

The Cognitive Gender Interaction of Driver Monitoring Systems and Driver Traffic Safety

Jonatan Akyol^{1*}, Alva Rosenqvist¹, Paul Hemeren¹
¹School of Informatics, University of Skövde



The Impact of Mobile Distractions on Driving Safety

Some drivers engage in secondary activities that contribute to decreased traffic safety. User Experience can inform and help people make safer and more conscious choices in traffic. Previous research on self-reported mobile phone use shows that a ban on mobile phone use while driving has not led people to completely cease the behavior.

Driver Monitoring and Traffic Safety

- How does a Driver Monitoring System provide drivers with sufficient information to avoid potentially dangerous traffic situations?
- Are there differences in female and male drivers' behaviors and perceptions regarding the Driver Monitoring System?

METHOD

The study involved 30 participants (15 female, 15 male) divided into three equal groups of 10, testing different monitoring situations:

Group A: Control group without mobile use or Driver Monitoring System.
Group B: Received distracting SMS messages from a mobile phone only.
Group C: Received distracting SMS messages *and* alerts from the Driver Monitoring System.



Picture. Critical scenarios in the driving simulator Skillster which the participants had to drive through.

SMS Distractions in Driving Simulation Study

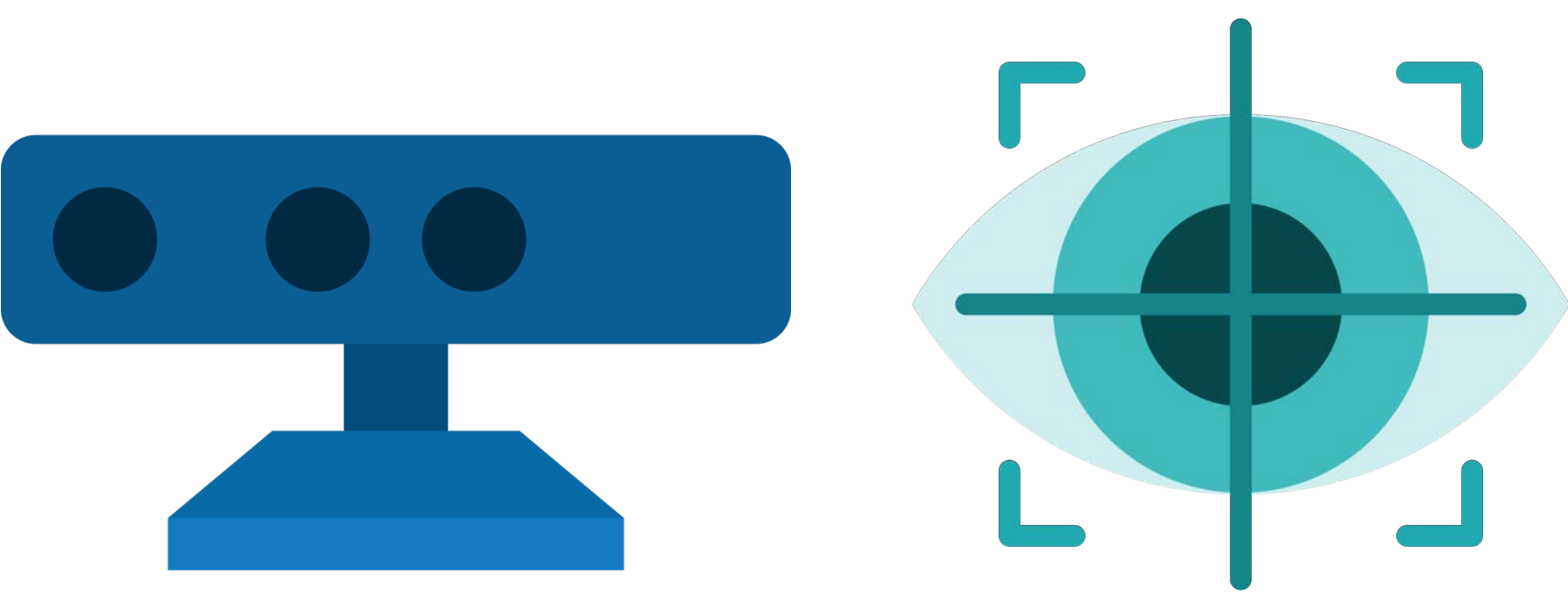
This study used a range of SMS messages to create visual and cognitive distractions during simulated driving events. Messages varied in complexity and required action.

