience reasons, part-time users due to cognitive/personal reasons, part-time users due to low perceived risk, and full-time nonusers. Cognitive/personal part-time users were categorized as users who forget to use the seat belt or are not in the habit of wearing the seat belt. Low-perceived-risk part-time users do not wear their seat belts when driving a short distance or when not driving on public roads. Comfort/convenience part-time users were not addressed in their framework because those issues are best addressed through changes to seat belt design. Working under the assumption that these categories of users are motivated by different factors, the framework was designed to target these groups through the use of different features. Table 10 schematically summarizes the concept and design.

Table 10. Schematic representation of UMTRI adaptive seat belt reminder system (chart is adapted from Eby et al., 2004)

Example metrics	Car not started 0 seconds Start of trip	Car started, not in gear <10 mph 4-8 seconds	Car starts moving 11-25 mph 2-3 minutes	Car on patrolled roadways >25 mph 5 minutes
Seat belt use group	Full-time user	Part-time user: cognitive/personal	Part-time user: low perceived risk	Full-time nonuser
Type of system engaged	No system engaged	Reminder system	Annoyance system	Interlock system
Driver	No signal	If driver not belted: user-selected signal that repeats at constant interval. If passenger not belted: flashing pictograph showing seat location	If driver not belted: buzzer that increases in intensity the faster the vehicle moves. If passenger not belted: flashing pictograph showing seat location	If driver not belted: a warning signal, then entertainment interlock. If passenger not belted: flashing pictograph showing seat location
Passenger	No signal	Light or "unbelted" pictograph that flashes at a constant interval	Light or "unbelted" pictograph that flashes at a constant interval	A warning signal followed by entertainment system interlock.

In the UMTRI framework, different levels of intrusiveness of the system are used for each user group. The system determines the type of seat belt user operating the vehicle based on time or

distance driven before the user buckles the seat belt. The system first assumes that the driver is a full-time user until some criterion is reached where it assumes that the user has forgotten to buckle up, at which point a reminder system is activated (person is classified as a cognitive/personal part-time user). It was recommended based on the focus groups that the reminder should be a flashing light or user-selectable voice message or auditory reminder that repeats at a constant interval. At some further criterion, the system assumes that the driver has chosen not to buckle up and an annoyance system is then activated (person is classified as a low perceived risk part-time user). A buzzer that gets more intense the faster the vehicle travels was suggested for this user group due to high annoyance ratings for this feature and the likelihood of maximizing system effectiveness. If the driver still does not buckle, the system assumes that a full-time non-user is operating the vehicle and an interlock system is then engaged which disables the entertainment system. This system is designed to eliminate annoyance for full-time users while encouraging part-time users to buckle the seat belt.

UMTRI also provided suggestions for a passenger seat belt reminder system for which the reminder system and/or entertainment system interlock components were recommended but not the annoyance system. The ideal display would consist of a diagrammatic display of seating positions with flashing lights at unbuckled locations. Based on survey and focus group findings, a flashing light or pictograph for direct display to the passenger is recommended based on opposition to the presentation of sounds to remind passengers to buckle.

4.4.3 TAC SafeCar project

The TAC SafeCar project was an Australian ITS demonstration project conducted by the Monash University Accident Research Centre, in conjunction with the Victorian Transport Accident Commission and Ford Australia. The researchers installed several ITS technologies in 15 vehicles which were then field tested with a sample of 23 drivers (15 experimental participants who experienced the operational system and 8 control participants who did not). One of these technologies was a seat belt reminder system. The description of the systems and the findings is taken primarily from Regan et al. (2006), and also from Regan et al. (2002) and Regan et al. (2005). What makes the system particularly interesting is that the field test data (1,500 km "before," 1,500 km "after" for the seat belt reminder system) show substantial sustained effects on objectively measured behavior. Relative to the "before" period, the reminder system decreased the percentage of trips in which an occupant was unbelted for any part of the trip (32% to 16%), the percentage of total driving time spent unbelted (5% to 0.18% initially, rising somewhat to 0.31%), the mean time to buckle the seat belt (30 seconds to 7 seconds), the peak speed while any occupant was unbuckled (33.5 km/h to 26.9 km/h), and the proportion of unbelted time spent at speeds of at least 40 km/h (6.72% to 0.05%). However, it should be noted that the reminder system included all occupant seat positions and these reported results are for all occupants, not specifically drivers.

The seat belt reminder system had both visual and auditory components. The repetition rate of the auditory warning increased as a function of vehicle speed. The system had the following characteristics:

- Visual displays were presented on the "ITS Visual Display," which was a 3.8" LCD display located to the left of the driver (would correspond to right in the U.S.) on the dashboard. The visual display for the seat belt reminder was a "FASTEN SEAT BELT" legend immediately below a seat belt icon. The text was black with character heights of

"at least 5mm," and the icon was red and approximately 25 mm wide by 35 mm high. The background field was white. The text message was static and the icon flashed at a rate of 3 Hz (duty cycle not specified).

- The auditory signal was "a collection of complex tones with components beginning as low as 2000 Hz and extending as high as 5000 Hz and beyond, but with the highest amplitude components grouped around 800 Hz." The sound was "loud enough" to be heard in all driving conditions but not loud enough to startle the driver. It was adjustable between 62.5-87.5 dB (peak sound pressure level). Users could not disable the auditory signal.
- Target seat locations: The reminder system was designed to warn when any occupant was unrestrained. Detection was based on sensing weight greater than 15 kg (33 pounds).
- Levels of warning: The system provided a sequence of four levels of warning that increased with vehicle speed:
    - Level 1: speed 0-9 km/h. Flashing visual icon over static text message "FASTEN SEAT BELT." There was no auditory component at level 1.
    - Level 2: speed 10-25 km/h. Same visual warning but accompanied by auditory warning played every 2 seconds (the reports do not indicate the duration of the "on" period of the auditory component for any of these levels).
    - Level 3: speed 25-50 km/h. Same visual warning but accompanied by auditory warning played every second.
    - Level 4: speed >50 km/h. Same visual warning but accompanied by auditory warning played at 2 times/second.

One interesting aspect of the findings was that the mean time to buckle the seat belt dropped from 30 seconds to 7 seconds. This suggests that the system may have trained occupants to buckle up rather than just respond to the higher levels of warning.

The TAC SafeCar Project reported not only substantial changes in objective measures of seat belt use but also good levels of subjective response (usefulness, acceptability, workload, attitudes). However, the positive response to this system should be considered in light of several factors. First, the reminder system was not a permanent feature of the participant's personal vehicle. Rather, it was an experimental vehicle provided to the participant for a period of about six months, through the participant's employer (company with a vehicle fleet). Second, the driver population was volunteers and as a group they began with high self-reported levels of seat belt use. Thus the sample included few drivers who routinely failed to use their seat belts. In questions administered at the end of the study, participants showed some skepticism regarding how effective the system would be with drivers who frequently and intentionally do not use seat belts. Thus while the study experimentally demonstrated meaningful behavioral effects and good acceptance, it remains questionable whether comparable results would be obtained with a more representative sample of U.S. drivers.

4.5 Conclusions

Evidence from observational studies and field evaluations suggests that seat belt reminder systems can meaningfully improve occupant seat belt use rates (e.g., Westat, 2007; Regan et al., 2006). The data are more limited, subjective, and anecdotal regarding public acceptance. It

appears that the majority of the general public finds such systems acceptable, but resistance by a minority of the public could limit both the public and political acceptability of the concept.

This project observed substantial differences among prototypical reminder systems and among reminder display elements in terms of perceived effectiveness, annoyance, and attention-getting ability. These factors are strongly interrelated, so that effective displays also tend to be annoying ones. No clear consensus existed regarding which systems or displays were most preferable and the degree to which annoyance was an important attribute of an effective system. Perhaps not surprisingly, those participants least likely to wear seat belts tended to find reminder displays relatively more annoying and relatively less effective in eliciting seat belt use. Since consistent seat belt users are not likely to experience the more aggressive components of seat belt reminder systems, their feelings of annoyance and acceptability may not be as critical as those of the much smaller group of routine or periodic nonusers.

Visual displays and auditory (speech and sounds) displays were clearly distinct in terms of their perceived effectiveness. In the stationary vehicle ratings of displays, the visual display with the highest mean effectiveness rating only reached the level of the lowest rated auditory displays. In the on-road comparison of prototype systems, the visual-only system was less effective than those with auditory elements. This is consistent with the field observations of Westat (2007), where visual-only systems were not found to be as effective as those with sounds. The limited effectiveness of visual displays suggests that they may be useful as low-level reminders, or as supplements to auditory displays, but they are not likely to be successful as the primary basis of an optimal seat belt reminder system. The three example systems discussed in Section 4.4 all employ auditory displays as the warning sequence progresses.

Although the term "seat belt reminder system" is used to describe these systems that promote greater seat belt use, it is evident that much of the potential gain in seat belt use comes not from simply reminding but from motivating seat belt use because seat belt use terminates intrusive signals. Where there is motivated non-use, an effective reminder system should provide a greater incentive for seat belt use and this requires some aggressive displays. Various strategies have been suggested but not systematically evaluated and compared, both for objective effects on seat belt use and for public acceptance. Such data are needed to better inform decisions about system design. However, ultimately the issue comes down to how much annoyance one is willing to impose upon various subset populations of seat belt nonusers and how much user control of the system one is willing to give to vehicle owners. The findings of this study and other research efforts provide some helpful guidance for system design and further evidence of the potential benefits of reminder systems on occupant seat belt use rates. However, data on annoyance, acceptance, and latitude for user control for those groups most likely to experience the more aggressive displays is more limited and further evaluation is needed to identify seat belt reminder systems that can motivate seat belt use while remaining acceptable to consumers.

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Appendix A: Experimental Protocol

INSTRUCTIONS: IN-VEHICLE SEAT BELT REMINDER STUDY

Preparation Checklist

- Car key
- Laptop computer
- Subject packet (instructions, consent form, closing questions)
- Subject payment
- Project cell phone (turn it on)
- Clipboard
- Pen
- Randomization schemes
- Receipt book (should be kept in car)

Setup

1. Plug cigarette lighter plug into the cigarette lighter adapter
2. Turn on laptop computer, then attach all laptop connections:
    a. Power cord
    b. Speaker cord (in headphone jack)
    c. GPS card (be sure cable is attached to card)
    d. USB cables (first "0" in bottom port, then "1" in top port)
3. Open car trunk and turn on power inverter; close trunk
4. Open Belt Reminder program, select "show single shots" and test a few sounds and displays to ensure proper operation and sound levels
5. Open the left-rear seat back to allow air flow between the car and the trunk
6. Place the black equipment bag over the top of the black suitcase to suppress the clicking sound
7. Turn on car ignition
8. *If laptop is low on battery, plug it into the inverter*

Introduction

Thank you for coming to participate in this study. My name is _____ and I'll be working with you today. During this session, you will experience different seat belt reminder systems in this car and tell me your feelings about them. The session will last for about 2 hours and you will be paid $75 at the end of the session. Did you bring the consent form with you? *If not, have subject read and sign consent form*.

<Drive the participant down to the staging area>

Before we get started, I'd like to ask you a few questions about your car and your seat belt use.

Background

Now I'll tell you a little more about the purpose of this study. All vehicles in the United States come equipped with seat belt reminder systems to alert drivers if they do not have their seat belts buckled. The law requires that a reminder light come on for about 6 seconds when the ignition is turned on and a beep or chime sounds during this period unless the seat belt is buckled. The reminder light is an icon that looks like this:

Most vehicles today have just this minimum required system. Every time you start your vehicle without the seat belt buckled, the icon lights up for a few seconds and a sound will come on for about 6 seconds, or less if you buckle up before that. After that, there is no more light or sound.

So all cars are required to have an icon and a sound that activate for about 6 seconds if the driver starts the car without putting on the seat belt. But some car companies have started using seat belt reminder systems that do more than this because they think it might be possible to create more effective reminders that are still acceptable to drivers. Today you are going to experience some of these reminder systems. I want to get your opinion on how you would react to each one. The session is going to be in two parts today. First, you are going drive this car which will allow you to experience various types of reminder systems. After the driving part, we will look at some additional ideas while we are parked, without having to drive. For each system that I show you, I am going to ask you for opinions or ratings. It is very important that you think about how you would respond to each of these ideas. I am not asking you to think about what others might do. I want to know your reaction. There are no right or wrong answers to these questions. What is important is that you think realistically about your own reactions.

Some of the reminders you experience will be visual displays and some will be sounds. We have temporarily installed some displays and speakers in this car. The displays and speakers are not neatly built into the vehicle, as they would be if they were actually furnished by the manufacturer. Please just ignore this when you give me your ratings or opinions of the things you see and hear. Just assume that the real product would look nice and would be neatly integrated into the vehicle. I want you to rate the concepts, so don't be concerned about how the packaging looks. Do you have any questions so far?

Part I: On-Road Systems

During the first part of this session, you are going to drive a short route several times, each time with a different seat belt reminder system. For safety, you actually will wear your seat belt at all times. But the car will react as if you are not wearing a seat belt. So while you make each drive you will see and hear exactly what a driver would see and hear if they were not wearing a seat belt. Every so often during the drive, I will ask you to make some ratings about your reaction to the seat belt reminder system. After we finish each drive, I will also ask you some more in-depth questions.

Before we go over the procedure in detail, we will take a short drive in the test car. This will

give you a chance to get familiar with the car and the route you will be driving before we begin the study. Before we leave this parking space, I'd like you to make whatever adjustments you need:

- Adjust seat and mirrors.
- Go over controls and displays
- Put on seat belt

Please remember that we will be driving in traffic, so safety is our top priority. You won't see or hear any seat belt reminders during this practice drive. I just want you to get familiar with driving this car along the route. I will give you directions as we go. First, we'll drive a bit in this parking lot, then we'll go out on the road along the route you will be driving during the study.

When you start to drive on the road: While you are driving during this study, always stay in the right lane and do not pass slower vehicles. There is no need to rush through the route. Please obey speed limits and use your turn signals.

Complete one lap of familiarity drive, check GPS monitor during drive to be sure that GPS signal is good and vehicle speed is being recorded, then return to parking space. Are you comfortable driving this route? When we do the actual drives, we will actually do two laps per drive.

Now let's go over the questions I will ask you while you are driving. All of the questions that I ask you will be about the seat belt reminder systems that you will experience in this car. I am going to ask you to make ratings several times during each drive. The first time I ask you, your rating should be based on what you have experienced up to that point. In other words, from the time you turned the car on until the time I asked the question. After that, each time I ask you for a rating, your answers should be based on what you have experienced since the last time I asked you for a rating. Does that make sense?

