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Research article

Driving simulator study of text messaging and phone conversations: Effects of messages' valence, drivers' values and self-reported driving behaviors

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ABSTRACT

This study investigated the impact of reading emotionally-laden text messages and engaging in handheld phone conversations on driving behavior in a simulated environment. Additionally, the study explored how driving behavior correlates with individual differences in basic human values and self-reported risky driving patterns (e.g., violations, errors, and lapses). A within-subject design was employed, where all participants read both a negative and a positive text message and answered a phone call while driving in the simulator. Results showed that average driving speed remained unchanged after receiving text messages and during phone calls but increased after the call ended. However, the standard deviation of speed varied across different conditions. Regarding centerline deviation, participants maintained a consistent distance from the centerline during baseline driving and after reading text messages, but moved closer to the centerline during phone conversations. Self-reported values of power, security, and universalism were significantly correlated with objective driving measures: power was associated with riskier driving behaviors, whereas security and universalism were linked to safer driving patterns. Moreover, self-reported driving errors and lapses were positively correlated with increased driving speed during and after phone calls.

2. Introduction

The use of mobile phones has significantly increased in recent years, with studies indicating that a large portion of the population experiences nomophobia [1]. The prevalence of smart device usage while driving is alarming, as drivers often use these devices extensively without considering safety concerns. While traffic regulations prohibit drivers from talking on the phone without hands-free equipment, many still engage in this behavior. It is widely known that texting and reading messages while driving is common e.g., [2,3,4]. For instance, 66.2 % of drivers in New Zealand report reading messages while driving, and 52.3 % send one to five texts per week. In the U.S., 1.7 % of drivers were observed using handheld devices for texting or calling [5], with concealed activities like messaging being reported more frequently [6]. Observational studies across different countries show varying rates of mobile phone use while driving, ranging from 1 % to 14 % [7–9]. In Latvia, where the current study was conducted, 75 % of respondents admitted to using their phones while driving to talk, read, or write text messages [10].

The high rate of mobile phone use while driving is concerning, as numerous studies have shown that this distraction leads to

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impaired driving performance. However, the impact on driving varies depending on the type of distraction and individual differences. The present study aims to investigate how different types of phone usage, such as talking on the phone and reading emotionally charged text messages (positive and negative), affect driving behavior.

2.1. Literature review

Research indicates that talking on the phone while driving leads to unsafe behaviors, such as reducing following distance and unintentional speed increases after prolonged phone conversations [11]. Numerous meta-analyses have confirmed that phone use while driving increases steering corrections [12,13], lateral and speed deviations [14,15], and delayed reaction times to braking [12,13,16]. Similarly, Caird et al. [17] found that both handheld and hands-free phone conversations impair reaction times, lane positioning, speed control, and collision rates. Oviedo-Trespalacios et al. [18] argued that phone usage and driving behaviors are influenced by complex interactions between human and environmental factors, such as road complexity and driver experience.

Texting while driving has been shown to be even more dangerous than talking on the phone, as it involves visual distractions. Studies have demonstrated that texting impairs drivers' ability to detect stimuli, maintain lane positioning, and control speed [12]. Boulagouas et al. [19] found that phone distractions hinder drivers' ability to detect hazards in roundabouts. Texting also impairs decision-making, especially in complex tasks such as weaving and turning [20,21]. Overall, visual-manual tasks, like texting, have the most detrimental effects on driving performance [14].

Emotional states also influence driving behavior, yet they are less studied than cognitive distractions. For instance, driving while in an emotional state, such as anger or sadness, has been associated with a nearly tenfold increase in crash risk [22]. Cunningham and Regan [23] emphasized that emotional distractions are often underestimated, yet they can significantly impair driving by reducing cognitive capacity.

The circumplex model of affect [24] suggests that emotions can be categorized along two dimensions: valence (positive or negative) and arousal (high or low). Emotions of different valence have varied effects on driving. Negative emotions have been linked to increased speed, while positive emotions may have a neutral or no effect [25]. Some studies have found that both positive and negative emotional stimuli can distract drivers, affecting their attention and decision-making [26]. Physiological research has also shown that negative messages tend to capture more attention [27]. Conversations that induce arousal can increase cognitive load, reducing the resources available for safe driving [28].

