

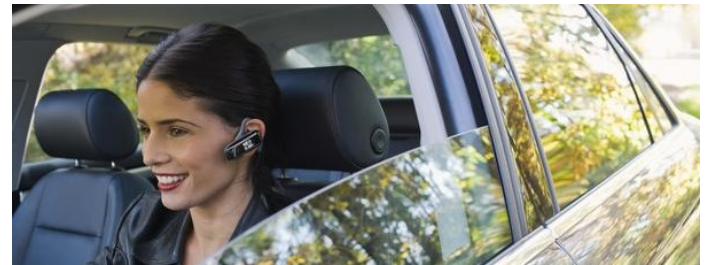
DRIVERS' VISUAL BEHAVIOR WHEN USING HANDHELD AND HANDS-FREE CELL PHONES



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Objective

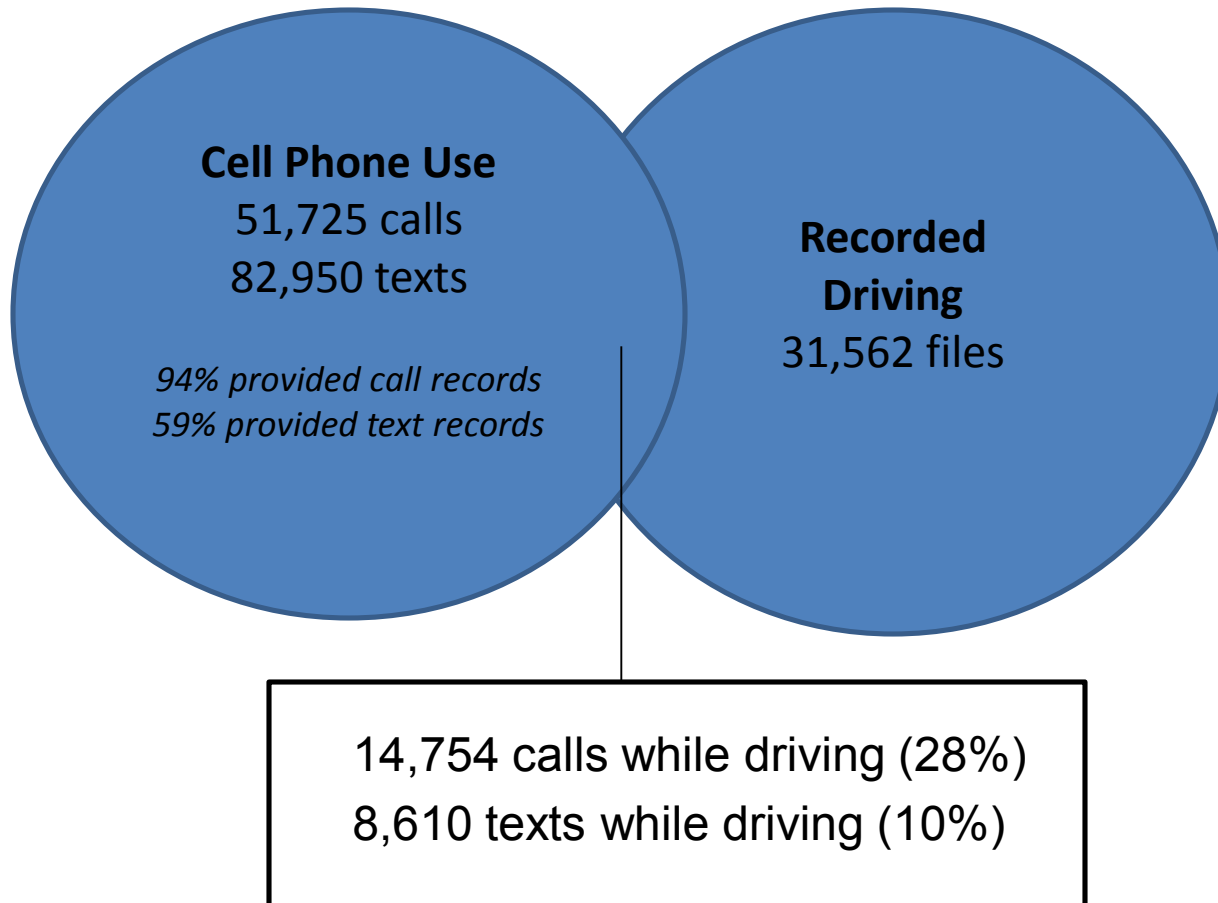
- Investigate drivers' visual attention to the forward roadway when using three types of cell phones
 - Hand-held (HH)
 - Portable hands-free (PHF)
 - Integrated hands-free (IHF)