Now let's go over the questions and the rating scales that you will use:

Periodic On-Road Ratings

The first question I will ask you is: **How likely is it that you would have buckled up?**
Please answer on a scale from 1 to 10, where:
"1" means that you **definitely would not have buckled up**
"10" means that you **definitely would have buckled up**

The second question I will ask you is: **How attention-getting is the reminder system?**
Please answer on a scale from 1 to 10, where:
"1" means that **you did not even notice it**
"10" means that **it is impossible to ignore**

The third question I will ask you is: **How annoying is the reminder system?**
Please answer on a scale from 1 to 10, where:
"1" means that **it is not annoying at all**
"10" means that **it is extremely annoying**

When you answer these questions, try to respond with your first impression, don't think too long before answering. Let's try a practice run driving along the route you just drove a few minutes ago. Then if you feel comfortable with the procedure, we will do five more drives with some different seat belt reminder systems. During this practice and the actual drives that will follow, I want you to imagine that that you are driving to visit a friend who lives about 15 minutes away. The actual drives we will make are only about 6 minutes long and just around the local streets here. But in thinking about how you might react to the seat belt reminder systems, please imagine that you are on this 15-minute drive. Also, imagine that you are driving alone, without me in the back seat. Does that make sense? Remember, the first time I ask you for ratings, your response should reflect your feelings up to that point. Then the next time I ask you for ratings, your response should cover your feelings since the previous ratings. Keep in mind that this drive is just for practice – we will not use your answers for our study. Please turn the car off now.

Do run with Practice system, then return to parking space and click "Stop Example". Make sure that the participant is using the rating scales as intended and field questions.

Before we begin the first drive, let's review the procedure. Remember that even though you will actually be wearing your seat belt the whole time, the car will react as if you are not wearing your seat belt, so you will experience the sounds and visual displays that the driver would get if he or she were not wearing the seat belt. As you drive, I would like you to imagine that you are heading out on a trip to visit a friend who lives about 15 minutes away. Also, imagine that you are driving alone, without me in the back seat. If you feel that my questions are distracting you from driving, please focus on driving and I will repeat the question when you are ready.

Now we will take five drives on the route you drove earlier. On each drive, you will experience a different seat belt reminder system and I will ask you to provide the same ratings from 1 to 10 that you provided during the practice we just finished. After we finish each drive, we will return back to this parking space where I will ask you some more in-depth questions about the system you just experienced.

Take first drive, then return to parking space and click "Stop Example" to end program.

Now that you have completed your drive with this seat belt reminder system, I'll ask you some questions about your impressions of it:

First Drive: Post-Drive Questions **System Number: (_____)**

How desirable would it be to you to have a seat belt reminder system like this in your vehicle? (keeping in mind that in real life the reminder system would turn off once you put on your seat belt)
Please answer on a scale from 1 to 10 where:
"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

What are the things you like or dislike most about this system?

Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your seat belt on those trips?
Please answer on a scale from 1 to 10 where:
"1" means that **you would definitely not buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

In a new vehicle, would you prefer to have a system like this or the basic current required seat belt warning system? With the current "basic" minimal system, if you do not buckle up, the sound and the seat belt icon come on for about 6 seconds, then turn off.
Please answer on a scale from 1 to 10 where:
"1" means that **you would strongly prefer to have the basic seat belt warning system instead of this system**
"10" means that **you would strongly prefer to have this seat belt warning system instead of a basic system**

If your car dealer or garage legally offered to uninstall this seat belt reminder system (leaving only the basic reminder), how much would you be willing to pay to have them remove it? *If they say they would not pay*: What if they offered to uninstall it for free?
I would not want them to remove it _____
I would pay as much as $_____

Can you suggest any improvements to the reminder system you just experienced?

Second Drive: Post-Drive Questions **System Number: (_____)**

How desirable would it be to you to have a seat belt reminder system like this in your vehicle? (keeping in mind that in real life the reminder system would turn off once you put on your seat belt)
Please answer on a scale from 1 to 10 where:

"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

What are the things you like or dislike most about this system?

Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your seat belt on those trips?
Please answer on a scale from 1 to 10 where:

"1" means that **you would definitely not buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

In a new vehicle, would you prefer to have a system like this or the basic current required seat belt warning system? With the current "basic" minimal system, if you do not buckle up, the sound and the seat belt icon come on for about 6 seconds, then turn off.
Please answer on a scale from 1 to 10 where:

"1" means that **you would strongly prefer to have the basic seat belt warning system instead of this system**
"10" means that **you would strongly prefer to have this seat belt warning system instead of a basic system**

If your car dealer or garage legally offered to uninstall this seat belt reminder system (leaving only the basic reminder), how much would you be willing to pay to have them remove it? *If they say they would not pay*: What if they offered to uninstall it for free?

I would not want them to remove it _____
I would pay as much as $_____

Can you suggest any improvements to the reminder system you just experienced?

Third Drive: Post-Drive Questions **System Number: (_____)**

How desirable would it be to you to have a seat belt reminder system like this in your vehicle? (keeping in mind that in real life the reminder system would turn off once you put on your seat belt)
Please answer on a scale from 1 to 10 where:

"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

What are the things you like or dislike most about this system?

Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your seat belt on those trips?
Please answer on a scale from 1 to 10 where:

"1" means that **you would definitely not buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

In a new vehicle, would you prefer to have a system like this or the basic current required seat belt warning system? With the current "basic" minimal system, if you do not buckle up, the sound and the seat belt icon come on for about 6 seconds, then turn off.
Please answer on a scale from 1 to 10 where:

"1" means that **you would strongly prefer to have the basic seat belt warning system instead of this system**
"10" means that **you would strongly prefer to have this seat belt warning system instead of a basic system**

If your car dealer or garage legally offered to uninstall this seat belt reminder system (leaving only the basic reminder), how much would you be willing to pay to have them remove it? *If they say they would not pay*: What if they offered to uninstall it for free?

I would not want them to remove it _____
I would pay as much as $_____

Can you suggest any improvements to the reminder system you just experienced?

Fourth Drive: Post-Drive Questions **System Number: (_____)**

How desirable would it be to you to have a seat belt reminder system like this in your vehicle? (keeping in mind that in real life the reminder system would turn off once you put on your seat belt)
Please answer on a scale from 1 to 10 where:

"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

What are the things you like or dislike most about this system?

Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your seat belt on those trips?
Please answer on a scale from 1 to 10 where:

"1" means that **you would definitely not buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

In a new vehicle, would you prefer to have a system like this or the basic current required seat belt warning system? With the current "basic" minimal system, if you do not buckle up, the sound and the seat belt icon come on for about 6 seconds, then turn off.
Please answer on a scale from 1 to 10 where:

"1" means that **you would strongly prefer to have the basic seat belt warning system instead of this system**
"10" means that **you would strongly prefer to have this seat belt warning system instead of a basic system**

If your car dealer or garage legally offered to uninstall this seat belt reminder system (leaving only the basic reminder), how much would you be willing to pay to have them remove it? *If they say they would not pay*: What if they offered to uninstall it for free?

I would not want them to remove it _____
I would pay as much as $_____

Can you suggest any improvements to the reminder system you just experienced?

Fifth Drive: Post-Drive Questions **System Number: (_____)**

How desirable would it be to you to have a seat belt reminder system like this in your vehicle? (keeping in mind that in real life the reminder system would turn off once you put on your seat belt)
Please answer on a scale from 1 to 10 where:

"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

What are the things you like or dislike most about this system?

Thinking specifically about the situations in which you sometimes do not wear your seat belt when you drive, how effective would this system be in getting you to wear your seat belt on those trips?
Please answer on a scale from 1 to 10 where:

"1" means that **you would definitely not buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

In a new vehicle, would you prefer to have a system like this or the basic current required seat belt warning system? With the current "basic" minimal system, if you do not buckle up, the sound and the seat belt icon come on for about 6 seconds, then turn off.
Please answer on a scale from 1 to 10 where:

"1" means that **you would strongly prefer to have the basic seat belt warning system instead of this system**
"10" means that **you would strongly prefer to have this seat belt warning system instead of a basic system**

If your car dealer or garage legally offered to uninstall this seat belt reminder system (leaving only the basic reminder), how much would you be willing to pay to have them remove it? *If they say they would not pay*: What if they offered to uninstall it for free?

I would not want them to remove it _____
I would pay as much as $_____

Can you suggest any improvements to the reminder system you just experienced?

Part II: Stationary Vehicle Judgments

<Drive participant back to the reserved parking space>

Now I am going to show you some more variations on the standard seat belt reminder system. I will just show you these while we are parked, so you won't have to do any more driving. Just imagine that you will encounter these systems under the same kinds of driving conditions you just experienced. I will ask you some questions about each one I show you.

Belt Reminder Sounds

In this part of the session, you are going to hear different sounds that might be used to remind you to buckle your seat belt. Since we will not actually be driving, you need to imagine that you are hearing these sounds in the course of your normal driving. After you hear each sound, I will ask you to make some ratings based on your impressions.

Each time you hear a sound, imagine that if you do not buckle up, you will hear it in your car about 30 seconds after you start up, and once every minute after that. Assume the only reminder is the sound you hear and there is no visual display. In order to have time to listen to a number of sounds, you will actually only hear the sound once. But to make your ratings, you have to imagine that if you were not buckled up, you would hear it after 30 seconds and then once every minute. Does that make sense?

<Turn on belt retractor speaker>

Here's the first sound…

1. Thinking specifically about the *situations in which <u>you</u> sometimes do not wear your seat belt* when you drive, **how effective would this reminder sound be in getting you to wear your seat belt** on those trips?
Please answer on a scale from 1 to 10 where:
"1" means that **you would definitely <u>not</u> buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

2. How annoying would this sound be during driving?
Please answer on a scale from 1 to 10 where:
1" means that **it is not annoying at all**
"10" means that **it is extremely annoying**

3. **How desirable would it be to you to have a seat belt reminder system like this in your vehicle?** (keeping in mind that the reminder system would turn off once you buckle your seat belt)
Please answer on a scale from 1 to 10 where:
"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

<u>Sound</u>	**Effect <u>Rating</u>**	**Annoyance <u>Rating</u>**	**Desirability <u>Rating</u>**
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

<Turn off belt retractor speaker>

Belt Reminder Visual Displays

In this part of the session, you are going to see various visual displays that might be used to remind you to buckle your seat belt. The visual displays will appear in the small black boxes located on the dashboard, in the center console, and above the rearview mirror. Since we will not actually be driving, you need to imagine that you are seeing these displays in the course of your normal driving. After you see each display, I will ask you to make some ratings based on your impressions.

Each time you see a display, imagine that if you do not buckle up, you will see it in your car about 30 seconds after you start up, and once every minute after that. Assume the only reminder is the display and there are no sounds. In order to have time to show you a number of displays, you will actually see each one only once. But to make your ratings, you have to imagine that if you were not buckled up, you would see it after 30 seconds and then once every minute. Does that make sense?

Here's the first display…

1. Thinking specifically about the *situations in which <u>you</u> sometimes do not wear your seat belt* when you drive, **how effective would this be in getting you to wear your seat belt** on those trips?
Please answer on a scale from 1 to 10 where:
"1" means that **you would definitely <u>not</u> buckle up with this sort of system**
"10" means that **you would definitely buckle up with this sort of system**

2. How annoying would this display be during driving?
Please answer on a scale from 1 to 10 where:
"1" means that **it is not annoying at all**
"10" means that **it is extremely annoying**

3. **How desirable would it be to you to have a seat belt reminder system like this in your vehicle?** (keeping in mind that the reminder system would turn off once you buckle your seat belt)
Please answer on a scale from 1 to 10 where:
"1" means that **it is extremely undesirable**
"10" means that **it is extremely desirable**

Visual <u>Display</u>	**Effect <u>Rating</u>**	**Annoyance <u>Rating</u>**	**Desirability <u>Rating</u>**
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____
____	_____	_____	____

Closing Questions

The last thing I'll ask you to do is answer a few questions on this sheet of paper. <*Write participant number at top and give closing questions to participant*> Please read the questions carefully and let me know if you have any questions or if anything is unclear.

Debrief

- Pay participant
- Have participant sign receipt and offer them the yellow copy
- Thank for participation and ask if they have any final questions or comments about the study
- Guide them to their car, if necessary

Shutdown

1. Turn off car, then open trunk and ***turn off power inverter (important!)***
2. Unplug cigarette lighter adapter plug
3. Turn off laptop and unplug all cords attached to it
4. Lock car doors
5. Bring instructions, consent form, final questions, and laptop back to office
6. At end of day, transfer data from laptop to project drive data folder using flash drive

Appendix B: Closing Questions

Closing Questions

1. If a driver is not wearing a seat belt, what do you think would be the best way to present a visual reminder? By "best," we mean that it helps get people to buckle up and it will be something that people are willing to have in their cars.
   a. A visual reminder that stays on continuously
   b. A visual reminder that stays on for some period of time (say 5 minutes) then goes off and stays off
   c. A visual reminder that comes on periodically (for example, it comes on for about 8 seconds every minute)
   d. A visual reminder that gets progressively brighter or flashes faster as time goes on

   Why did you select that one?

2. If a driver is not wearing a seat belt, what do you think would be the best way to present an auditory reminder? By "best," we mean that it helps get people to buckle up and it will be something that people are willing to have in their cars.
   a. A sound that stays on continuously
   b. A sound that stays on for some period of time (say, 5 minutes) then goes off and stays off
   c. A sound that comes on periodically (for example, for about 8 seconds every minute)
   d. A voice message that comes on periodically (say, once every minute)
   e. A sound that gets progressively louder or beeps faster as time goes on

   Why did you select that one?

3. What do you think of the idea of letting people customize their reminder sound, in the same way people can customize the ring of their cell phones?

4. Describe what you think would be the very best seat belt reminder system for when a driver does not buckle up. Your idea can be a variation on something you experienced during this study or something from your own imagination. Please specify what sort of sounds or visual displays the system should have and how/when they should be presented.

5. Describe what you think would be the very best seat belt reminder system for when the front seat passenger does not buckle up. Please specify what sort of sounds or visual displays the system should have and how/when they should be presented.

Appendix C: Description of Seat Belt Reminder Systems in Phase 1 Drives

This appendix describes the displays and timing rules of the seat belt reminder systems experienced by study participants during the on-road driving portion of the study. Each system is outlined in a table where each row represents one stage of the seat belt reminder. *Vehicle status* refers to the vehicle state required for the stage to commence, where "on" means that the vehicle is running and "motion" means that the vehicle is traveling at a speed of at least 5 mph. Start time is the number of seconds following vehicle ignition at which a stage commences, given that enabling criteria (e.g., vehicle motion) are met. *Duration* refers to the number of seconds that a given stage is active (though a stage may exceed its stated duration if the enabling criteria for the following stage are not met). *Skip rules* states which stage will follow the current stage when it is completed. Sound states the type of sound that is played during the stage and the number of times that it occurs per second (Hz). *Driver visual* refers to the visual display that is shown during the stage, whether it is steady or flashing, and the number of times that it flashes per second (Hz).