MESSAGE CONTENT	ACTION REQUIRED	COMPLEXITY
"What is the name of your hometown?"	Read & Respond	simple
"Thank you for your participation."	Read	simple
"50% off on online orders! Valid only today!"	Read	simple
"What is 30 + 27?"	Read & Respond	complex
"Which two cities would you like to visit?"	Read & Respond	complex
"What are two things you enjoy doing in your free time?"	Read & Respond	complex

Table 1. SMS messages sent and used as a distraction for group B and C. From Ezzati Amini, 2023.

Smart Eye AIS12

A Driver Monitoring System (DMS) that responds to distractions, eyes off road, and fatigue, alerting the driver to such behavior through auditory warning signals.



Data Collection

Tools: Smart Eye AIS12 DMS, Skillster driving simulator.
Metrics: Eyes off the Road (EOR) analyzed in iMotions, warnings from the Skillster simulator and self-reported safety perception.

RESULTS

"The 'Eyes Off Road' results show that mobile distractions significantly increase attention lapses, as expected. Groups exposed to distractions (B and C) had more frequent 'Eyes Off Road' incidents than the control group, underscoring the impact of mobile use on driver focus."



Total Eyes Off Road

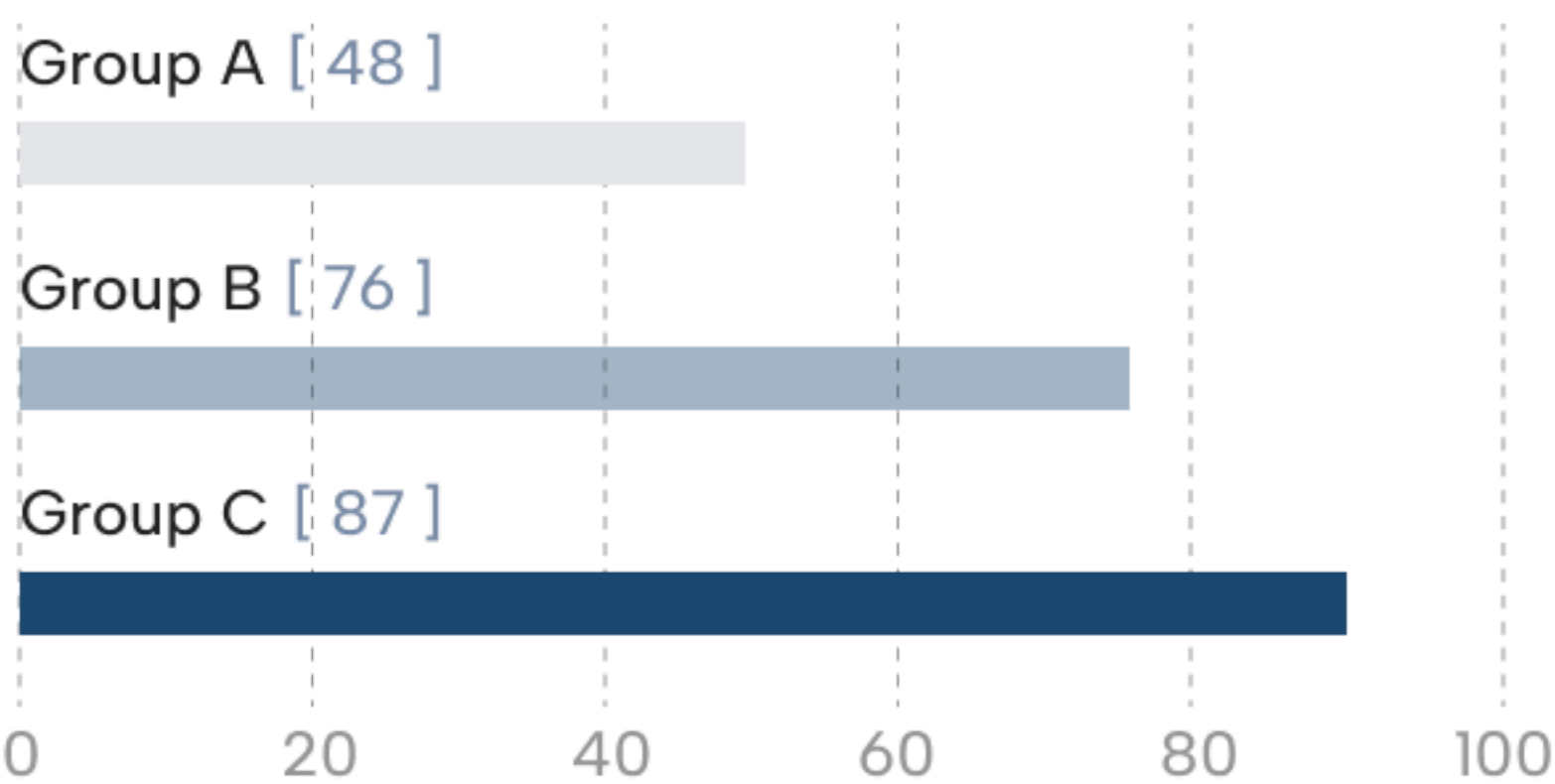