Method

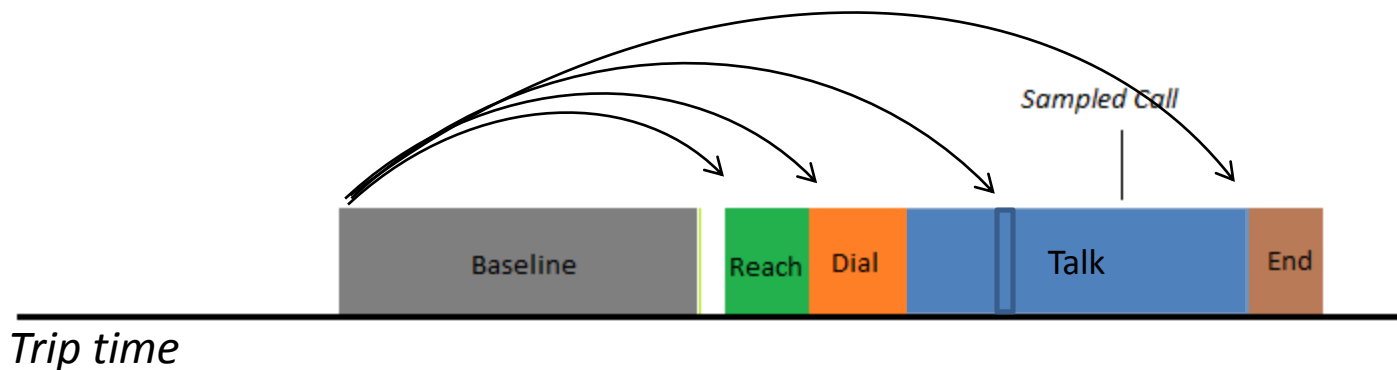
- Data collected by VTTI and Westat under NHTSA contract in 2011
 - Used same DAS as SHRP2
- 204 drivers in study for 31 days each
 - 63% female and 37% male with median age of 41 years
- Only drivers that reported talking on a cell phone while driving at least once per day were recruited
 - Recruited from Southwest Virginia, Northern Virginia, and Raleigh, North Carolina