Practice system

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	On	0 s	6 s	Continuous	Beep (1 Hz)	Steady icon
2	On	6 s	9 s	Continuous	None	Steady icon
3	On	17 s	3 s	Continuous	Practice sound	Flashing icon (3 Hz)
4	On	21 s	45 s	If start time < 300 s, then skip to stage 3; If start time > 300 s, then end	None	Steady icon

Basic Reminder

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	On	0 s	6 s	continuous	Chime (1 Hz)	Steady icon
2	On	6 s	54 s	continuous	None	Steady icon
3	On	60 s	Infinite	End	None	None

Continuous Flashing

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	On	0 s	6 s	Continuous	Chime (1 Hz)	Flashing icon (3 Hz)
2	On	6 s	Infinite	End	None	Flashing icon (3 Hz)

Periodic Reminder

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	On	0 s	6 s	Continuous	Chime (1 Hz)	Flashing icon (1 Hz)
2	On	6 s	30+ s	Continuous	None	Steady icon
3	Motion	36+ s	6 s	Continuous	Chime (3 Hz)	Flashing icon (3 Hz)
4	On	42+ s	30+ s	Continuous	None	Steady icon
5	Motion	72+ s	6 s	Continuous	Chime (3 Hz)	Flashing icon (3 Hz)
6	On	78+ s	30+ s	Continuous	None	Steady icon
7	Motion	108+ s	6 s	Continuous	Chime (3 Hz)	Flashing icon (3 Hz)
8	On	114+ s	Infinite	End	None	None

Aggressive Reminder

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	ON	0 s	4 s	Continuous	Chime (1 Hz)	Flashing icon (1 Hz) on dash Flashing icon (1 Hz) on rearview Steady text in center display
2	ON	4 s	2 s	Continuous	Chime (3 Hz)	Flashing icon (1 Hz) on dash Flashing icon (1 Hz) on rearview Steady text in center display
3	ON	6 s	30+ s	Continuous	None	Steady icon on dash Steady icon on rearview Steady text in center display
4	Motion	36 s +	6 s	Go to stage 3	Chime (3 Hz)	Flashing icon (3 Hz) on dash Flashing icon (3 Hz) on rearview Steady text in center display

One Long Reminder Phase

Stage	Vehicle Status	Start Time	Duration	Skip Rules	Sound	Driver Visual
1	On	0 s	6 s	Continuous	Beep (1 Hz)	Flashing icon (3 Hz)
2	On	6 s	24 s	Continuous	None	Flashing icon (3 Hz)
4	Motion	30+ s	6+ s	Continuous	Beep (1 Hz)	Flashing icon (3 Hz)
5	On	36+ s	24+ s	Continuous	Beep (3 Hz)	Flashing icon (3 Hz)
6	On	60+ s	Infinite	End	None	Flashing icon (3 Hz)

Appendix D: ANOVA Analysis Details

Table D-1. On-road ratings of effectiveness

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	38.13	<0.0001
Gender	1	687	2.42	0.120
System*Gender	4	687	0.57	0.688
Age Category	2	687	0.17	0.842
System*Age Category	8	687	0.68	0.707
Gender*Age Category	2	687	0.57	0.567
Rating Point	3	687	21.99	<0.0001
System*Rating Point	12	687	12.46	<0.0001
Rating Point*Gender	3	687	1.69	0.168
Rating Point*Age Category	6	687	0.41	0.875
Belt Use	2	687	5.41	0.005
System*Belt Use	8	687	2.92	0.003
Gender*Belt Use	2	687	1.38	0.253
Age Category*Belt Use	4	687	0.29	0.885
Rating Point*Belt Use	6	687	1.81	0.094

Table D-2. On-road ratings of annoyance

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	77.34	<.0001
Gender	1	687	6.33	0.012
System*Gender	4	687	2.04	0.087
Age Category	2	687	2.70	0.068
System*Age Category	8	687	0.52	0.842
Gender*Age Category	2	687	0.28	0.754
Rating Point	3	687	46.64	<.0001
System*Rating Point	12	687	30.07	<.0001
Rating Point*Gender	3	687	2.86	0.036
Rating Point*Age Category	6	687	1.05	0.392
Belt Use	2	687	0.31	0.733
System*Belt Use	8	687	0.51	0.853
Gender*Belt Use	2	687	0.95	0.387
Age Category*Belt Use	4	687	0.73	0.570
Rating Point*Belt Use	6	687	0.84	0.539

Table D-3. On-road ratings of attention

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	88.09	<.0001
Gender	1	687	1.73	0.189
System*Gender	4	687	0.86	0.490
Age Category	2	687	1.28	0.279
System*Age Category	8	687	1.35	0.214
Gender*Age Category	2	687	0.09	0.917
Rating Point	3	687	59.84	<.0001
System*Rating Point	12	687	29.18	<.0001
Rating Point*Gender	3	687	0.48	0.695
Rating Point*Age Category	6	687	1.34	0.236
Belt Use	2	687	0.48	0.617
System*Belt Use	8	687	1.21	0.290
Gender*Belt Use	2	687	0.14	0.867
Age Category*Belt Use	4	687	0.01	1.000
Rating Point*Belt Use	6	687	2.69	0.014

Table D-4. Post-drive ratings of effectiveness

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	36.57	<0.0001
Gender	1	168	2.78	0.097
System*Gender	4	168	1.12	0.348
Age Category	2	168	0.69	0.504
System*Age Category	8	168	1.12	0.350
Gender*Age Category	2	168	0.03	0.968
Belt Use	2	168	2.21	0.113
System*Belt Use	8	168	1.33	0.230
Gender*Belt Use	2	168	0.13	0.880
Age Category*Belt Use	4	168	0.12	0.973

Table D-5. Post-drive ratings of desirability

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	2.61	0.038
Gender	1	168	1.41	0.237
System*Gender	4	168	0.62	0.652
Age Category	2	168	1.03	0.360
System*Age Category	8	168	1.11	0.361
Gender*Age Category	2	168	0.41	0.665
Belt Use	2	168	0.49	0.613
System*Belt Use	8	168	1.78	0.085
Gender*Belt Use	2	168	1.74	0.179
Age Category*Belt Use	4	168	3.01	0.020

Table D-6. Post-drive ratings of preference

Effect	Numerator DF	Denominator DF	F Value	Probability
System	4	168	2.97	0.021
Gender	1	168	2.80	0.096
System*Gender	4	168	0.72	0.580
Age Category	2	168	0.36	0.695
System*Age Category	8	168	0.77	0.631
Gender*Age Category	2	168	0.83	0.436
Belt Use	2	168	1.06	0.350
System*Belt Use	8	168	1.57	0.137
Gender*Belt Use	2	168	1.96	0.144
Age Category*Belt Use	4	168	2.20	0.071

Table D-7. Stationary ratings of effectiveness

Effect	Numerator DF	Denominator DF	F Value	Probability
Display	26	883	16.45	<.0001
Gender	1	883	2.86	0.091
Display*Gender	26	883	2.95	<.0001
Age Category	2	883	1.37	0.254
Display*Age Category	52	883	1.63	0.004
Gender*Age Category	2	883	0.10	0.904
Display*Age*Gender	52	883	1.17	0.190
Belt Use	2	883	2.42	0.090
Display*Belt Use	52	883	1.20	0.166
Gender*Belt Use	2	883	0.11	0.895
Display*Gender*Belt Use	52	883	1.28	0.094
Age Category*Belt Use	4	883	0.59	0.669
Display*Age*Belt Use	104	883	1.30	0.028
Gender*Age*Belt Use	4	883	0.21	0.932

Table D-8. Stationary ratings of annoyance

Effect	Numerator DF	Denominator DF	F Value	Probability
Display	26	883	40.01	<0.0001
Gender	1	883	1.36	0.243
Display*Gender	26	883	1.01	0.449
Age Category	2	883	1.33	0.265
Display*Age Category	52	883	1.53	0.010
Gender*Age Category	2	883	0.67	0.510
Display*Age*Gender	52	883	0.76	0.888
Belt Use	2	883	1.60	0.203
Display*Belt Use	52	883	0.93	0.619
Gender*Belt Use	2	883	2.11	0.122
Display*Gender*Belt Use	52	883	1.59	0.006
Age Category*Belt Use	4	883	0.24	0.917
Display*Age*Belt Use	104	883	0.98	0.542
Gender*Age*Belt Use	4	883	0.25	0.912

Table D-9. Stationary ratings of desirability

Effect	Numerator DF	Denominator DF	F Value	Probability
Display	26	883	1.92	0.004
Gender	1	883	0.68	0.409
Display*Gender	26	883	0.86	0.661
Age Category	2	883	1.61	0.201
Display*Age Category	52	883	1.13	0.245
Gender*Age Category	2	883	0.59	0.554
Display*Age*Gender	52	883	0.89	0.688
Belt Use	2	883	3.89	0.021
Display*Belt Use	52	883	0.92	0.638
Gender*Belt Use	2	883	0.23	0.795
Display*Gender*Belt Use	52	883	0.98	0.509
Age Category*Belt Use	4	883	0.49	0.741
Display*Age*Belt Use	104	883	1.05	0.350
Gender*Age*Belt Use	4	883	0.56	0.691

Appendix E: On-Road Rating Least Squares Means and Standard Errors for All Combinations of Conditions in ANOVA

(NOTE: See data key in Appendix H)

Table E-1. On-road ratings of effectiveness

Effect	Sex	Age category	System	Rating point	Belt use category	Estimate	Standard error
System			0			3.8179	0.4336
System			1			4.4743	0.4341
System			2			5.7356	0.4341
System			3			7.1236	0.4344
System			4			5.3359	0.4341
Sex	1					4.6693	0.5735
Sex	2					5.9256	0.5543
System*Sex	1		0			3.3949	0.6294
System*Sex	2		0			4.2409	0.6121
System*Sex	1		1			3.9179	0.6293
System*Sex	2		1			5.0308	0.6125
System*Sex	1		2			4.9796	0.6293
System*Sex	2		2			6.4916	0.6125
System*Sex	1		3			6.3165	0.6293
System*Sex	2		3			7.9306	0.6134
System*Sex	1		4			4.7376	0.6293
System*Sex	2		4			5.9342	0.6125
AgeCat		1				4.9696	0.6924
AgeCat		2				5.4632	0.702
AgeCat		3				5.4596	0.6836
System*AgeCat		1	0			3.0585	0.7622
System*AgeCat		2	0			4.4339	0.7698
System*AgeCat		3	0			3.9612	0.7543
System*AgeCat		1	1			4.2776	0.7626
System*AgeCat		2	1			4.4242	0.7734
System*AgeCat		3	1			4.7212	0.7544
System*AgeCat		1	2			5.581	0.7626
System*AgeCat		2	2			5.9713	0.7734
System*AgeCat		3	2			5.6545	0.7544
System*AgeCat		1	3			6.9449	0.7626
System*AgeCat		2	3			7.2229	0.7735
System*AgeCat		3	3			7.2029	0.7564
System*AgeCat		1	4			4.9859	0.7626

System*AgeCat		2	4		5.2637	0.7734
System*AgeCat		3	4		5.7581	0.7544
Sex*AgeCat	1	1			3.7184	1.0557
Sex*AgeCat	1	2			5.0802	1.0097
Sex*AgeCat	1	3			5.2093	1.014
Sex*AgeCat	2	1			6.2208	0.9316
Sex*AgeCat	2	2			5.8462	1.0087
Sex*AgeCat	2	3			5.7099	0.9316
Rating_Point				1	5.0744	0.4072
Rating_Point				2	6.1298	0.4076
Rating_Point				3	5.146	0.4077
Rating_Point				4	4.8397	0.4077
System*Rating_Point			0	1	4.7872	0.4927
System*Rating_Point			0	2	3.8967	0.4936
System*Rating_Point			0	3	3.3715	0.4936
System*Rating_Point			0	4	3.2162	0.4936
System*Rating_Point			1	1	4.8811	0.4937
System*Rating_Point			1	2	4.4906	0.4937
System*Rating_Point			1	3	4.1738	0.4937
System*Rating_Point			1	4	4.3518	0.4937
System*Rating_Point			2	1	5.1996	0.4937
System*Rating_Point			2	2	7.1842	0.4937
System*Rating_Point			2	3	6.1174	0.4937
System*Rating_Point			2	4	4.4412	0.4937
System*Rating_Point			3	1	5.876	0.4937
System*Rating_Point			3	2	7.3397	0.4937
System*Rating_Point			3	3	7.438	0.4956
System*Rating_Point			3	4	7.8405	0.4956
System*Rating_Point			4	1	4.6281	0.4937
System*Rating_Point			4	2	7.7376	0.4937
System*Rating_Point			4	3	4.6291	0.4937
System*Rating_Point			4	4	4.3488	0.4937
Rating_Point*Sex	1			1	4.6556	0.5926
Rating_Point*Sex	2			1	5.4932	0.5741
Rating_Point*Sex	1			2	5.3739	0.5926
Rating_Point*Sex	2			2	6.8856	0.5742
Rating_Point*Sex	1			3	4.557	0.5926
Rating_Point*Sex	2			3	5.7349	0.5745
Rating_Point*Sex	1			4	4.0906	0.5926
Rating_Point*Sex	2			4	5.5888	0.5745
Rating_Point*AgeCat		1		1	4.9003	0.7163
Rating_Point*AgeCat		2		1	5.2044	0.7245

Rating_Point*AgeCat		3		1	5.1185	0.7077
Rating_Point*AgeCat		1		2	5.8713	0.7164
Rating_Point*AgeCat		2		2	6.2798	0.7268
Rating_Point*AgeCat		3		2	6.2382	0.7078
Rating_Point*AgeCat		1		3	4.6426	0.7164
Rating_Point*AgeCat		2		3	5.424	0.7268
Rating_Point*AgeCat		3		3	5.3712	0.7083
Rating_Point*AgeCat		1		4	4.464	0.7164
Rating_Point*AgeCat		2		4	4.9446	0.7268
Rating_Point*AgeCat		3		4	5.1105	0.7083
Belt Use				1	3.8289	0.6925
Belt Use				2	5.1251	0.698
Belt Use				3	6.9383	0.664
System*Belt Use			0	1	2.6288	0.7629
System*Belt Use			0	2	3.5112	0.7618
System*Belt Use			0	3	5.3136	0.7307
System*Belt Use			1	1	3.3232	0.7629
System*Belt Use			1	2	3.4035	0.776
System*Belt Use			1	3	6.6963	0.7344
System*Belt Use			2	1	4.1696	0.7629
System*Belt Use			2	2	6.0183	0.776
System*Belt Use			2	3	7.0189	0.7344
System*Belt Use			3	1	5.1034	0.7629
System*Belt Use			3	2	7.8666	0.7759
System*Belt Use			3	3	8.4006	0.7363
System*Belt Use			4	1	3.9197	0.7629
System*Belt Use			4	2	4.8258	0.776
System*Belt Use			4	3	7.2622	0.7344
Sex*Belt Use	1			1	2.8301	1.0796
Sex*Belt Use	1			2	5.4774	0.9385
Sex*Belt Use	1			3	5.7004	0.9777
Sex*Belt Use	2			1	4.8278	0.8676
Sex*Belt Use	2			2	4.7728	1.1247
Sex*Belt Use	2			3	8.1763	0.8918
AgeCat*Belt Use		1		1	4.0356	1.1782
AgeCat*Belt Use		1		2	4.916	1.0537
AgeCat*Belt Use		1		3	5.957	1.3887
AgeCat*Belt Use		2		1	3.2482	1.3909
AgeCat*Belt Use		2		2	5.6317	1.2755
AgeCat*Belt Use		2		3	7.5098	0.8708
AgeCat*Belt Use		3		1	4.203	0.9907
Rating_Poin*Belt Use				1	3.5114	0.7166