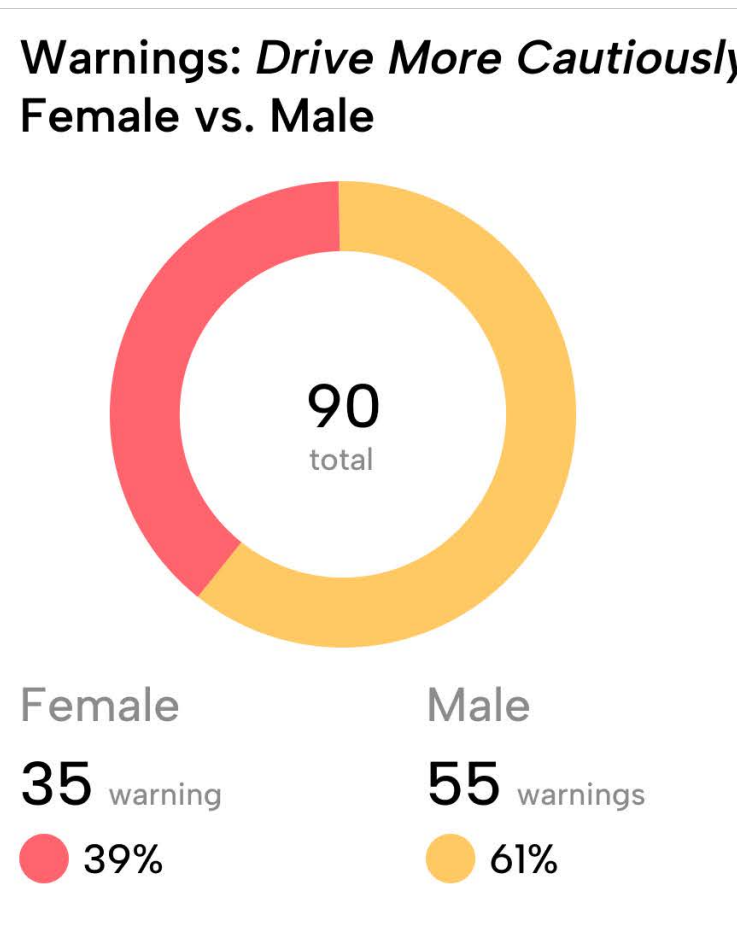
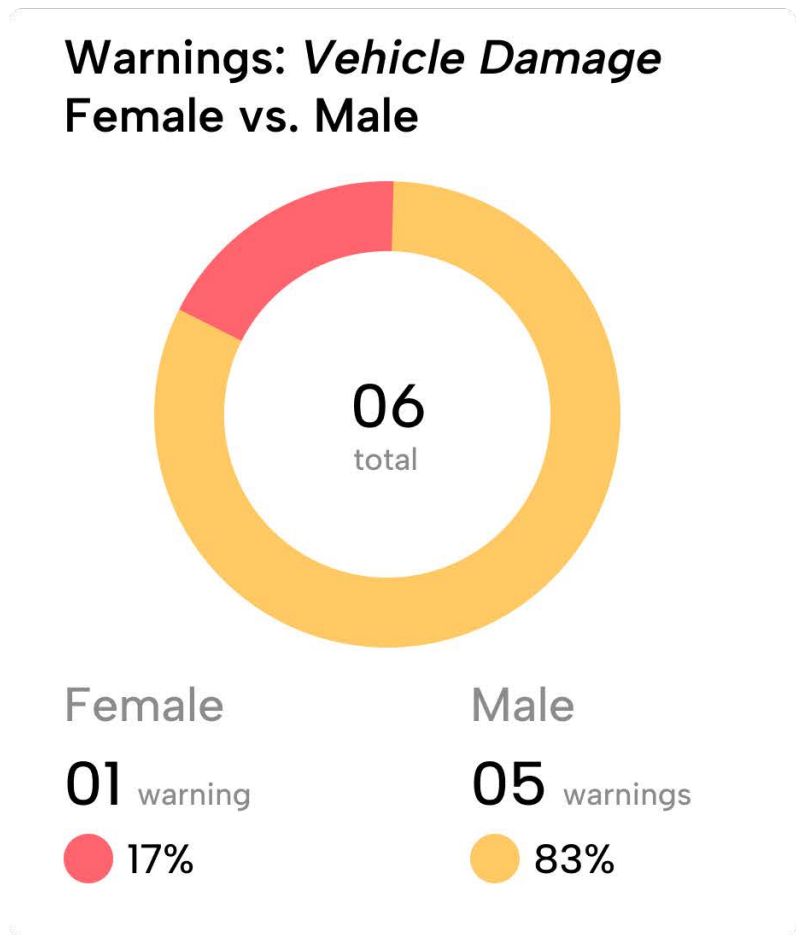
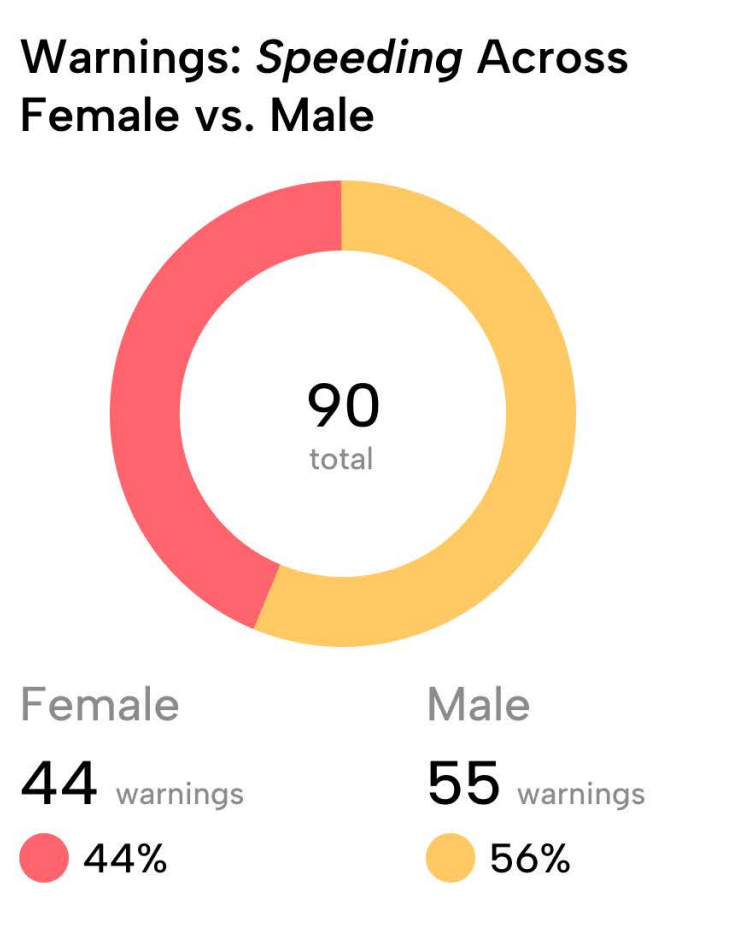
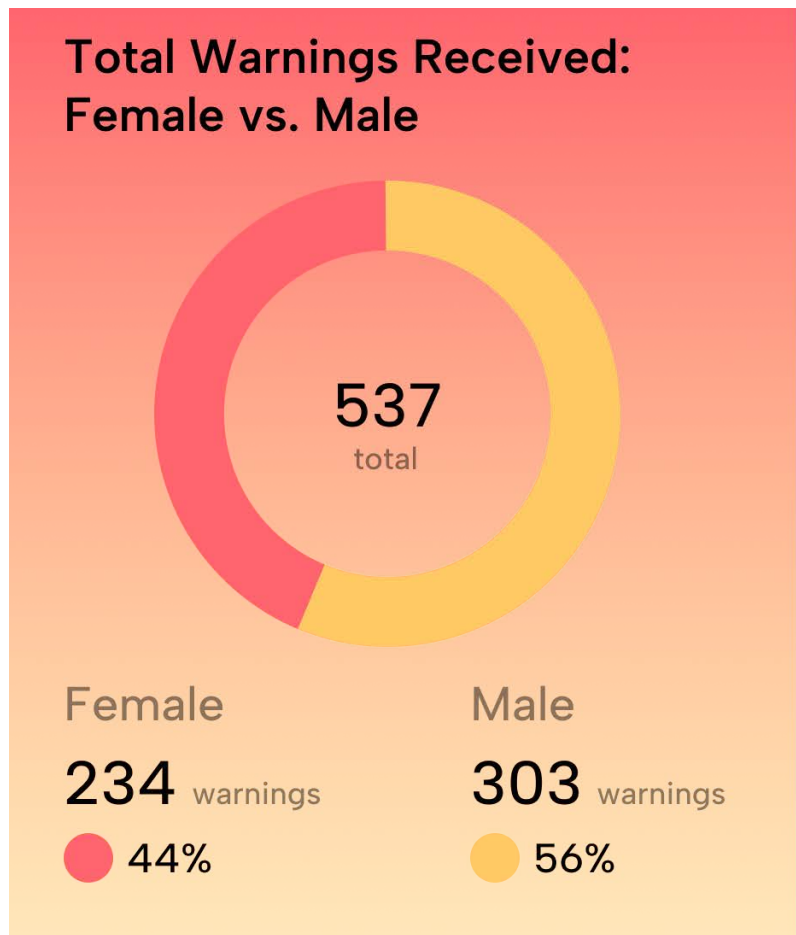
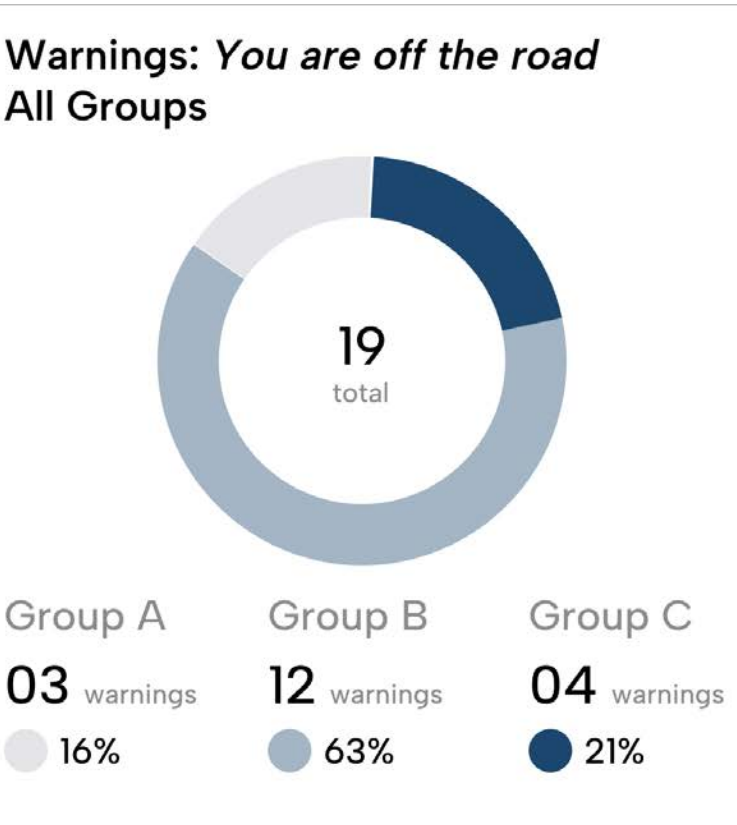
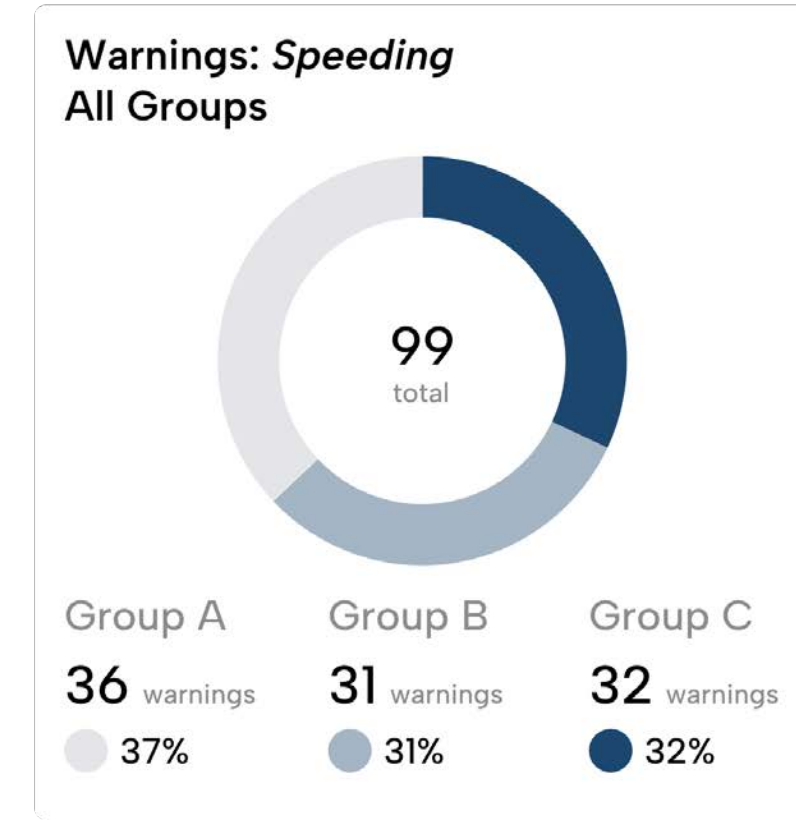
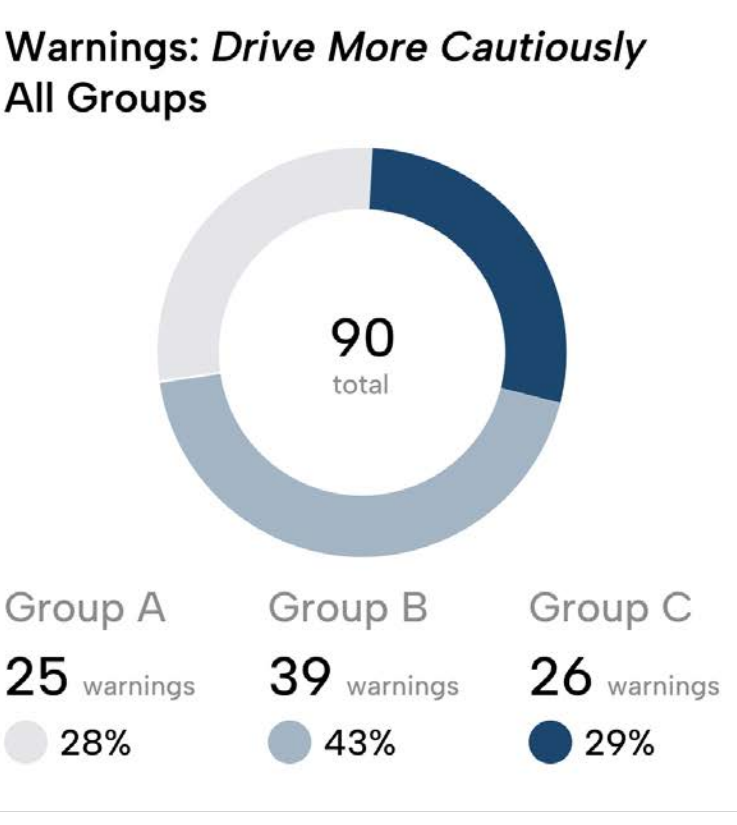


