An Evaluation of a Prototype Safer Teen Car

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Driving and the Lifespan

Age-Old Question
Based on miles driven, older drivers have a higher involvement in fatal crashes but they experience fewer fatal crashes per licensed driver.

Fatal crashes per 100 million vehicle-miles traveled:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Fatal Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-24</td>
<td>7.0</td>
</tr>
<tr>
<td>25-34</td>
<td>2.5</td>
</tr>
<tr>
<td>35-44</td>
<td>2.2</td>
</tr>
<tr>
<td>45-54</td>
<td>2.0</td>
</tr>
<tr>
<td>55-64</td>
<td>2.0</td>
</tr>
<tr>
<td>65-74</td>
<td>3.0</td>
</tr>
<tr>
<td>75 and older</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Fatal crashes per 100,000 licensed drivers:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Fatal Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 and younger</td>
<td>53.7</td>
</tr>
<tr>
<td>25 to 64</td>
<td>25.9</td>
</tr>
<tr>
<td>65 and older</td>
<td>21.2</td>
</tr>
</tbody>
</table>

*For 2001  †For 2005
Source: Government Accountability Office
Teen drivers represent most crashes and years of lost productive life.

Changing teen behavior early may improve their behavior later.
Technology and the Driving Lifespan

![Graph showing the relationship between technology and driver lifespan]

- **Absent**
  - Feedback
  - Coaching
  - Monitoring

- **Present**
  - Support
  - Warnings
  - Monitoring

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*Texas A&M Transportation Institute*
Strategies for Vehicle-Based Monitoring

- Driver Feedback: Real time info to driver about errors/unsafe behavior
- Vehicle Adaptation: Alter some aspect of vehicle performance based on driver behavior or situation
- Reporting: Record, summarize, and transmit for later review
- Coaching: Intermediary interprets and provides explicit guidance
- External Motivation: Formal incentives based on monitored behavior

Programs
Research Questions

How well does feedback work? How do teens adapt?
- Limited experience so far

How desirable/acceptable is it to teen and parent?
- What will motivate purchase and use of vehicles with Safe Teen Car technology

How does automotive industry feel about this?
- General objective of encouraging automotive industry interest through demonstration of a practical prototype system
Safe Teen Car Prototype

What subsystems were included?
- Teen driver identification
- Speeding
- Seat belt use
- Excessive maneuver
- *Cell phone use
- Context - time of day
- Passengers