Rating_Poin*Belt Use	1	2	4.5861	0.7201
Rating_Poin*Belt Use	1	3	7.1257	0.6882
Rating_Poin*Belt Use	2	1	4.6125	0.7166
Rating_Poin*Belt Use	2	2	6.2477	0.7251
Rating_Poin*Belt Use	2	3	7.5291	0.6877
Rating_Poin*Belt Use	3	1	3.6892	0.7166
Rating_Poin*Belt Use	3	2	5.13	0.7251
Rating_Poin*Belt Use	3	3	6.6186	0.6883
Rating_Poin*Belt Use	4	1	3.5027	0.7166
Rating_Poin*Belt Use	4	2	4.5365	0.7251
Rating_Poin*Belt Use	4	3	6.4799	0.6883

Table E-2. On-road ratings of attention

Effect	Sex	Age category	System	Rating point	Belt use category	Estimate	Standard error
System			0			2.6293	0.3412
System			1			3.5748	0.3417
System			2			6.0643	0.3417
System			3			8.083	0.3421
System			4			5.2542	0.3417
Sex	1					4.7514	0.3995
Sex	2					5.4909	0.3866
System*Sex	1		0			2.6032	0.4927
System*Sex	2		0			2.6554	0.4828
System*Sex	1		1			3.2523	0.4926
System*Sex	2		1			3.8972	0.4831
System*Sex	1		2			5.4888	0.4926
System*Sex	2		2			6.6397	0.4831
System*Sex	1		3			7.6393	0.4926
System*Sex	2		3			8.5268	0.4844
System*Sex	1		4			4.7732	0.4926
System*Sex	2		4			5.7353	0.4831
AgeCat		1				4.5736	0.4826
AgeCat		2				5.1048	0.4903
AgeCat		3				5.685	0.4764
System*AgeCat		1	0			1.6848	0.599
System*AgeCat		2	0			3.2542	0.605
System*AgeCat		3	0			2.949	0.5941
System*AgeCat		1	1			2.7753	0.5994
System*AgeCat		2	1			3.926	0.6085
System*AgeCat		3	1			4.023	0.5942
System*AgeCat		1	2			5.7844	0.5994
System*AgeCat		2	2			5.7734	0.6085
System*AgeCat		3	2			6.635	0.5942
System*AgeCat		1	3			7.5138	0.5994
System*AgeCat		2	3			8.0472	0.6085
System*AgeCat		3	3			8.6881	0.5969
System*AgeCat		1	4			5.1095	0.5994
System*AgeCat		2	4			4.5233	0.6085
System*AgeCat		3	4			6.1299	0.5942
Sex*AgeCat	1	1				4.1545	0.7359
Sex*AgeCat	1	2				4.6225	0.7035
Sex*AgeCat	1	3				5.4772	0.7065
Sex*AgeCat	2	1				4.9926	0.6489

Sex*AgeCat	2	2			5.5872	0.7047
Sex*AgeCat	2	3			5.8928	0.6492
Rating_Point				1	5.1625	0.2938
Rating_Point				2	6.3327	0.2942
Rating_Point				3	4.961	0.2943
Rating_Point				4	4.0283	0.2943
System*Rating_Point			0	1	4.4087	0.4147
System*Rating_Point			0	2	2.5755	0.4155
System*Rating_Point			0	3	1.9039	0.4155
System*Rating_Point			0	4	1.6293	0.4155
System*Rating_Point			1	1	4.5892	0.4155
System*Rating_Point			1	2	3.2134	0.4155
System*Rating_Point			1	3	3.5001	0.4155
System*Rating_Point			1	4	2.9963	0.4155
System*Rating_Point			2	1	5.3392	0.4155
System*Rating_Point			2	2	8.1925	0.4155
System*Rating_Point			2	3	6.8959	0.4155
System*Rating_Point			2	4	3.8296	0.4155
System*Rating_Point			3	1	6.9673	0.4155
System*Rating_Point			3	2	8.5289	0.4155
System*Rating_Point			3	3	8.4401	0.4179
System*Rating_Point			3	4	8.3958	0.4179
System*Rating_Point			4	1	4.5083	0.4155
System*Rating_Point			4	2	9.1533	0.4155
System*Rating_Point			4	3	4.065	0.4155
System*Rating_Point			4	4	3.2904	0.4155
Rating_Point*Sex	1			1	4.6843	0.4267
Rating_Point*Sex	2			1	5.6408	0.4148
Rating_Point*Sex	1			2	6.0106	0.4267
Rating_Point*Sex	2			2	6.6548	0.4149
Rating_Point*Sex	1			3	4.6771	0.4267
Rating_Point*Sex	2			3	5.2448	0.4153
Rating_Point*Sex	1			4	3.6335	0.4267
Rating_Point*Sex	2			4	4.4231	0.4153
Rating_Point*AgeCat		1		1	4.377	0.5168
Rating_Point*AgeCat		2		1	5.4815	0.5232
Rating_Point*AgeCat		3		1	5.6291	0.5108
Rating_Point*AgeCat		1		2	5.7684	0.5169
Rating_Point*AgeCat		2		2	6.4394	0.5252
Rating_Point*AgeCat		3		2	6.7903	0.5109
Rating_Point*AgeCat		1		3	4.4757	0.5169
Rating_Point*AgeCat		2		3	4.7745	0.5252

Rating_Point*AgeCat		3		3	5.6327	0.5117
Rating_Point*AgeCat		1		4	3.6731	0.5169
Rating_Point*AgeCat		2		4	3.7239	0.5252
Rating_Point*AgeCat		3		4	4.6879	0.5117
Belt Use				1	4.7302	0.4823
Belt Use				2	5.3138	0.4941
Belt Use				3	5.3194	0.4658
System*Belt Use		0		1	2.4593	0.5996
System*Belt Use		0		2	3.0386	0.6053
System*Belt Use		0		3	2.3901	0.5774
System*Belt Use		1		1	3.6547	0.5996
System*Belt Use		1		2	3.1679	0.62
System*Belt Use		1		3	3.9017	0.5817
System*Belt Use		2		1	5.4271	0.5996
System*Belt Use		2		2	6.5146	0.62
System*Belt Use		2		3	6.2512	0.5817
System*Belt Use		3		1	7.2364	0.5996
System*Belt Use		3		2	8.7127	0.6199
System*Belt Use		3		3	8.2999	0.5842
System*Belt Use		4		1	4.8732	0.5996
System*Belt Use		4		2	5.1353	0.62
System*Belt Use		4		3	5.7542	0.5817
Sex*Belt Use	1			1	4.5214	0.7519
Sex*Belt Use	1			2	4.9796	0.6676
Sex*Belt Use	1			3	4.7531	0.692
Sex*Belt Use	2			1	4.9389	0.6043
Sex*Belt Use	2			2	5.648	0.7845
Sex*Belt Use	2			3	5.8857	0.6216
AgeCat*Belt Use	1			1	4.1284	0.8206
AgeCat*Belt Use	1			2	4.7501	0.7342
AgeCat*Belt Use	1			3	4.8422	0.9679
AgeCat*Belt Use	2			1	4.6768	0.9688
AgeCat*Belt Use	2			2	5.3025	0.9237
AgeCat*Belt Use	2			3	5.3351	0.6221
AgeCat*Belt Use	3			1	5.3853	0.69
AgeCat*Belt Use	3			2	5.8889	0.9703
AgeCat*Belt Use	3			3	5.7809	0.8212
Rating_Point*Belt Use			1	1	4.2685	0.5167
Rating_Point*Belt Use			1	2	5.7044	0.5272
Rating_Point*Belt Use			1	3	5.5147	0.5
Rating_Point*Belt Use			2	1	5.8383	0.5167
Rating_Point*Belt Use			2	2	6.6539	0.5314

Rating_Point*Belt Use	2	3	6.5059	0.4994
Rating_Point*Belt Use	3	1	4.7855	0.5167
Rating_Point*Belt Use	3	2	5.0037	0.5314
Rating_Point*Belt Use	3	3	5.0937	0.5002
Rating_Point*Belt Use	4	1	4.0283	0.5167
Rating_Point*Belt Use	4	2	3.8932	0.5314
Rating_Point*Belt Use	4	3	4.1633	0.5002

Table E-3. On-road ratings of annoyance

Effect	Sex	Age category	System	Rating point	Belt use category	Estimate	Standard error
System			0			1.726	0.2974
System			1			2.2151	0.2978
System			2			4.7477	0.2978
System			3			6.1604	0.2982
System			4			4.4654	0.2978
Sex	1					3.2674	0.336
Sex	2					4.4584	0.3252
System*Sex	1		0			1.6234	0.4289
System*Sex	2		0			1.8287	0.421
System*Sex	1		1			1.6693	0.4288
System*Sex	2		1			2.7609	0.4213
System*Sex	1		2			4.0066	0.4288
System*Sex	2		2			5.4889	0.4213
System*Sex	1		3			5.2605	0.4288
System*Sex	2		3			7.0602	0.4226
System*Sex	1		4			3.7771	0.4288
System*Sex	2		4			5.1536	0.4213
AgeCat		1				3.1694	0.406
AgeCat		2				3.8961	0.4127
AgeCat		3				4.5233	0.4008
System*AgeCat		1	0			1.3249	0.522
System*AgeCat		2	0			1.7277	0.5272
System*AgeCat		3	0			2.1254	0.5179
System*AgeCat		1	1			1.4771	0.5223
System*AgeCat		2	1			2.3662	0.5302
System*AgeCat		3	1			2.802	0.518
System*AgeCat		1	2			4.2548	0.5223
System*AgeCat		2	2			4.7446	0.5302
System*AgeCat		3	2			5.2439	0.518
System*AgeCat		1	3			5.2131	0.5223
System*AgeCat		2	3			6.027	0.5303
System*AgeCat		3	3			7.241	0.5208
System*AgeCat		1	4			3.5769	0.5223
System*AgeCat		2	4			4.615	0.5302
System*AgeCat		3	4			5.2042	0.518
Sex*AgeCat	1	1				2.8191	0.6191
Sex*AgeCat	1	2				3.2453	0.5918
Sex*AgeCat	1	3				3.7378	0.5943
Sex*AgeCat	2	1				3.5197	0.5458

Sex*AgeCat	2	2			4.5469	0.5932
Sex*AgeCat	2	3			5.3087	0.5462
Rating_Point				1	3.5623	0.2522
Rating_Point				2	5.0056	0.2524
Rating_Point				3	3.7542	0.2526
Rating_Point				4	3.1297	0.2526
System*Rating_Point			0	1	2.806	0.3743
System*Rating_Point			0	2	1.5406	0.375
System*Rating_Point			0	3	1.3119	0.375
System*Rating_Point			0	4	1.2456	0.375
System*Rating_Point			1	1	2.9171	0.375
System*Rating_Point			1	2	2.1001	0.375
System*Rating_Point			1	3	1.9131	0.375
System*Rating_Point			1	4	1.9301	0.375
System*Rating_Point			2	1	3.5643	0.375
System*Rating_Point			2	2	6.5807	0.375
System*Rating_Point			2	3	5.5811	0.375
System*Rating_Point			2	4	3.2649	0.375
System*Rating_Point			3	1	4.7159	0.375
System*Rating_Point			3	2	6.378	0.375
System*Rating_Point			3	3	6.7233	0.3774
System*Rating_Point			3	4	6.8243	0.3774
System*Rating_Point			4	1	3.808	0.375
System*Rating_Point			4	2	8.4285	0.375
System*Rating_Point			4	3	3.2415	0.375
System*Rating_Point			4	4	2.3835	0.375
Rating_Point*Sex	1			1	2.6653	0.3658
Rating_Point*Sex	2			1	4.4593	0.3561
Rating_Point*Sex	1			2	4.4998	0.3658
Rating_Point*Sex	2			2	5.5113	0.3562
Rating_Point*Sex	1			3	3.2501	0.3658
Rating_Point*Sex	2			3	4.2583	0.3566
Rating_Point*Sex	1			4	2.6544	0.3658
Rating_Point*Sex	2			4	3.6049	0.3566
Rating_Point*AgeCat		1		1	2.5545	0.4434
Rating_Point*AgeCat		2		1	3.6677	0.4489
Rating_Point*AgeCat		3		1	4.4646	0.4384
Rating_Point*AgeCat		1		2	4.3212	0.4434
Rating_Point*AgeCat		2		2	4.9821	0.4508
Rating_Point*AgeCat		3		2	5.7134	0.4385
Rating_Point*AgeCat		1		3	3.161	0.4434
Rating_Point*AgeCat		2		3	3.7656	0.4508

Rating_Point*AgeCat		3		3	4.336	0.4393
Rating_Point*AgeCat		1		4	2.6408	0.4434
Rating_Point*AgeCat		2		4	3.169	0.4508
Rating_Point*AgeCat		3		4	3.5792	0.4393
Belt Use				1	4.1242	0.4057
Belt Use				2	3.7518	0.4174
Belt Use				3	3.7128	0.3925
System*Belt Use			0	1	2.007	0.5225
System*Belt Use			0	2	1.7455	0.5297
System*Belt Use			0	3	1.4256	0.5045
System*Belt Use			1	1	2.4376	0.5225
System*Belt Use			1	2	1.6922	0.5418
System*Belt Use			1	3	2.5155	0.5075
System*Belt Use			2	1	5.0555	0.5225
System*Belt Use			2	2	4.7156	0.5418
System*Belt Use			2	3	4.4722	0.5075
System*Belt Use			3	1	6.4544	0.5225
System*Belt Use			3	2	6.2715	0.5418
System*Belt Use			3	3	5.7551	0.5101
System*Belt Use			4	1	4.6663	0.5225
System*Belt Use			4	2	4.3341	0.5418
System*Belt Use			4	3	4.3956	0.5075
Sex*Belt Use	1			1	3.9928	0.6325
Sex*Belt Use	1			2	2.9325	0.5646
Sex*Belt Use	1			3	2.877	0.5846
Sex*Belt Use	2			1	4.2556	0.5082
Sex*Belt Use	2			2	4.5711	0.66
Sex*Belt Use	2			3	4.5486	0.523
AgeCat*Belt Use		1		1	3.0128	0.6902
AgeCat*Belt Use		1		2	3.4032	0.6175
AgeCat*Belt Use		1		3	3.0922	0.8142
AgeCat*Belt Use		2		1	4.3067	0.8148
AgeCat*Belt Use		2		2	3.1818	0.7848
AgeCat*Belt Use		2		3	4.1998	0.5268
AgeCat*Belt Use		3		1	5.053	0.5804
AgeCat*Belt Use		3		2	4.6704	0.8162
AgeCat*Belt Use		3		3	3.8465	0.691
Rating_Poin*Belt Use			1	1	3.5357	0.4433
Rating_Poin*Belt Use			1	2	3.6932	0.4541
Rating_Poin*Belt Use			1	3	3.4578	0.4298
Rating_Poin*Belt Use			2	1	5.2634	0.4433
Rating_Poin*Belt Use			2	2	4.8859	0.4578

Rating_Poin*Belt Use	2	3	4.8674	0.4293
Rating_Poin*Belt Use	3	1	4.1565	0.4433
Rating_Poin*Belt Use	3	2	3.574	0.4578
Rating_Poin*Belt Use	3	3	3.532	0.4301
Rating_Poin*Belt Use	4	1	3.5409	0.4433
Rating_Poin*Belt Use	4	2	2.854	0.4578
Rating_Poin*Belt Use	4	3	2.994	0.4301