Table 2. This chart shows the average number of 'Eyes Off Road' instances per individual for each group across three driving courses.



Data from the Skillster simulator revealed differences in driving behavior between female and male participants, highlighting variations in risk-taking and responses to distractions.



CONCLUSIONS

Driver Monitoring Systems (DMS) demonstrate potential in mitigating risks associated with text message distractions while driving. This study indicates that DMS warnings contribute to safer driving behaviors when drivers are faced with text-based distractions. Notably, while objective measures show improved safety, drivers may not subjectively perceive these benefits. Gender differences in responses to DMS and text distractions were observed, requiring further investigation.

References

Dingus, T. A., Owens, J. M., Guo, F., Fang, Y., Perez, M., McClafferty, J., Buchanan- King, M., & Fitch, G. M. (2019). The prevalence of and crash risk associated with primarily cognitive secondary tasks. *Safety Science*, 119, 98–105. <https://doi.org/10.1016/j.ssci.2019.01.005>

Ezzati Amini, R., Al Haddad, C., Batabyal, D., Gkena, I., De Vos, B., Cuenen, A., Brijs, T., & Antoniou, C. (2023). Driver distraction and in-vehicle interventions: A driving simulator study on visual attention and driving performance. *Accident Analysis & Prevention*, 191, 107195. <https://doi.org/10.1016/j.aap.2023.107195>

Klauser, S. G., Dingus, T. A., Neale, V. L., Sudweeks, J. D., & Ramsey, D. J. (2006). The impact of driver inattention on near-crash/Crash risk: An analysis using the 100-Car naturalistic driving study data. *PsychEXTRA Dataset*. <https://doi.org/10.1037/e729262011-001>

World Health Organization & NHTSA (U.S.). (2011). Mobile phone use: a growing problem of driver distraction. World Health Organization. <https://iris.who.int/handle/10665/44494>