Combined NDS Data with Cell Logs

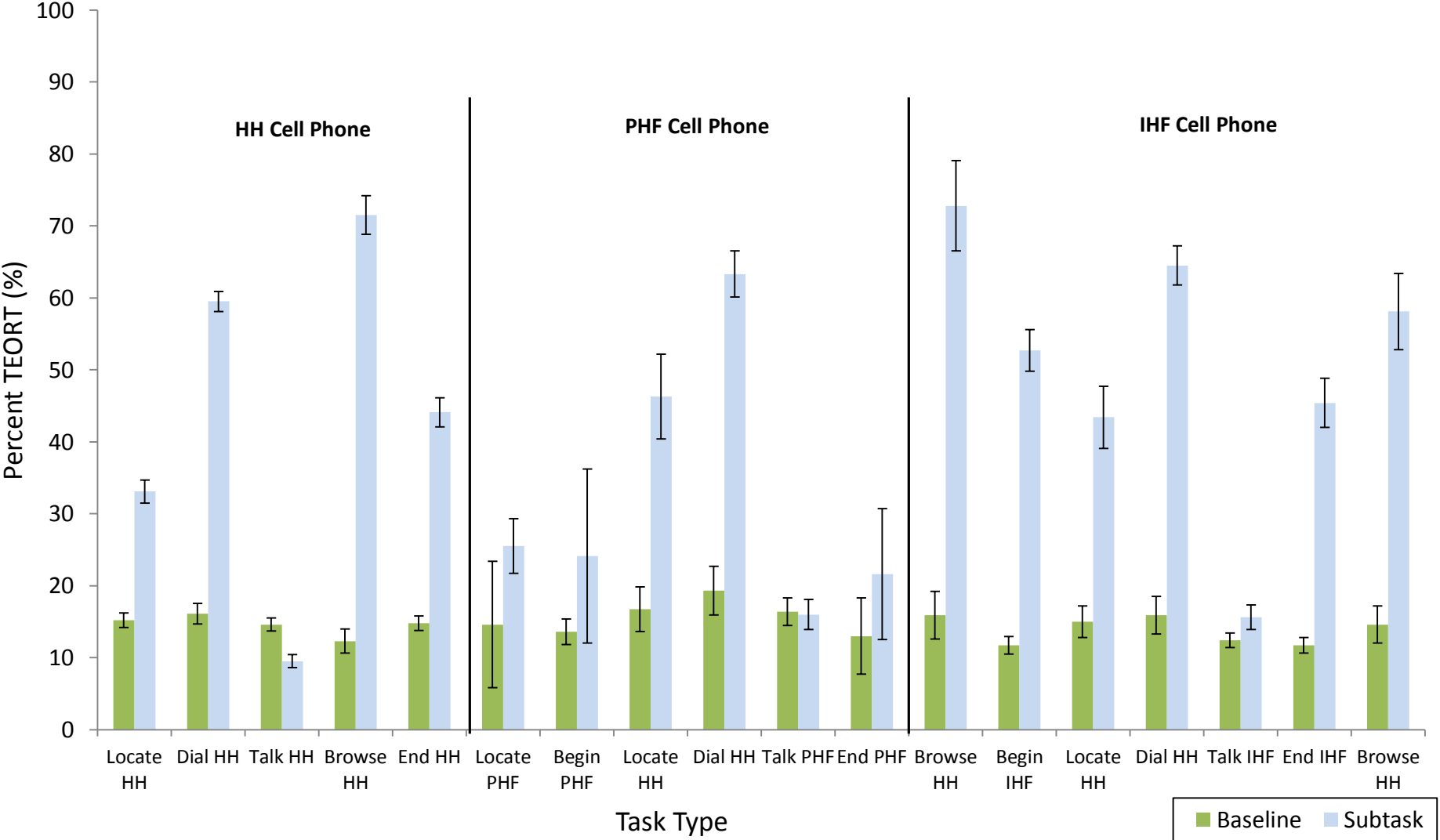


Method

- Sampled 10% of calls made while driving (1,564 calls)
- Baseline epochs that took place 30 seconds prior to the start of the call were sampled
- Only calls and baselines above 8 km/h were selected
- Eye glance locations during cell phone subtasks compared to baselines