Appendix F: Post-Drive Rating Least Squares Means and Standard Errors for All Combinations of Conditions in ANOVA

(NOTE: See data key in Appendix H)

Table F-1. Post-drive ratings of effectiveness

Effect	System	Sex	Age category	Belt use category	Estimate	Standard error
System	0				2.6303	0.448
System	1				3.297	0.448
System	2				6.0262	0.448
System	3				7.7762	0.448
System	4				6.2762	0.448
Sex		1			4.6581	0.4605
Sex		2			5.7442	0.4439
System*Sex	0	1			2.4646	0.648
System*Sex	0	2			2.7961	0.6364
System*Sex	1	1			3.1577	0.648
System*Sex	1	2			3.4363	0.6364
System*Sex	2	1			4.9862	0.648
System*Sex	2	2			7.0661	0.6364
System*Sex	3	1			7.0931	0.648
System*Sex	3	2			8.4593	0.6364
System*Sex	4	1			5.5889	0.648
System*Sex	4	2			6.9634	0.6364
AgeCat			1		4.7341	0.5542
AgeCat			2		5.6254	0.556
AgeCat			3		5.244	0.5465
System*AgeCat	0		1		1.5672	0.7873
System*AgeCat	0		2		3.2989	0.7885
System*AgeCat	0		3		3.0249	0.7819
System*AgeCat	1		1		2.1827	0.7873
System*AgeCat	1		2		3.3991	0.7885
System*AgeCat	1		3		4.3092	0.7819
System*AgeCat	2		1		5.8195	0.7873
System*AgeCat	2		2		6.7219	0.7885
System*AgeCat	2		3		5.5372	0.7819
System*AgeCat	3		1		7.7926	0.7873
System*AgeCat	3		2		8.3847	0.7885
System*AgeCat	3		3		7.1512	0.7819
System*AgeCat	4		1		6.3085	0.7873

System*AgeCat	4		2		6.3224	0.7885
System*AgeCat	4		3		6.1976	0.7819
Sex*AgeCat		1	1		4.1992	0.8453
Sex*AgeCat		1	2		4.9745	0.8122
Sex*AgeCat		1	3		4.8007	0.8106
Sex*AgeCat		2	1		5.269	0.7444
Sex*AgeCat		2	2		6.2763	0.8107
Sex*AgeCat		2	3		5.6873	0.7442
Belt Use				1	4.2552	0.5535
Belt Use				2	5.5757	0.5647
Belt Use				3	5.7726	0.5493
System*Belt Use	0			1	2.1112	0.7878
System*Belt Use	0			2	3.5529	0.799
System*Belt Use	0			3	2.227	0.7849
System*Belt Use	1			1	2.5644	0.7878
System*Belt Use	1			2	3.3413	0.799
System*Belt Use	1			3	3.9854	0.7849
System*Belt Use	2			1	4.989	0.7878
System*Belt Use	2			2	7.1092	0.799
System*Belt Use	2			3	5.9803	0.7849
System*Belt Use	3			1	6.7327	0.7878
System*Belt Use	3			2	7.6711	0.799
System*Belt Use	3			3	8.9248	0.7849
System*Belt Use	4			1	4.8787	0.7878
System*Belt Use	4			2	6.2043	0.799
System*Belt Use	4			3	7.7455	0.7849
Sex*Belt Use		1		1	3.9104	0.8631
Sex*Belt Use		1		2	4.8129	0.7575
Sex*Belt Use		1		3	5.2511	0.8424
Sex*Belt Use		2		1	4.6	0.6932
Sex*Belt Use		2		2	6.3386	0.9008
Sex*Belt Use		2		3	6.2941	0.7129
AgeCat*Belt Use			1	1	3.8927	0.9413
AgeCat*Belt Use			1	2	5.2663	0.8424
AgeCat*Belt Use			1	3	5.0433	1.1119
AgeCat*Belt Use			2	1	4.3237	1.1121
AgeCat*Belt Use			2	2	6.2425	1.0485
AgeCat*Belt Use			2	3	6.3101	0.7917
AgeCat*Belt Use			3	1	4.5493	0.7915
AgeCat*Belt Use			3	2	5.2184	1.1134
AgeCat*Belt Use			3	3	5.9644	0.9411

Table F-2. Post-drive ratings of desirability

Effect	System	Sex	Age category	Belt use category	Estimate	Standard error
System	0				4.0772	0.4837
System	1				4.9314	0.4837
System	2				4.8689	0.4837
System	3				6.0355	0.4837
System	4				4.4939	0.4837
Sex		1			4.5547	0.3892
Sex		2			5.2081	0.3752
System*Sex	0	1			4.1924	0.6958
System*Sex	0	2			3.962	0.6881
System*Sex	1	1			4.3399	0.6958
System*Sex	1	2			5.5228	0.6881
System*Sex	2	1			4.3187	0.6958
System*Sex	2	2			5.4191	0.6881
System*Sex	3	1			5.4122	0.6958
System*Sex	3	2			6.6589	0.6881
System*Sex	4	1			4.51	0.6958
System*Sex	4	2			4.4777	0.6881
AgeCat			1		5.09	0.4684
AgeCat			2		5.234	0.47
AgeCat			3		4.3201	0.4619
System*AgeCat	0		1		5.2072	0.8484
System*AgeCat	0		2		4.3355	0.8491
System*AgeCat	0		3		2.6889	0.8447
System*AgeCat	1		1		4.6113	0.8484
System*AgeCat	1		2		5.5769	0.8491
System*AgeCat	1		3		4.6059	0.8447
System*AgeCat	2		1		5.4179	0.8484
System*AgeCat	2		2		5.6868	0.8491
System*AgeCat	2		3		3.5019	0.8447
System*AgeCat	3		1		5.2564	0.8484
System*AgeCat	3		2		6.4364	0.8491
System*AgeCat	3		3		6.4139	0.8447
System*AgeCat	4		1		4.9572	0.8484
System*AgeCat	4		2		4.1345	0.8491
System*AgeCat	4		3		4.3898	0.8447
Sex*AgeCat		1	1		5.0599	0.7144
Sex*AgeCat		1	2		4.5693	0.6865
Sex*AgeCat		1	3		4.0348	0.6851
Sex*AgeCat		2	1		5.1201	0.6292

Sex*AgeCat		2	2		5.8988	0.6852
Sex*AgeCat		2	3		4.6054	0.629
Belt Use				1	4.5505	0.4678
Belt Use				2	5.2291	0.4773
Belt Use				3	4.8645	0.4643
System*Belt Use	0			1	4.7783	0.8495
System*Belt Use	0			2	4.7892	0.8597
System*Belt Use	0			3	2.6641	0.8476
System*Belt Use	1			1	4.7063	0.8495
System*Belt Use	1			2	5.4636	0.8597
System*Belt Use	1			3	4.6243	0.8476
System*Belt Use	2			1	5.2274	0.8495
System*Belt Use	2			2	4.9045	0.8597
System*Belt Use	2			3	4.4747	0.8476
System*Belt Use	3			1	4.224	0.8495
System*Belt Use	3			2	6.3229	0.8597
System*Belt Use	3			3	7.5597	0.8476
System*Belt Use	4			1	3.8167	0.8495
System*Belt Use	4			2	4.6651	0.8597
System*Belt Use	4			3	4.9998	0.8476
Sex*Belt Use		1		1	4.0788	0.7295
Sex*Belt Use		1		2	4.3357	0.6403
Sex*Belt Use		1		3	5.2494	0.712
Sex*Belt Use		2		1	5.0222	0.5859
Sex*Belt Use		2		2	6.1224	0.7614
Sex*Belt Use		2		3	4.4797	0.6025
AgeCat*Belt Use			1	1	6.245	0.7956
AgeCat*Belt Use			1	2	4.8843	0.712
AgeCat*Belt Use			1	3	4.1407	0.9398
AgeCat*Belt Use			2	1	3.5451	0.94
AgeCat*Belt Use			2	2	6.9788	0.8862
AgeCat*Belt Use			2	3	5.1781	0.6692
AgeCat*Belt Use			3	1	3.8615	0.669
AgeCat*Belt Use			3	2	3.8241	0.9411
AgeCat*Belt Use			3	3	5.2747	0.7955

Table F-3. Post-drive ratings of preference

Effect	System	Sex	Age category	Belt use category	Estimate	Standard error
System	0				4.026	0.5368
System	1				4.2343	0.5368
System	2				4.9843	0.5368
System	3				6.1093	0.5368
System	4				4.5885	0.5368
Sex		1			4.225	0.4761
Sex		2			5.352	0.459
System*Sex	0	1			3.9638	0.7736
System*Sex	0	2			4.0882	0.7632
System*Sex	1	1			3.988	0.7736
System*Sex	1	2			4.4806	0.7632
System*Sex	2	1			4.3407	0.7736
System*Sex	2	2			5.6279	0.7632
System*Sex	3	1			5.3324	0.7736
System*Sex	3	2			6.8862	0.7632
System*Sex	4	1			3.5001	0.7736
System*Sex	4	2			5.6768	0.7632
AgeCat			1		4.8527	0.573
AgeCat			2		5.1075	0.5749
AgeCat			3		4.4052	0.565
System*AgeCat	0		1		3.9537	0.9421
System*AgeCat	0		2		4.7153	0.9431
System*AgeCat	0		3		3.4089	0.9372
System*AgeCat	1		1		4.1145	0.9421
System*AgeCat	1		2		3.901	0.9431
System*AgeCat	1		3		4.6874	0.9372
System*AgeCat	2		1		5.6558	0.9421
System*AgeCat	2		2		5.6783	0.9431
System*AgeCat	2		3		3.6189	0.9372
System*AgeCat	3		1		5.3698	0.9421
System*AgeCat	3		2		6.8405	0.9431
System*AgeCat	3		3		6.1176	0.9372
System*AgeCat	4		1		5.1698	0.9421
System*AgeCat	4		2		4.4025	0.9431
System*AgeCat	4		3		4.1931	0.9372
Sex*AgeCat		1	1		4.91	0.8739
Sex*AgeCat		1	2		4.3125	0.8397
Sex*AgeCat		1	3		3.4525	0.8381
Sex*AgeCat		2	1		4.7955	0.7696

Sex*AgeCat		2	2		5.9025	0.8381
Sex*AgeCat		2	3		5.3579	0.7694
Belt Use				1	4.1387	0.5723
Belt Use				2	5.3344	0.5839
Belt Use				3	4.8923	0.5679
System*Belt Use	0			1	4.2912	0.9432
System*Belt Use	0			2	5.2616	0.9552
System*Belt Use	0			3	2.5252	0.9406
System*Belt Use	1			1	3.508	0.9432
System*Belt Use	1			2	4.9429	0.9552
System*Belt Use	1			3	4.252	0.9406
System*Belt Use	2			1	5.0623	0.9432
System*Belt Use	2			2	5.2047	0.9552
System*Belt Use	2			3	4.6859	0.9406
System*Belt Use	3			1	4.5638	0.9432
System*Belt Use	3			2	6.0627	0.9552
System*Belt Use	3			3	7.7014	0.9406
System*Belt Use	4			1	3.268	0.9432
System*Belt Use	4			2	5.2003	0.9552
System*Belt Use	4			3	5.2972	0.9406
Sex*Belt Use		1		1	3.7884	0.8924
Sex*Belt Use		1		2	3.8223	0.7832
Sex*Belt Use		1		3	5.0642	0.8709
Sex*Belt Use		2		1	4.4889	0.7166
Sex*Belt Use		2		2	6.8465	0.9313
Sex*Belt Use		2		3	4.7204	0.737
AgeCat*Belt Use			1	1	5.4941	0.9732
AgeCat*Belt Use			1	2	5.0677	0.8709
AgeCat*Belt Use			1	3	3.9963	1.1495
AgeCat*Belt Use			2	1	3.5591	1.1498
AgeCat*Belt Use			2	2	7.0862	1.084
AgeCat*Belt Use			2	3	4.6772	0.8185
AgeCat*Belt Use			3	1	3.3628	0.8184
AgeCat*Belt Use			3	2	3.8494	1.1512
AgeCat*Belt Use			3	3	6.0035	0.973

Appendix G: Stationary Vehicle Rating Least Squares Means and Standard Errors for Main Effects and One-Way Interactions in ANOVA

(NOTE: See data key in Appendix H)

Table G-1. Stationary ratings of effectiveness

Effect	Stimulus	Sex	Age category	Belt use category	Estimate	Standard error
Stim	A1				5.3838	0.4756
Stim	A10				5.7764	0.4756
Stim	A11				5.2643	0.4784
Stim	A12				5.7048	0.4756
Stim	A13				6.6393	0.4756
Stim	A14				5.3374	0.4756
Stim	A15				5.1685	0.4756
Stim	A2				7.0304	0.4756
Stim	A3				7.2879	0.4756
Stim	A4				5.8908	0.4756
Stim	A5				5.4168	0.4756
Stim	A6				5.8626	0.4756
Stim	A7				5.8143	0.4756
Stim	A8				5.5636	0.4756
Stim	A9				5.1707	0.4756
Stim	V1				2.716	0.4756
Stim	V10				4.982	0.4756
Stim	V11				5.6653	0.4756
Stim	V12				3.1547	0.4756
Stim	V2				3.5028	0.4756
Stim	V3				4.2556	0.4756
Stim	V4				3.1918	0.4756
Stim	V5				4.3344	0.4756
Stim	V6				3.0225	0.4756
Stim	V7				3.9961	0.4756
Stim	V8				4.4744	0.4756
Stim	V9				4.7099	0.4756
Sex		1			4.3726	0.5624
Sex		2			5.6509	0.5045
Stim*Sex	A1	1			4.0692	0.7043
Stim*Sex	A1	2			6.6983	0.6493
Stim*Sex	A10	1			4.4248	0.7043
Stim*Sex	A10	2			7.128	0.6493

Stim*Sex	A11	1	4.5662	0.7058
Stim*Sex	A11	2	5.9625	0.6666
Stim*Sex	A12	1	4.6223	0.7043
Stim*Sex	A12	2	6.7873	0.6493
Stim*Sex	A13	1	5.7702	0.7043
Stim*Sex	A13	2	7.5084	0.6493
Stim*Sex	A14	1	4.9963	0.7043
Stim*Sex	A14	2	5.6786	0.6493
Stim*Sex	A15	1	4.1142	0.7043
Stim*Sex	A15	2	6.2228	0.6493
Stim*Sex	A2	1	6.0101	0.7043
Stim*Sex	A2	2	8.0507	0.6493
Stim*Sex	A3	1	6.0443	0.7043
Stim*Sex	A3	2	8.5315	0.6493
Stim*Sex	A4	1	4.8774	0.7043
Stim*Sex	A4	2	6.9042	0.6493
Stim*Sex	A5	1	4.0134	0.7043
Stim*Sex	A5	2	6.8203	0.6493
Stim*Sex	A6	1	5.1309	0.7043
Stim*Sex	A6	2	6.5943	0.6493
Stim*Sex	A7	1	4.3792	0.7043
Stim*Sex	A7	2	7.2495	0.6493
Stim*Sex	A8	1	4.3652	0.7043
Stim*Sex	A8	2	6.762	0.6493
Stim*Sex	A9	1	4.3438	0.7043
Stim*Sex	A9	2	5.9975	0.6493
Stim*Sex	V1	1	2.758	0.7043
Stim*Sex	V1	2	2.6739	0.6493
Stim*Sex	V10	1	4.8127	0.7043
Stim*Sex	V10	2	5.1513	0.6493
Stim*Sex	V11	1	5.3316	0.7043
Stim*Sex	V11	2	5.9989	0.6493
Stim*Sex	V12	1	2.7359	0.7043
Stim*Sex	V12	2	3.5735	0.6493
Stim*Sex	V2	1	3.8295	0.7043
Stim*Sex	V2	2	3.1762	0.6493
Stim*Sex	V3	1	3.9961	0.7043
Stim*Sex	V3	2	4.5151	0.6493
Stim*Sex	V4	1	3.1929	0.7043
Stim*Sex	V4	2	3.1907	0.6493
Stim*Sex	V5	1	4.1669	0.7043
Stim*Sex	V5	2	4.5019	0.6493

