This presentation concerns results of a research project on Novice Driver Training that we are conducting for the US Centers for Disease Control. This presentation describes the accident history of simulator trained novice drivers in comparison to traditionally trained drivers.
Project Objectives

- Develop PC Based Training and Assessment System
- Train 500 Unlicensed High School Students
- Compare Violation and Accident History of Simulator Trained Subjects with Traditionally Trained Drivers (Transfer of Training)

- Three phases to project: 1) develop training system; 2) train novice drivers; 3) analyze accident rates
- Just recently received accident data, this presentation includes preliminary results
Hypothesis:

Simulator Training Can Transfer to On-Road Performance and Reduce Novice Driver Accident Rate

Does simulator training reduce on-road accidents????
Training Objectives

- Transmit knowledge relevant to driving scenarios (rules of road, TCD’s)
- Train situation awareness and hazard perception
- Train decision making and appropriate control response (steering, braking, turn indicator)

• A Power Point orientation was used to present information important for driving the simulation
• Information included background on TCD’s (traffic control devices including markings, signs and signals), rules of the road and hazard scenarios.
• Driving scenarios contained a wide variety of hazards designed to train situation awareness, decision making and appropriate control response (steering, braking, turn indicator).
• Three levels of simulator fidelity: 1) High school computer lab, converted computers, low cost desk top set up; 2) Full cab, curved screen, high cost; 3) Desk top wide angle display, medium cost.

• Two settings: 1) research labs (Hawthorne and Culver City); 2) High schools (Palos Verdes, San Diego).
<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>Recruiting Method</th>
<th>Simulator Configuration</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawthorne, CA</td>
<td>DMV Office</td>
<td>Wide FOV Vehicle Cab</td>
<td>159</td>
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<tr>
<td>Culver City, CA</td>
<td>DMV Office</td>
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<td>Palos Verdes, CA</td>
<td>High School Drivers Ed.</td>
<td>Single Monitor Desktop</td>
<td>147</td>
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<tr>
<td>San Diego, CA</td>
<td>High School Drivers Ed.</td>
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<td>68</td>
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</tbody>
</table>

- DMV (Dept. of Motor Vehicles) office: subjects randomly selected from line while waiting to get learner's permit. Given incentives to participate.
- High School Driver's Education classes at high schools: all students in class were recruited.
• Training protocol designed to be consistent with traditional driver education curricula.
• Presentation varied somewhat at each geographical location.
• Median age 15 (eligible for learners permit)
• Slightly more females
• Majority are 16 and under
• Gender distribution about even for single monitor system (high schools)
• More females in laboratory groups (three monitor and vehicle cab)
• Significant licensure at age 16
• Another spike at age 18 (many students wait to age 18 to avoid GDL restrictions)
Median time between training and licensure is about 8 months.
Majority of subjects licensed within 18 months.
Some subjects have significant delays in licensure (beyond 2 years)
• Licensure delayed most for schools (Palos Verdes, San Diego).
• Culver City (lab) fastest licensure.
• Some Hawthorne recruitment came from announcements at local high schools. This may be responsible for licensure delay over Culver City.
• Accident accumulation distributions relative to training date are similar for each group.
• San Diego the most variable (smallest population).
• Accident rate somewhat sparse when segmented by geographic group
• Variability in San Diego group apparent
• DMV events (accidents and violations) occur over three years from training date
• Accidents occurring before licensure
• Accidents peak in first three months of licensure
Accident Status Distribution by Geographic Area

- **Culver City**: 146 accidents, 81.1% no accidents, 18.9% accidents
- **Hawthorne**: 141 accidents, 88.7% no accidents, 11.3% accidents
- **Palos Verdes**: 124 accidents, 84.4% no accidents, 15.6% accidents
- **San Diego**: 55 accidents, 80.9% no accidents, 19.1% accidents

- **Hawthorne (lab)** has lowest overall accident rate (11.3%)
• Wide FOV Vehicle Cab gives the lowest accident rate
Accident Status Distribution by FOV Type & Training Environment

- Wide FOV & Laboratory: 289 (84.8%), 52 accidents (15.3%)
- Single Monitor Desktop PC & Classroom: 177 (83.1%), 36 accidents (16.9%)

• Wide FOV gives the lowest accident rate
• Males more likely to have DMV records (accidents and tickets)
• Consider cumulative accident rates to get fair group comparisons
• Each 3 month period rate computed as number of accidents divided by number of drivers
• Hawthorne group (wide FOV vehicle cab) gives lowest accident rate
### TD Regression Analysis Summary

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>R²</th>
<th>Slope</th>
<th>95% Lower Conf. Int.</th>
<th>95% Upper Conf. Int.</th>
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- Confidence intervals show that Hawthorne group has significantly lower accident rate than other groups.
• Mayhew and Janke data give a good reference for typical accident rates of traditionally trained drivers

• Regression shows average accident rate is about 0.084 accidents per driver or 8.4% for novice drivers
California Accident Rates

- Novice driver accident rates over twice experienced driver rates.
- About 9% of drivers having accidents
• Now compare simulator trained driver groups with Mayhew and Janke data
• Accident rate versus months from drivers license allows us to compare simulator trained population against traditionally trained drivers.
• Hawthorne accident rate one third of Mayhew/Janke rate
• Culver City about three quarters of Mayhew/Janke rate
## DL Regression Analysis Summary

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*Confidence intervals show that Hawthorne and Culver City accident rates significantly lower than Mayhew/Janke rate.*
 Various considerations have confounded the accident comparisons of the various groups
Concluding Remarks

- Simulator training can reduce novice driver accident rate
- Efficacy improves with simulator fidelity
- Adequate level of fidelity not clear
- Role of driver education and instructors not clear

• Preliminary conclusions
Future Research Questions

- Effectiveness of e-Learning and Computer Based Instruction?
- Instructor interaction?
- Developmental factors?
- Necessary level of simulator fidelity?

• Thoughts for future research
• Novice drivers initially get more aggressive with training, but in final trials when approaching graduation become more conservative.
• Females more conservative.
• Conservatism increases with FOV and fidelity.