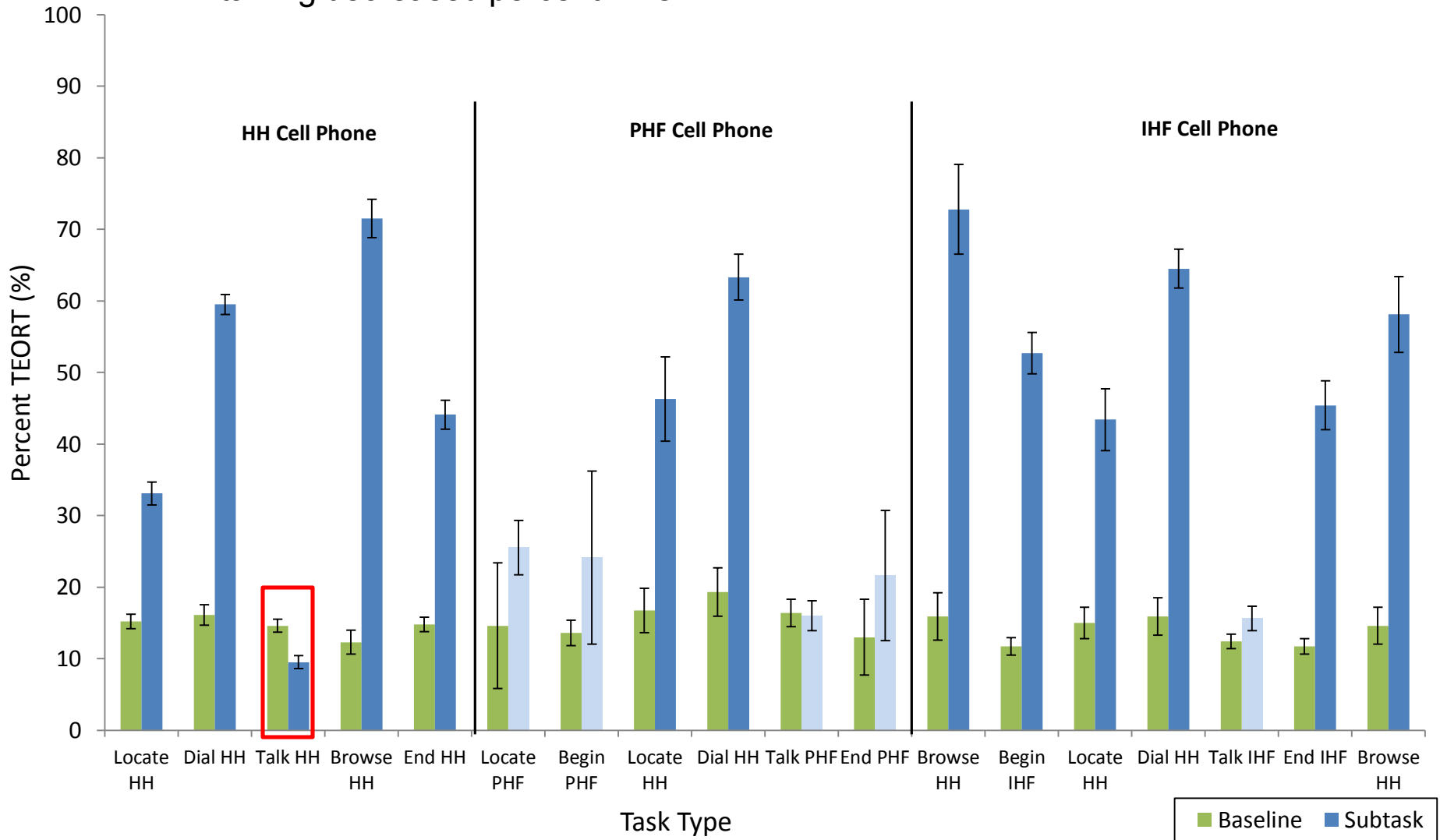


Percent Total Eyes Off Road Time



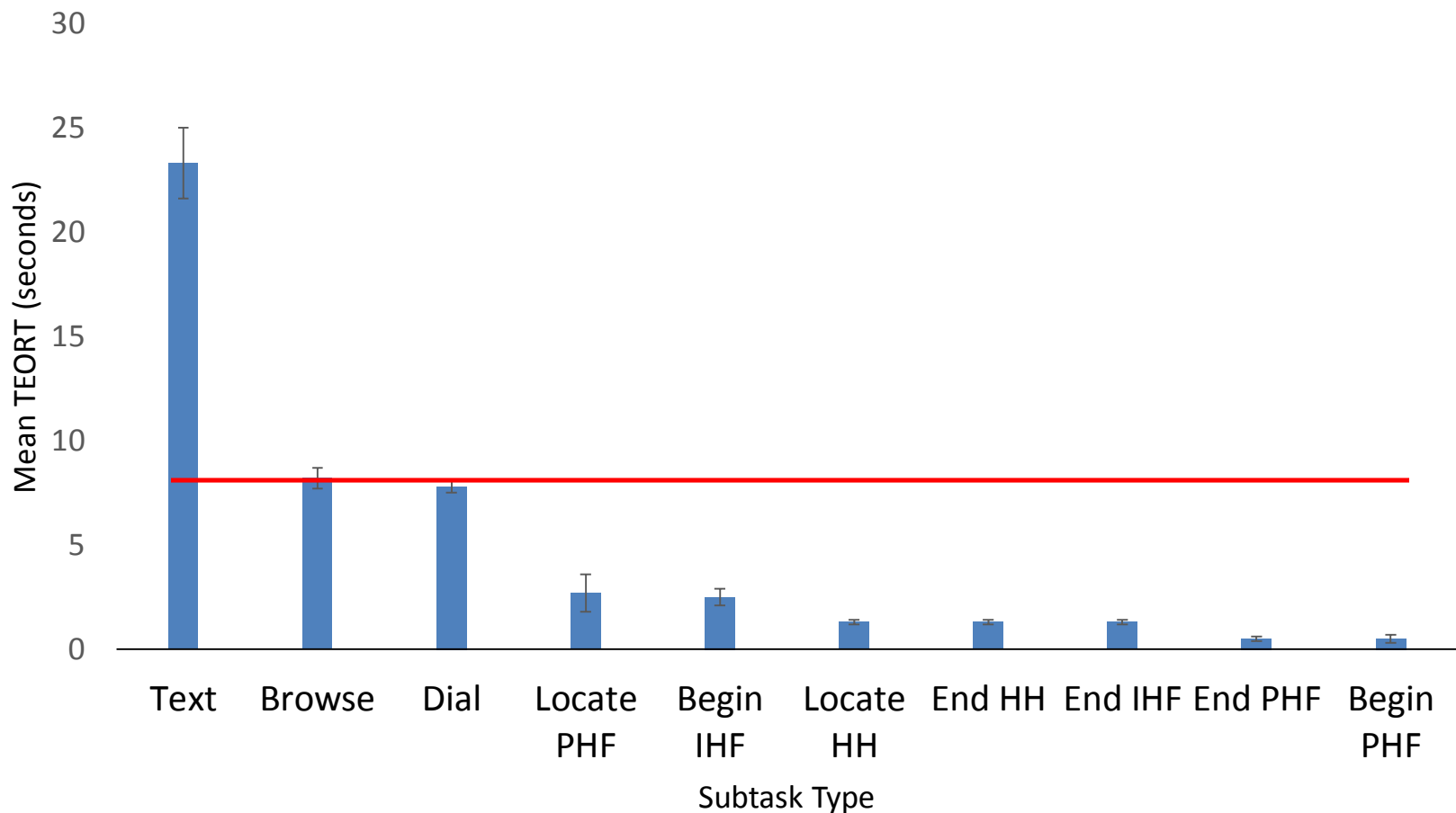
Percent Total Eyes Off Road Time

- Locating, dialing, browsing, & ending a call all increased %TEORT
 - HH talking decreased percent TEORT



Total Eyes Off Road Time Duration

- Text messaging, browsing, and dialing on an HH cell phone led to longest TEORT durations



SCE Risk

| Subtask | Rate Ratio | LCL | UCL | p-value |
|--------------------------------|-------------|------|------|---------|
| Cell Phone Use – Collapsed | 1.32 | 0.96 | 1.81 | .0917 |
| Visual-Manual | 2.93 | 1.90 | 4.51 | < .0001 |
| Call-related Visual-Manual | 3.34 | 1.76 | 6.35 | .0003 |
| Text-related Visual-Manual | 2.12 | 1.14 | 3.96 | .0184 |
| Talking/Listening | 0.84 | 0.55 | 1.29 | .4217 |
| Talking/Listening HH | 0.84 | 0.47 | 1.53 | .5764 |
| Talking/Listening PHF | 1.19 | 0.55 | 2.57 | .6581 |
| Talking/Listening IHF | 0.61 | 0.27 | 1.41 | .2447 |
| HH Cell Phone Use (Collapsed) | 1.73 | 1.20 | 2.49 | .0034 |
| PHF Cell Phone Use (Collapsed) | 1.06 | 0.49 | 2.30 | .8780 |
| IHF Cell Phone Use (Collapsed) | 0.57 | 0.25 | 1.31 | .1859 |

Discussion

- Hand-held cell phone use demands significantly more visual attention than hands-free cell phone use
- Hand-held cell phone use associated with increased SCE risk while no association found for hands-free cell phone use
- Drivers' visual attention to road increased when conversing on HH cell phone while no change for hands-free cell phone use
 - Similar to previous findings ([Atchley & Dressel, 2004](#); [Maples et al., 2008](#); [Olson et al., 2009](#))
 - Perhaps head mobility restricted when using HH phone
 - Perhaps drivers less likely to perform other visually demanding tasks when using HH phone

Take Away

- Drivers' interactions with hands-free cell phones differ from their interactions with HH cell phones
- Hand-held cell phone use associated with increased SCE risk
- Differences justify distinctions made between cell phone types in laws banning cell phone use while driving

Questions



Cell Phone Use

- Drivers conversed on cell phone 12% of time
- Mean call length was 2.36 minutes
- Dialing averaged 12 s
- Push to begin averaged 3 s on PHF and 5 s on IHF
- Texting averaged 35 s