Stim*Sex	V6	1		2.9928	0.7043
Stim*Sex	V6	2		3.0521	0.6493
Stim*Sex	V7	1		3.8907	0.7043
Stim*Sex	V7	2		4.1015	0.6493
Stim*Sex	V8	1		4.1182	0.7043
Stim*Sex	V8	2		4.8306	0.6493
Stim*Sex	V9	1		4.5068	0.7043
Stim*Sex	V9	2		4.9129	0.6493
AgeCat			1	4.8202	0.6475
AgeCat			2	5.8657	0.6804
AgeCat			3	4.3493	0.6341
Stim*AgeCat	A1		1	5.306	0.8243
Stim*AgeCat	A1		2	6.2503	0.8516
Stim*AgeCat	A1		3	4.595	0.8095
Stim*AgeCat	A10		1	5.5595	0.8243
Stim*AgeCat	A10		2	7.3625	0.8516
Stim*AgeCat	A10		3	4.4071	0.8095
Stim*AgeCat	A11		1	5.3855	0.8367
Stim*AgeCat	A11		2	7.0599	0.8531
Stim*AgeCat	A11		3	3.3475	0.8104
Stim*AgeCat	A12		1	5.4858	0.8243
Stim*AgeCat	A12		2	7.2937	0.8516
Stim*AgeCat	A12		3	4.3349	0.8095
Stim*AgeCat	A13		1	5.988	0.8243
Stim*AgeCat	A13		2	8.4661	0.8516
Stim*AgeCat	A13		3	5.4639	0.8095
Stim*AgeCat	A14		1	5.7394	0.8243
Stim*AgeCat	A14		2	6.7494	0.8516
Stim*AgeCat	A14		3	3.5235	0.8095
Stim*AgeCat	A15		1	5.0449	0.8243
Stim*AgeCat	A15		2	6.9566	0.8516
Stim*AgeCat	A15		3	3.504	0.8095
Stim*AgeCat	A2		1	6.6856	0.8243
Stim*AgeCat	A2		2	8.0243	0.8516
Stim*AgeCat	A2		3	6.3812	0.8095
Stim*AgeCat	A3		1	7.6216	0.8243
Stim*AgeCat	A3		2	7.1228	0.8516
Stim*AgeCat	A3		3	7.1194	0.8095
Stim*AgeCat	A4		1	5.2424	0.8243
Stim*AgeCat	A4		2	6.8807	0.8516
Stim*AgeCat	A4		3	5.5492	0.8095
Stim*AgeCat	A5		1	4.8592	0.8243

Stim*AgeCat	A5	2	6.3396	0.8516
Stim*AgeCat	A5	3	5.0517	0.8095
Stim*AgeCat	A6	1	5.8282	0.8243
Stim*AgeCat	A6	2	6.5391	0.8516
Stim*AgeCat	A6	3	5.2204	0.8095
Stim*AgeCat	A7	1	5.1672	0.8243
Stim*AgeCat	A7	2	7.7838	0.8516
Stim*AgeCat	A7	3	4.4919	0.8095
Stim*AgeCat	A8	1	5.2467	0.8243
Stim*AgeCat	A8	2	6.8431	0.8516
Stim*AgeCat	A8	3	4.6009	0.8095
Stim*AgeCat	A9	1	5.1643	0.8243
Stim*AgeCat	A9	2	6.0074	0.8516
Stim*AgeCat	A9	3	4.3403	0.8095
Stim*AgeCat	V1	1	2.7925	0.8243
Stim*AgeCat	V1	2	3.3083	0.8516
Stim*AgeCat	V1	3	2.0471	0.8095
Stim*AgeCat	V10	1	4.4424	0.8243
Stim*AgeCat	V10	2	5.5015	0.8516
Stim*AgeCat	V10	3	5.002	0.8095
Stim*AgeCat	V11	1	5.1679	0.8243
Stim*AgeCat	V11	2	6.3409	0.8516
Stim*AgeCat	V11	3	5.487	0.8095
Stim*AgeCat	V12	1	3.9186	0.8243
Stim*AgeCat	V12	2	2.6383	0.8516
Stim*AgeCat	V12	3	2.9071	0.8095
Stim*AgeCat	V2	1	3.0323	0.8243
Stim*AgeCat	V2	2	4.0194	0.8516
Stim*AgeCat	V2	3	3.4568	0.8095
Stim*AgeCat	V3	1	3.9611	0.8243
Stim*AgeCat	V3	2	4.862	0.8516
Stim*AgeCat	V3	3	3.9436	0.8095
Stim*AgeCat	V4	1	3.4305	0.8243
Stim*AgeCat	V4	2	3.2808	0.8516
Stim*AgeCat	V4	3	2.864	0.8095
Stim*AgeCat	V5	1	4.3063	0.8243
Stim*AgeCat	V5	2	4.5925	0.8516
Stim*AgeCat	V5	3	4.1043	0.8095
Stim*AgeCat	V6	1	2.3032	0.8243
Stim*AgeCat	V6	2	3.9425	0.8516
Stim*AgeCat	V6	3	2.8217	0.8095
Stim*AgeCat	V7	1	3.6975	0.8243

Stim*AgeCat	V7		2		4.3134	0.8516
Stim*AgeCat	V7		3		3.9774	0.8095
Stim*AgeCat	V8		1		4.6003	0.8243
Stim*AgeCat	V8		2		4.738	0.8516
Stim*AgeCat	V8		3		4.0849	0.8095
Stim*AgeCat	V9		1		4.168	0.8243
Stim*AgeCat	V9		2		5.1579	0.8516
Stim*AgeCat	V9		3		4.8037	0.8095
Sex*AgeCat		1	1		3.9778	0.9971
Sex*AgeCat		1	2		5.4455	0.9623
Sex*AgeCat		1	3		3.6944	0.9623
Sex*AgeCat		2	1		5.6626	0.8262
Sex*AgeCat		2	2		6.286	0.9623
Sex*AgeCat		2	3		5.0041	0.826
Belt Use				1	4.2567	0.6341
Belt Use				2	4.6437	0.6929
Belt Use				3	6.1348	0.6341
Stim*Belt Use	A1			1	4.3389	0.8135
Stim*Belt Use	A1			2	4.8415	0.8663
Stim*Belt Use	A1			3	6.9709	0.8111
Stim*Belt Use	A10			1	4.9757	0.8135
Stim*Belt Use	A10			2	5.3019	0.8663
Stim*Belt Use	A10			3	7.0516	0.8111
Stim*Belt Use	A11			1	5.0589	0.8135
Stim*Belt Use	A11			2	4.2892	0.8856
Stim*Belt Use	A11			3	6.4449	0.8116
Stim*Belt Use	A12			1	4.5213	0.8135
Stim*Belt Use	A12			2	5.7558	0.8663
Stim*Belt Use	A12			3	6.8374	0.8111
Stim*Belt Use	A13			1	5.4522	0.8135
Stim*Belt Use	A13			2	6.6363	0.8663
Stim*Belt Use	A13			3	7.8295	0.8111
Stim*Belt Use	A14			1	4.6729	0.8135
Stim*Belt Use	A14			2	4.2594	0.8663
Stim*Belt Use	A14			3	7.08	0.8111
Stim*Belt Use	A15			1	4.0803	0.8135
Stim*Belt Use	A15			2	4.8304	0.8663
Stim*Belt Use	A15			3	6.5949	0.8111
Stim*Belt Use	A2			1	6.0226	0.8135
Stim*Belt Use	A2			2	6.4535	0.8663
Stim*Belt Use	A2			3	8.6149	0.8111
Stim*Belt Use	A3			1	6.2824	0.8135

Stim*Belt Use	A3	2	6.7782	0.8663
Stim*Belt Use	A3	3	8.8031	0.8111
Stim*Belt Use	A4	1	5.5436	0.8135
Stim*Belt Use	A4	2	5.1155	0.8663
Stim*Belt Use	A4	3	7.0132	0.8111
Stim*Belt Use	A5	1	5.3492	0.8135
Stim*Belt Use	A5	2	5.0287	0.8663
Stim*Belt Use	A5	3	5.8726	0.8111
Stim*Belt Use	A6	1	5.2412	0.8135
Stim*Belt Use	A6	2	5.1775	0.8663
Stim*Belt Use	A6	3	7.169	0.8111
Stim*Belt Use	A7	1	6.4764	0.8135
Stim*Belt Use	A7	2	6.0011	0.8663
Stim*Belt Use	A7	3	4.9654	0.8111
Stim*Belt Use	A8	1	4.5685	0.8135
Stim*Belt Use	A8	2	5.0929	0.8663
Stim*Belt Use	A8	3	7.0293	0.8111
Stim*Belt Use	A9	1	4.4746	0.8135
Stim*Belt Use	A9	2	4.4028	0.8663
Stim*Belt Use	A9	3	6.6346	0.8111
Stim*Belt Use	V1	1	2.4332	0.8135
Stim*Belt Use	V1	2	2.6842	0.8663
Stim*Belt Use	V1	3	3.0305	0.8111
Stim*Belt Use	V10	1	3.7393	0.8135
Stim*Belt Use	V10	2	5.2108	0.8663
Stim*Belt Use	V10	3	5.9957	0.8111
Stim*Belt Use	V11	1	4.4764	0.8135
Stim*Belt Use	V11	2	5.8275	0.8663
Stim*Belt Use	V11	3	6.6919	0.8111
Stim*Belt Use	V12	1	1.9752	0.8135
Stim*Belt Use	V12	2	3.3976	0.8663
Stim*Belt Use	V12	3	4.0913	0.8111
Stim*Belt Use	V2	1	3.1224	0.8135
Stim*Belt Use	V2	2	2.5593	0.8663
Stim*Belt Use	V2	3	4.8269	0.8111
Stim*Belt Use	V3	1	3.3815	0.8135
Stim*Belt Use	V3	2	3.7319	0.8663
Stim*Belt Use	V3	3	5.6535	0.8111
Stim*Belt Use	V4	1	2.532	0.8135
Stim*Belt Use	V4	2	2.8243	0.8663
Stim*Belt Use	V4	3	4.2191	0.8111
Stim*Belt Use	V5	1	3.4719	0.8135

Stim*Belt Use	V5			2	4.1883	0.8663
Stim*Belt Use	V5			3	5.343	0.8111
Stim*Belt Use	V6			1	2.5726	0.8135
Stim*Belt Use	V6			2	2.6772	0.8663
Stim*Belt Use	V6			3	3.8176	0.8111
Stim*Belt Use	V7			1	3.641	0.8135
Stim*Belt Use	V7			2	3.605	0.8663
Stim*Belt Use	V7			3	4.7422	0.8111
Stim*Belt Use	V8			1	2.8091	0.8135
Stim*Belt Use	V8			2	4.1938	0.8663
Stim*Belt Use	V8			3	6.4202	0.8111
Stim*Belt Use	V9			1	3.7173	0.8135
Stim*Belt Use	V9			2	4.5164	0.8663
Stim*Belt Use	V9			3	5.8959	0.8111
Sex*Belt Use		1		1	3.608	1.0117
Sex*Belt Use		1		2	3.7895	0.9209
Sex*Belt Use		1		3	5.7202	0.9873
Sex*Belt Use		2		1	4.9053	0.7648
Sex*Belt Use		2		2	5.498	1.0356
Sex*Belt Use		2		3	6.5494	0.796
AgeCat*Belt Use			1	1	3.2716	1.0472
AgeCat*Belt Use			1	2	5.4852	0.96
AgeCat*Belt Use			1	3	5.7037	1.3246
AgeCat*Belt Use			2	1	5.3827	1.3246
AgeCat*Belt Use			2	2	5.1065	1.2825
AgeCat*Belt Use			2	3	7.108	0.8761
AgeCat*Belt Use			3	1	4.1157	0.8761
AgeCat*Belt Use			3	2	3.3395	1.3246
AgeCat*Belt Use			3	3	5.5926	1.0472

Table G-2. Stationary ratings of annoyance

Effect	Stimulus	Sex	Age category	Belt use category	Estimate	Standard error
Stim	A1				6.0945	0.4247
Stim	A10				6.5085	0.4247
Stim	A11				4.8427	0.4288
Stim	A12				4.8963	0.4247
Stim	A13				6.7743	0.4247
Stim	A14				4.1627	0.4247
Stim	A15				4.901	0.4247
Stim	A2				7.3592	0.4247
Stim	A3				8.8779	0.4247
Stim	A4				5.8909	0.4247
Stim	A5				5.7202	0.4247
Stim	A6				7.2446	0.4247
Stim	A7				7.4548	0.4247
Stim	A8				4.9105	0.4247
Stim	A9				4.5897	0.4247
Stim	V1				1.4575	0.4247
Stim	V10				3.4509	0.4247
Stim	V11				3.9988	0.4247
Stim	V12				1.8602	0.4247
Stim	V2				1.6793	0.4247
Stim	V3				2.7685	0.4247
Stim	V4				1.8569	0.4247
Stim	V5				3.4194	0.4247
Stim	V6				1.823	0.4247
Stim	V7				2.6482	0.4247
Stim	V8				1.7602	0.4247
Stim	V9				2.8189	0.4247
Sex		1			4.1224	0.3995
Sex		2			4.7494	0.3585
Stim*Sex	A1	1			5.5917	0.6268
Stim*Sex	A1	2			6.5974	0.5876
Stim*Sex	A10	1			6.4268	0.6268
Stim*Sex	A10	2			6.5901	0.5876
Stim*Sex	A11	1			4.6824	0.629
Stim*Sex	A11	2			5.0029	0.6122
Stim*Sex	A12	1			4.6014	0.6268
Stim*Sex	A12	2			5.1913	0.5876
Stim*Sex	A13	1			6.5096	0.6268
Stim*Sex	A13	2			7.0389	0.5876