- Recognition
- Behaviors/Teen Driver Issues
- Contextual Factors
Methods

Participants
- 30 teens aged 16 - 18 (17M; 13 F)
- 15 from Minnesota, 15 from Maryland
- 6 months minimum driving experience after licensure
- Paid $200
### Statistical Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Time</th>
<th>Effect (comparison)</th>
<th>Variable (g-force, speed, position)</th>
<th>Statistic</th>
<th>( p )</th>
<th>( \eta^2 )</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>D+N</td>
<td>S(BS-LT)</td>
<td>&gt; 0.4-0.5 g</td>
<td>( F(1, 24) = 4.6 )</td>
<td>.041</td>
<td>.16</td>
<td>.54</td>
</tr>
<tr>
<td>SE</td>
<td>D</td>
<td>S(BS-IM)</td>
<td>6-10 mph</td>
<td>( F(1, 27) = 5.0 )</td>
<td>.033</td>
<td>.16</td>
<td>.58</td>
</tr>
<tr>
<td>SE</td>
<td>D</td>
<td>S(BS-IM)</td>
<td>11-15 mph</td>
<td>( F(1, 27) = 6.0 )</td>
<td>.020</td>
<td>.18</td>
<td>.66</td>
</tr>
<tr>
<td>SE</td>
<td>N</td>
<td>S(LT-TR)</td>
<td>1-5 mph</td>
<td>( F(1, 24) = 6.6 )</td>
<td>.029</td>
<td>.24</td>
<td>.61</td>
</tr>
<tr>
<td>SE</td>
<td>N</td>
<td>S(LT-TR)</td>
<td>11-15 mph</td>
<td>( F(1, 18) = 6.6 )</td>
<td>.005</td>
<td>.36</td>
<td>.85</td>
</tr>
<tr>
<td>SE</td>
<td>N</td>
<td>S(BS-TR)</td>
<td>11-15 mph</td>
<td>( F(1, 19) = 5.4 )</td>
<td>.031</td>
<td>.22</td>
<td>.60</td>
</tr>
<tr>
<td>SE</td>
<td>D</td>
<td>S(BS-IM) x L*</td>
<td>6-10 mph</td>
<td>( F(1, 27) = 5.9 )</td>
<td>.022</td>
<td>.18</td>
<td>.58</td>
</tr>
<tr>
<td>SE</td>
<td>N</td>
<td>L(LT-TR)</td>
<td>6-10 mph</td>
<td>( F(1, 18) = 5.3 )</td>
<td>.033</td>
<td>.23</td>
<td>.59</td>
</tr>
<tr>
<td>SE</td>
<td>N</td>
<td>L(BS-IM)</td>
<td>11-15 mph</td>
<td>( F(1, 24) = 4.4 )</td>
<td>.047</td>
<td>.16</td>
<td>.52</td>
</tr>
<tr>
<td>SB</td>
<td>D</td>
<td>S(LT-TR)</td>
<td>Driver side rear</td>
<td>( F(1, 14) = 7.2 )</td>
<td>.018</td>
<td>.34</td>
<td>.70</td>
</tr>
<tr>
<td>SB</td>
<td>N</td>
<td>S(BS-IM) x L*</td>
<td>Driver side rear</td>
<td>( F(1, 11) = 5.8 )</td>
<td>.034</td>
<td>.35</td>
<td>.59</td>
</tr>
<tr>
<td>SB</td>
<td>D</td>
<td>S(LT-TR)</td>
<td>Passen side rear</td>
<td>( F(1, 13) = 6.4 )</td>
<td>.025</td>
<td>.33</td>
<td>.65</td>
</tr>
<tr>
<td>SB</td>
<td>D</td>
<td>S(BS-TR)</td>
<td>Passen side rear</td>
<td>( F(1, 15) = 7.8 )</td>
<td>.042</td>
<td>.25</td>
<td>.55</td>
</tr>
</tbody>
</table>

\( G = \) g force, \( SE = \) Speeding Exceedance, \( SB = \) Seatbelt compliance, \( D = \) Day, \( N = \) Night, \( D+N = \) Day and Night data combined, \( BS = \) Baseline, \( IM = \) Immediate, \( LT=\)Long Term, \( TR = \) Transfer, \( S = \) stage effect, \( L = \) Location effect

* Follow up tests indicated no significant differences within this interaction.
Maneuver Effect

![Graph showing Maneuver Effect]

The graph illustrates the percent of vehicle miles driven within maneuver range across different stages: Baseline, Immediate, Short Term, Long Term, and Transfer. The data is categorized by acceleration ranges: > 0.2 - 0.3 g, > 0.3 - 0.4 g, > 0.4 - 0.5 g, and > 0.5 g.
Speed Effect - Night Only

- >1 to 5 mph > SL
- >6-10 mph > SL
- >11-15 mph > SL
- >15 + mph > SL

Percent of Miles Driven Within Speed Range

Baseline | Immediate | Short Term | Long Term | Transfer
--- | --- | --- | --- | ---
0.0% | 5.0% | 5.0% | 5.0% | 5.0%
Seatbelt Compliance - Day Only

![Graph showing seatbelt compliance over different stages]

- Driver
- Front Passenger
- Left Rear Passenger
- Right Rear Passenger

Percent of Miles Traveled with Seatbelts Buckled

<table>
<thead>
<tr>
<th>Stage</th>
<th>Baseline</th>
<th>Immediate</th>
<th>Short Term</th>
<th>Long Term</th>
<th>Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Passenger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Rear Passenger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Rear Passenger</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Selected Findings

• Reduction in *some* speeding measures (miles speeding)
  - Less speeding at night compared to day
  - Less speeding at 11 – 15 over when STC first used
  - Increase in speeding at 10 – 15 over after removal
• Reduction in per mile excessive maneuvers at night
• Reduction in per mile excessive maneuvers when STC first used
• Generally strong seat belt compliance, increase for rear passenger between immediate and short-term
• Favorable response by teens and parents
Recommendations

- Retain speeding subsystem ‘as is’
- Retain excessive maneuver subsystem
  - Modify strong auditory warning, longitudinal event warnings
- Retain seat belt subsystem
- Retain passenger presence but improve reliability
- Driving context is a positive feature
- Cell phone detection requires further study/improvement
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