Stim*Sex	A14	1	3.6895	0.6268
Stim*Sex	A14	2	4.6358	0.5876
Stim*Sex	A15	1	4.6326	0.6268
Stim*Sex	A15	2	5.1694	0.5876
Stim*Sex	A2	1	6.7827	0.6268
Stim*Sex	A2	2	7.9358	0.5876
Stim*Sex	A3	1	8.3274	0.6268
Stim*Sex	A3	2	9.4284	0.5876
Stim*Sex	A4	1	5.3198	0.6268
Stim*Sex	A4	2	6.462	0.5876
Stim*Sex	A5	1	5.0045	0.6268
Stim*Sex	A5	2	6.4359	0.5876
Stim*Sex	A6	1	6.7309	0.6268
Stim*Sex	A6	2	7.7582	0.5876
Stim*Sex	A7	1	6.3794	0.6268
Stim*Sex	A7	2	8.5302	0.5876
Stim*Sex	A8	1	3.9541	0.6268
Stim*Sex	A8	2	5.8669	0.5876
Stim*Sex	A9	1	4.1764	0.6268
Stim*Sex	A9	2	5.003	0.5876
Stim*Sex	V1	1	1.4608	0.6268
Stim*Sex	V1	2	1.4543	0.5876
Stim*Sex	V10	1	3.0875	0.6268
Stim*Sex	V10	2	3.8143	0.5876
Stim*Sex	V11	1	3.3944	0.6268
Stim*Sex	V11	2	4.6032	0.5876
Stim*Sex	V12	1	1.5361	0.6268
Stim*Sex	V12	2	2.1842	0.5876
Stim*Sex	V2	1	1.8205	0.6268
Stim*Sex	V2	2	1.5382	0.5876
Stim*Sex	V3	1	3.1744	0.6268
Stim*Sex	V3	2	2.3626	0.5876
Stim*Sex	V4	1	1.4229	0.6268
Stim*Sex	V4	2	2.2909	0.5876
Stim*Sex	V5	1	3.4103	0.6268
Stim*Sex	V5	2	3.4286	0.5876
Stim*Sex	V6	1	1.6354	0.6268
Stim*Sex	V6	2	2.0106	0.5876
Stim*Sex	V7	1	2.9512	0.6268
Stim*Sex	V7	2	2.3453	0.5876
Stim*Sex	V8	1	1.6657	0.6268
Stim*Sex	V8	2	1.8547	0.5876

Stim*Sex	V9	1		2.9372	0.6268
Stim*Sex	V9	2		2.7007	0.5876
AgeCat			1	4.6848	0.46
AgeCat			2	4.7948	0.4834
AgeCat			3	3.8282	0.4505
Stim*AgeCat	A1		1	6.0412	0.7413
Stim*AgeCat	A1		2	6.2271	0.7575
Stim*AgeCat	A1		3	6.0154	0.7291
Stim*AgeCat	A10		1	7.0654	0.7413
Stim*AgeCat	A10		2	7.5683	0.7575
Stim*AgeCat	A10		3	4.8916	0.7291
Stim*AgeCat	A11		1	5.312	0.759
Stim*AgeCat	A11		2	6.1437	0.7598
Stim*AgeCat	A11		3	3.0723	0.7304
Stim*AgeCat	A12		1	5.756	0.7413
Stim*AgeCat	A12		2	5.5899	0.7575
Stim*AgeCat	A12		3	3.343	0.7291
Stim*AgeCat	A13		1	6.6708	0.7413
Stim*AgeCat	A13		2	7.7427	0.7575
Stim*AgeCat	A13		3	5.9094	0.7291
Stim*AgeCat	A14		1	4.7795	0.7413
Stim*AgeCat	A14		2	4.0066	0.7575
Stim*AgeCat	A14		3	3.7019	0.7291
Stim*AgeCat	A15		1	5.9318	0.7413
Stim*AgeCat	A15		2	5.6741	0.7575
Stim*AgeCat	A15		3	3.097	0.7291
Stim*AgeCat	A2		1	7.8045	0.7413
Stim*AgeCat	A2		2	7.9825	0.7575
Stim*AgeCat	A2		3	6.2908	0.7291
Stim*AgeCat	A3		1	9.1968	0.7413
Stim*AgeCat	A3		2	9.3697	0.7575
Stim*AgeCat	A3		3	8.0671	0.7291
Stim*AgeCat	A4		1	6.3171	0.7413
Stim*AgeCat	A4		2	6.5599	0.7575
Stim*AgeCat	A4		3	4.7958	0.7291
Stim*AgeCat	A5		1	5.8124	0.7413
Stim*AgeCat	A5		2	6.4551	0.7575
Stim*AgeCat	A5		3	4.893	0.7291
Stim*AgeCat	A6		1	7.463	0.7413
Stim*AgeCat	A6		2	8.3614	0.7575
Stim*AgeCat	A6		3	5.9093	0.7291
Stim*AgeCat	A7		1	7.5219	0.7413

Stim*AgeCat	A7	2	8.2419	0.7575
Stim*AgeCat	A7	3	6.6006	0.7291
Stim*AgeCat	A8	1	6.0486	0.7413
Stim*AgeCat	A8	2	5.2852	0.7575
Stim*AgeCat	A8	3	3.3978	0.7291
Stim*AgeCat	A9	1	6.1344	0.7413
Stim*AgeCat	A9	2	4.406	0.7575
Stim*AgeCat	A9	3	3.2286	0.7291
Stim*AgeCat	V1	1	1.185	0.7413
Stim*AgeCat	V1	2	1.2743	0.7575
Stim*AgeCat	V1	3	1.9133	0.7291
Stim*AgeCat	V10	1	3.9254	0.7413
Stim*AgeCat	V10	2	3.328	0.7575
Stim*AgeCat	V10	3	3.0992	0.7291
Stim*AgeCat	V11	1	4.3036	0.7413
Stim*AgeCat	V11	2	3.0845	0.7575
Stim*AgeCat	V11	3	4.6084	0.7291
Stim*AgeCat	V12	1	2.422	0.7413
Stim*AgeCat	V12	2	1.4588	0.7575
Stim*AgeCat	V12	3	1.6996	0.7291
Stim*AgeCat	V2	1	1.3501	0.7413
Stim*AgeCat	V2	2	1.8274	0.7575
Stim*AgeCat	V2	3	1.8606	0.7291
Stim*AgeCat	V3	1	2.0249	0.7413
Stim*AgeCat	V3	2	3.6963	0.7575
Stim*AgeCat	V3	3	2.5843	0.7291
Stim*AgeCat	V4	1	1.4536	0.7413
Stim*AgeCat	V4	2	1.6868	0.7575
Stim*AgeCat	V4	3	2.4303	0.7291
Stim*AgeCat	V5	1	3.4808	0.7413
Stim*AgeCat	V5	2	3.3896	0.7575
Stim*AgeCat	V5	3	3.3879	0.7291
Stim*AgeCat	V6	1	1.1394	0.7413
Stim*AgeCat	V6	2	2.1766	0.7575
Stim*AgeCat	V6	3	2.1531	0.7291
Stim*AgeCat	V7	1	2.4662	0.7413
Stim*AgeCat	V7	2	2.8841	0.7575
Stim*AgeCat	V7	3	2.5944	0.7291
Stim*AgeCat	V8	1	1.7523	0.7413
Stim*AgeCat	V8	2	1.9844	0.7575
Stim*AgeCat	V8	3	1.5439	0.7291
Stim*AgeCat	V9	1	3.1309	0.7413

Stim*AgeCat	V9	2		3.0535	0.7575
Stim*AgeCat	V9	3		2.2724	0.7291
Sex*AgeCat	1	1		4.7654	0.7084
Sex*AgeCat	1	2		4.4372	0.6837
Sex*AgeCat	1	3		3.1646	0.6837
Sex*AgeCat	2	1		4.6042	0.5871
Sex*AgeCat	2	2		5.1523	0.6837
Sex*AgeCat	2	3		4.4918	0.5869
Belt Use			1	5.0638	0.4505
Belt Use			2	3.889	0.4923
Belt Use			3	4.3549	0.4505
Stim*Belt Use	A1		1	6.8277	0.7348
Stim*Belt Use	A1		2	5.1979	0.7702
Stim*Belt Use	A1		3	6.258	0.7314
Stim*Belt Use	A10		1	7.6214	0.7348
Stim*Belt Use	A10		2	5.7543	0.7702
Stim*Belt Use	A10		3	6.1496	0.7314
Stim*Belt Use	A11		1	6.4768	0.7348
Stim*Belt Use	A11		2	3.9962	0.7982
Stim*Belt Use	A11		3	4.0549	0.7321
Stim*Belt Use	A12		1	6.2857	0.7348
Stim*Belt Use	A12		2	3.8337	0.7702
Stim*Belt Use	A12		3	4.5695	0.7314
Stim*Belt Use	A13		1	8.2045	0.7348
Stim*Belt Use	A13		2	5.5503	0.7702
Stim*Belt Use	A13		3	6.568	0.7314
Stim*Belt Use	A14		1	4.199	0.7348
Stim*Belt Use	A14		2	4.0778	0.7702
Stim*Belt Use	A14		3	4.2113	0.7314
Stim*Belt Use	A15		1	5.4416	0.7348
Stim*Belt Use	A15		2	4.4228	0.7702
Stim*Belt Use	A15		3	4.8385	0.7314
Stim*Belt Use	A2		1	8.4244	0.7348
Stim*Belt Use	A2		2	6.7115	0.7702
Stim*Belt Use	A2		3	6.9418	0.7314
Stim*Belt Use	A3		1	9.6211	0.7348
Stim*Belt Use	A3		2	7.9225	0.7702
Stim*Belt Use	A3		3	9.0899	0.7314
Stim*Belt Use	A4		1	7.1667	0.7348
Stim*Belt Use	A4		2	5.0622	0.7702
Stim*Belt Use	A4		3	5.4439	0.7314
Stim*Belt Use	A5		1	7.3299	0.7348

Stim*Belt Use	A5	2	4.6766	0.7702
Stim*Belt Use	A5	3	5.154	0.7314
Stim*Belt Use	A6	1	8.2092	0.7348
Stim*Belt Use	A6	2	6.9356	0.7702
Stim*Belt Use	A6	3	6.5889	0.7314
Stim*Belt Use	A7	1	8.4078	0.7348
Stim*Belt Use	A7	2	6.4587	0.7702
Stim*Belt Use	A7	3	7.4978	0.7314
Stim*Belt Use	A8	1	5.0829	0.7348
Stim*Belt Use	A8	2	4.8509	0.7702
Stim*Belt Use	A8	3	4.7977	0.7314
Stim*Belt Use	A9	1	5.1073	0.7348
Stim*Belt Use	A9	2	3.5467	0.7702
Stim*Belt Use	A9	3	5.1151	0.7314
Stim*Belt Use	V1	1	1.2165	0.7348
Stim*Belt Use	V1	2	1.8245	0.7702
Stim*Belt Use	V1	3	1.3315	0.7314
Stim*Belt Use	V10	1	3.1593	0.7348
Stim*Belt Use	V10	2	3.414	0.7702
Stim*Belt Use	V10	3	3.7794	0.7314
Stim*Belt Use	V11	1	4.0395	0.7348
Stim*Belt Use	V11	2	3.5722	0.7702
Stim*Belt Use	V11	3	4.3848	0.7314
Stim*Belt Use	V12	1	2.1862	0.7348
Stim*Belt Use	V12	2	1.6236	0.7702
Stim*Belt Use	V12	3	1.7708	0.7314
Stim*Belt Use	V2	1	1.5865	0.7348
Stim*Belt Use	V2	2	1.3642	0.7702
Stim*Belt Use	V2	3	2.0873	0.7314
Stim*Belt Use	V3	1	3.2524	0.7348
Stim*Belt Use	V3	2	1.94	0.7702
Stim*Belt Use	V3	3	3.113	0.7314
Stim*Belt Use	V4	1	2.0921	0.7348
Stim*Belt Use	V4	2	1.8243	0.7702
Stim*Belt Use	V4	3	1.6543	0.7314
Stim*Belt Use	V5	1	4.7987	0.7348
Stim*Belt Use	V5	2	2.4475	0.7702
Stim*Belt Use	V5	3	3.0122	0.7314
Stim*Belt Use	V6	1	1.8634	0.7348
Stim*Belt Use	V6	2	2.0805	0.7702
Stim*Belt Use	V6	3	1.5252	0.7314
Stim*Belt Use	V7	1	2.8277	0.7348

Stim*Belt Use	V7			2	2.083	0.7702
Stim*Belt Use	V7			3	3.034	0.7314
Stim*Belt Use	V8			1	1.769	0.7348
Stim*Belt Use	V8			2	1.4645	0.7702
Stim*Belt Use	V8			3	2.0472	0.7314
Stim*Belt Use	V9			1	3.5248	0.7348
Stim*Belt Use	V9			2	2.3671	0.7702
Stim*Belt Use	V9			3	2.5649	0.7314
Sex*Belt Use		1		1	5.358	0.7188
Sex*Belt Use		1		2	2.8241	0.6542
Sex*Belt Use		1		3	4.1852	0.7014
Sex*Belt Use		2		1	4.7695	0.5433
Sex*Belt Use		2		2	4.9539	0.7359
Sex*Belt Use		2		3	4.5247	0.5655
AgeCat*Belt Use			1	1	5.4321	0.744
AgeCat*Belt Use			1	2	4.4927	0.6824
AgeCat*Belt Use			1	3	4.1296	0.9411
AgeCat*Belt Use			2	1	5.5062	0.9411
AgeCat*Belt Use			2	2	3.9028	0.9112
AgeCat*Belt Use			2	3	4.9753	0.6225
AgeCat*Belt Use			3	1	4.2531	0.6225
AgeCat*Belt Use			3	2	3.2716	0.9411
AgeCat*Belt Use			3	3	3.9599	0.744

Table G-3. Stationary ratings of desirability

Effect	Stimulus	Sex	Age category	Belt use category	Estimate	Standard error
Stim	A1				3.9307	0.45
Stim	A10				2.9823	0.45
Stim	A11				3.4424	0.4556
Stim	A12				4.1463	0.45
Stim	A13				3.5279	0.45
Stim	A14				4.7031	0.45
Stim	A15				3.8375	0.45
Stim	A2				4.3208	0.45
Stim	A3				3.3817	0.45
Stim	A4				3.5802	0.45
Stim	A5				3.293	0.45
Stim	A6				3.2299	0.45
Stim	A7				2.7749	0.45
Stim	A8				4.2151	0.45
Stim	A9				3.1024	0.45
Stim	V1				3.2452	0.45
Stim	V10				4.133	0.45
Stim	V11				4.5948	0.45
Stim	V12				3.236	0.45
Stim	V2				4.0652	0.45
Stim	V3				4.1407	0.45
Stim	V4				3.8681	0.45
Stim	V5				3.8894	0.45
Stim	V6				3.2664	0.45
Stim	V7				3.8549	0.45
Stim	V8				4.7319	0.45
Stim	V9				4.58	0.45
Sex		1			3.5971	0.3303
Sex		2			3.9639	0.2964
Stim*Sex	A1	1			3.4609	0.6628
Stim*Sex	A1	2			4.4006	0.6283
Stim*Sex	A10	1			2.519	0.6628
Stim*Sex	A10	2			3.4456	0.6283
Stim*Sex	A11	1			3.2682	0.6657
Stim*Sex	A11	2			3.6166	0.6606
Stim*Sex	A12	1			3.6285	0.6628
Stim*Sex	A12	2			4.664	0.6283
Stim*Sex	A13	1			3.4073	0.6628
Stim*Sex	A13	2			3.6485	0.6283

Stim*Sex	A14	1	4.373	0.6628
Stim*Sex	A14	2	5.0333	0.6283
Stim*Sex	A15	1	3.2911	0.6628
Stim*Sex	A15	2	4.384	0.6283
Stim*Sex	A2	1	3.6254	0.6628
Stim*Sex	A2	2	5.0162	0.6283
Stim*Sex	A3	1	2.6767	0.6628
Stim*Sex	A3	2	4.0866	0.6283
Stim*Sex	A4	1	3.2519	0.6628
Stim*Sex	A4	2	3.9084	0.6283
Stim*Sex	A5	1	2.4819	0.6628
Stim*Sex	A5	2	4.1042	0.6283
Stim*Sex	A6	1	2.5746	0.6628
Stim*Sex	A6	2	3.8853	0.6283
Stim*Sex	A7	1	2.3894	0.6628
Stim*Sex	A7	2	3.1605	0.6283
Stim*Sex	A8	1	3.8231	0.6628
Stim*Sex	A8	2	4.6071	0.6283
Stim*Sex	A9	1	2.631	0.6628
Stim*Sex	A9	2	3.5739	0.6283
Stim*Sex	V1	1	3.2699	0.6628
Stim*Sex	V1	2	3.2205	0.6283
Stim*Sex	V10	1	4.0866	0.6628
Stim*Sex	V10	2	4.1795	0.6283
Stim*Sex	V11	1	4.7977	0.6628
Stim*Sex	V11	2	4.3918	0.6283
Stim*Sex	V12	1	3.4089	0.6628
Stim*Sex	V12	2	3.0631	0.6283
Stim*Sex	V2	1	4.6833	0.6628
Stim*Sex	V2	2	3.4471	0.6283
Stim*Sex	V3	1	3.8849	0.6628
Stim*Sex	V3	2	4.3965	0.6283
Stim*Sex	V4	1	4.2456	0.6628
Stim*Sex	V4	2	3.4907	0.6283
Stim*Sex	V5	1	4.0834	0.6628
Stim*Sex	V5	2	3.6953	0.6283
Stim*Sex	V6	1	3.4785	0.6628
Stim*Sex	V6	2	3.0544	0.6283
Stim*Sex	V7	1	4.1941	0.6628
Stim*Sex	V7	2	3.5157	0.6283
Stim*Sex	V8	1	4.794	0.6628
Stim*Sex	V8	2	4.6698	0.6283

Stim*Sex	V9	1		4.7933	0.6628
Stim*Sex	V9	2		4.3667	0.6283
AgeCat			1	3.9563	0.3804
AgeCat			2	4.1512	0.3997
AgeCat			3	3.2341	0.3724
Stim*AgeCat	A1		1	4.4687	0.7892
Stim*AgeCat	A1		2	5.0553	0.8008
Stim*AgeCat	A1		3	2.2682	0.7771
Stim*AgeCat	A10		1	2.2737	0.7892
Stim*AgeCat	A10		2	3.6799	0.8008
Stim*AgeCat	A10		3	2.9933	0.7771
Stim*AgeCat	A11		1	4.225	0.8127
Stim*AgeCat	A11		2	3.5808	0.8038
Stim*AgeCat	A11		3	2.5213	0.7788
Stim*AgeCat	A12		1	3.6056	0.7892
Stim*AgeCat	A12		2	5.3967	0.8008
Stim*AgeCat	A12		3	3.4365	0.7771
Stim*AgeCat	A13		1	2.9424	0.7892
Stim*AgeCat	A13		2	3.8296	0.8008
Stim*AgeCat	A13		3	3.8116	0.7771
Stim*AgeCat	A14		1	5.2275	0.7892
Stim*AgeCat	A14		2	5.8544	0.8008
Stim*AgeCat	A14		3	3.0275	0.7771
Stim*AgeCat	A15		1	3.1958	0.7892
Stim*AgeCat	A15		2	5.2506	0.8008
Stim*AgeCat	A15		3	3.0662	0.7771
Stim*AgeCat	A2		1	3.8393	0.7892
Stim*AgeCat	A2		2	4.9351	0.8008
Stim*AgeCat	A2		3	4.188	0.7771
Stim*AgeCat	A3		1	2.2591	0.7892
Stim*AgeCat	A3		2	3.5294	0.8008
Stim*AgeCat	A3		3	4.3564	0.7771
Stim*AgeCat	A4		1	3.9188	0.7892
Stim*AgeCat	A4		2	4.4026	0.8008
Stim*AgeCat	A4		3	2.419	0.7771
Stim*AgeCat	A5		1	3.8255	0.7892
Stim*AgeCat	A5		2	3.9249	0.8008
Stim*AgeCat	A5		3	2.1287	0.7771
Stim*AgeCat	A6		1	2.882	0.7892
Stim*AgeCat	A6		2	2.7379	0.8008
Stim*AgeCat	A6		3	4.0698	0.7771
Stim*AgeCat	A7		1	3.0834	0.7892

Stim*AgeCat	A7	2	3.1424	0.8008
Stim*AgeCat	A7	3	2.099	0.7771
Stim*AgeCat	A8	1	3.817	0.7892
Stim*AgeCat	A8	2	5.3112	0.8008
Stim*AgeCat	A8	3	3.5171	0.7771
Stim*AgeCat	A9	1	2.756	0.7892
Stim*AgeCat	A9	2	3.9948	0.8008
Stim*AgeCat	A9	3	2.5566	0.7771
Stim*AgeCat	V1	1	3.6662	0.7892
Stim*AgeCat	V1	2	3.4462	0.8008
Stim*AgeCat	V1	3	2.6231	0.7771
Stim*AgeCat	V10	1	3.8658	0.7892
Stim*AgeCat	V10	2	4.3068	0.8008
Stim*AgeCat	V10	3	4.2265	0.7771
Stim*AgeCat	V11	1	4.4735	0.7892
Stim*AgeCat	V11	2	5.2671	0.8008
Stim*AgeCat	V11	3	4.0437	0.7771
Stim*AgeCat	V12	1	4.7435	0.7892
Stim*AgeCat	V12	2	2.7657	0.8008
Stim*AgeCat	V12	3	2.1989	0.7771
Stim*AgeCat	V2	1	4.8187	0.7892
Stim*AgeCat	V2	2	4.0704	0.8008
Stim*AgeCat	V2	3	3.3065	0.7771
Stim*AgeCat	V3	1	5.0961	0.7892
Stim*AgeCat	V3	2	3.7117	0.8008
Stim*AgeCat	V3	3	3.6143	0.7771
Stim*AgeCat	V4	1	4.6446	0.7892
Stim*AgeCat	V4	2	3.685	0.8008
Stim*AgeCat	V4	3	3.2748	0.7771
Stim*AgeCat	V5	1	4.4456	0.7892
Stim*AgeCat	V5	2	3.9294	0.8008
Stim*AgeCat	V5	3	3.293	0.7771
Stim*AgeCat	V6	1	3.7994	0.7892
Stim*AgeCat	V6	2	3.496	0.8008
Stim*AgeCat	V6	3	2.5039	0.7771
Stim*AgeCat	V7	1	4.3806	0.7892
Stim*AgeCat	V7	2	3.6923	0.8008
Stim*AgeCat	V7	3	3.4918	0.7771
Stim*AgeCat	V8	1	5.9518	0.7892
Stim*AgeCat	V8	2	4.5469	0.8008
Stim*AgeCat	V8	3	3.697	0.7771
Stim*AgeCat	V9	1	4.6133	0.7892

Stim*AgeCat	V9		2		4.54	0.8008
Stim*AgeCat	V9		3		4.5867	0.7771
Sex*AgeCat		1	1		4.1	0.5857
Sex*AgeCat		1	2		3.8714	0.5652
Sex*AgeCat		1	3		2.82	0.5652
Sex*AgeCat		2	1		3.8125	0.4856
Sex*AgeCat		2	2		4.4311	0.5652
Sex*AgeCat		2	3		3.6481	0.4852
Belt Use		1			3.1908	0.3724
Belt Use		2			3.5432	0.4071
Belt Use		3			4.6075	0.3724
Stim*Belt Use	A1			1	3.521	0.7847
Stim*Belt Use	A1			2	3.5569	0.8138
Stim*Belt Use	A1			3	4.7143	0.7801
Stim*Belt Use	A10			1	2.2125	0.7847
Stim*Belt Use	A10			2	2.8051	0.8138
Stim*Belt Use	A10			3	3.9293	0.7801
Stim*Belt Use	A11			1	2.2717	0.7847
Stim*Belt Use	A11			2	2.831	0.8511
Stim*Belt Use	A11			3	5.2244	0.7811
Stim*Belt Use	A12			1	2.9732	0.7847
Stim*Belt Use	A12			2	4.2648	0.8138
Stim*Belt Use	A12			3	5.2008	0.7801
Stim*Belt Use	A13			1	1.3557	0.7847
Stim*Belt Use	A13			2	3.7192	0.8138
Stim*Belt Use	A13			3	5.5087	0.7801
Stim*Belt Use	A14			1	4.8327	0.7847
Stim*Belt Use	A14			2	3.518	0.8138
Stim*Belt Use	A14			3	5.7588	0.7801
Stim*Belt Use	A15			1	3.5215	0.7847
Stim*Belt Use	A15			2	3.2201	0.8138
Stim*Belt Use	A15			3	4.7709	0.7801
Stim*Belt Use	A2			1	2.8744	0.7847
Stim*Belt Use	A2			2	3.9388	0.8138
Stim*Belt Use	A2			3	6.1492	0.7801
Stim*Belt Use	A3			1	2.5176	0.7847
Stim*Belt Use	A3			2	4.3577	0.8138
Stim*Belt Use	A3			3	3.2696	0.7801
Stim*Belt Use	A4			1	2.8359	0.7847
Stim*Belt Use	A4			2	3.9484	0.8138
Stim*Belt Use	A4			3	3.9562	0.7801
Stim*Belt Use	A5			1	2.9499	0.7847

Stim*Belt Use	A5	2	3.4382	0.8138
Stim*Belt Use	A5	3	3.491	0.7801
Stim*Belt Use	A6	1	3.2747	0.7847
Stim*Belt Use	A6	2	2.4869	0.8138
Stim*Belt Use	A6	3	3.9282	0.7801
Stim*Belt Use	A7	1	2.2387	0.7847
Stim*Belt Use	A7	2	2.5481	0.8138
Stim*Belt Use	A7	3	3.5381	0.7801
Stim*Belt Use	A8	1	4.1626	0.7847
Stim*Belt Use	A8	2	3.265	0.8138
Stim*Belt Use	A8	3	5.2177	0.7801
Stim*Belt Use	A9	1	2.7987	0.7847
Stim*Belt Use	A9	2	2.7546	0.8138
Stim*Belt Use	A9	3	3.754	0.7801
Stim*Belt Use	V1	1	3.3367	0.7847
Stim*Belt Use	V1	2	3.002	0.8138
Stim*Belt Use	V1	3	3.3968	0.7801
Stim*Belt Use	V10	1	3.0078	0.7847
Stim*Belt Use	V10	2	4.3973	0.8138
Stim*Belt Use	V10	3	4.994	0.7801
Stim*Belt Use	V11	1	3.7949	0.7847
Stim*Belt Use	V11	2	4.9079	0.8138
Stim*Belt Use	V11	3	5.0815	0.7801
Stim*Belt Use	V12	1	2.2349	0.7847
Stim*Belt Use	V12	2	3.818	0.8138
Stim*Belt Use	V12	3	3.6552	0.7801
Stim*Belt Use	V2	1	4.6627	0.7847
Stim*Belt Use	V2	2	2.7173	0.8138
Stim*Belt Use	V2	3	4.8156	0.7801
Stim*Belt Use	V3	1	3.6188	0.7847
Stim*Belt Use	V3	2	3.6125	0.8138
Stim*Belt Use	V3	3	5.1908	0.7801
Stim*Belt Use	V4	1	2.9952	0.7847
Stim*Belt Use	V4	2	4.0463	0.8138
Stim*Belt Use	V4	3	4.5629	0.7801
Stim*Belt Use	V5	1	2.5328	0.7847
Stim*Belt Use	V5	2	3.749	0.8138
Stim*Belt Use	V5	3	5.3862	0.7801
Stim*Belt Use	V6	1	3.5674	0.7847
Stim*Belt Use	V6	2	2.8382	0.8138
Stim*Belt Use	V6	3	3.3937	0.7801
Stim*Belt Use	V7	1	3.9153	0.7847

Stim*Belt Use	V7			2	3.1419	0.8138
Stim*Belt Use	V7			3	4.5075	0.7801
Stim*Belt Use	V8			1	3.944	0.7847
Stim*Belt Use	V8			2	4.2386	0.8138
Stim*Belt Use	V8			3	6.0131	0.7801
Stim*Belt Use	V9			1	4.2014	0.7847
Stim*Belt Use	V9			2	4.5444	0.8138
Stim*Belt Use	V9			3	4.9942	0.7801
Sex*Belt Use		1		1	2.8796	0.5942
Sex*Belt Use		1		2	3.2821	0.5409
Sex*Belt Use		1		3	4.6296	0.5799
Sex*Belt Use		2		1	3.5021	0.4492
Sex*Belt Use		2		2	3.8043	0.6086
Sex*Belt Use		2		3	4.5854	0.4675
AgeCat*Belt Use			1	1	3.1883	0.6151
AgeCat*Belt Use			1	2	4.2237	0.5646
AgeCat*Belt Use			1	3	4.4568	0.778
AgeCat*Belt Use			2	1	3.7716	0.778
AgeCat*Belt Use			2	2	3.3565	0.7533
AgeCat*Belt Use			2	3	5.3256	0.5146
AgeCat*Belt Use			3	1	2.6127	0.5146
AgeCat*Belt Use			3	2	3.0494	0.778
AgeCat*Belt Use			3	3	4.0401	0.6151

Appendix H: Data Key for Appendices E, F, and G

Sex	Age category	System	Rating point	Belt use category	Stimulus
1 = male	1 = younger	0 = basic reminder	1 = 15 seconds	1 = rare users	A1 = slow chime
2 = female	2 = middle	1 = continuous flashing	2 = 75 seconds	2 = occasional users	A2 = fast chime
	3 = older	2 = periodic reminder	3 = 180 seconds	3 = frequent users	A3 = slow chime (loud)
		3 = aggressive reminder	4 = 300 seconds		A4 = slow chime (belt)
		4 = one long reminder phase			A5 = slow beep
					A6 = fast beep
					A7 = high urgency
					A8 = male polite
					A9 = male urgent
					A10 = male urgent (loud)
					A11 = male polite (belt retractor)
					A12 = male warning
					A13 = male warning (loud)
					A14 = female polite
					A15 = female urgent
					V1 = dashboard icon
					V2 = dashboard text
					V3 = dashboard icon & text
					V4 = dashboard icon (flashing)
					V5 = dashboard text (flashing)
					V6 = dashboard icon (bright)
					V7 = dashboard text (bright)
					V8 = center console
					V9 = center console (urgent)
					V10 = center console urgent (bright)
					V11 = center console urgent (flashing)
					V12 = rearview mirror icon & text

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