2.2. Basic human values and driving behavior

Basic human values, as defined by Schwartz [29,30], are another important individual difference variable influencing driving behavior. Schwartz's theory of basic human values includes ten distinct value types: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, conformity, tradition, and security. Previous studies have found that the values of power, security, and universalism are particularly predictive of driving behavior [31–33]. For example, individuals who prioritize power tend to exhibit riskier driving behaviors, while those valuing security and universalism tend to drive more cautiously.

2.3. Driving violations and errors

Dangerous driving behavior is often categorized into violations and errors, which have different motivational bases [34]. Violations are intentional breaches of norms, such as speeding or tailgating, whereas errors are unintentional failures in planned actions, such as misjudgments or missed observations [35]. The Drivers' Behavior Questionnaire (DBQ) [34] is widely used to assess these behaviors, distinguishing between violations, errors, and lapses. While many studies have validated the DBQ against self-reported accidents and citations, fewer have validated it against objective driving measures [36].

2.4. Current study

The current study aims to experimentally investigate the impact of emotionally charged text messages on driving behavior using a driving simulator. While naturalistic driving studies (NDS) provide insight into real-world behavior, simulator studies allow for greater experimental control and safety. Meta-analyses suggest that simulator studies often show more significant impairments in driving performance due to phone use than NDS [37]. Therefore, a simulator was chosen for this study, as it allows for the manipulation of text messages and phone conversations during driving and provides more precise data on driving performance.

The study has three primary aims:

1. To assess how different modes of mobile phone use (talking and reading emotionally charged text messages) impact various driving parameters.
2. To explore correlations between driving patterns and preferences for basic values (power, security, and universalism).
3. To examine how individual differences in violations, errors, and lapses relate to phone use while driving.

3. Method

3.1. Participants

A total of 62 participants (58 % female) were recruited for this study. Participants' ages ranged from 20 to 58 years (M = 33.5, SD = 1.15). Recruitment was conducted via email and social networks. The inclusion criteria required participants to (1) possess a valid Latvian driver's license and (2) have at least one year of regular driving experience. Driving quality, such as adherence to traffic rules or avoidance of errors, was not considered in these criteria, though the results indicate reasonable variability in driving behavior within the sample (see Table 1 in the results section). The participants had an average of 11.58 years of driving experience (SD = 7.65 years). To determine the minimum required sample size for hypothesis testing, a priori power analysis was conducted using G*Power version 3.1.9.6 [38]. The analysis indicated that 21 participants were needed to detect a medium effect size (.25) with 80 % power at $\alpha = .05$ for a one-way ANOVA with five repeated measures. Therefore, the final sample size of 62 was deemed sufficient for the study.

3.2. Apparatus

The study utilized the DriveLab integrated simulator setup, which includes the Green Dino driving simulator V15 [39], Drive Master LT, a media recorder, and The Observer XT software for data integration and analysis. The simulator offers 39 prerecorded driving lessons of varying conditions and durations and is located at the University of Latvia. Drive Master LT includes a car seat, a Ford Focus steering wheel, three flat LED screens (<180°), automatic transmission, and realistic environmental sounds. Based on Wynne et al.'s [40] (2019) simulator fidelity rating system, the setup used in this study was classified as low fidelity, with a score of 7.

3.3. Stimuli

To induce emotional valence (positive and negative), participants received text messages that provided feedback on their driving performance. The messages were in Latvian and were specifically crafted to evoke either positive or negative emotions. The positive message read: "Have you attended a safe driving school? You drive very well. It seems like you drive better than 90 % of drivers! If everyone drove like you, accidents would be almost non-existent." Conversely, the negative message stated: "Most retirees drive better! Do you have a valid driver's license? Are you even qualified to drive? Such driving is very dangerous and could lead to serious accidents."

3.4. Experimental procedure and design

Upon arrival, participants were briefed on the experimental procedure and then signed the consent form (see Fig. 1 for the graphical representation of the experimental procedure). Participation was voluntary and unpaid. After the initial briefing, participants were introduced to the driving simulator and given a short practice drive. Following this, they completed the Driver Behavior Questionnaire (DBQ) to assess their tendencies toward violations, errors, and lapses (described in detail below). Participants were instructed to drive as they normally would in real life. They were also informed that they could withdraw from the study at any time if they experienced discomfort or motion sickness.

The study employed a within-subject, repeated-measures design, which helped control for potential confounding variables, such as differences in driving experience between novice and experienced drivers. A driving-style training scenario from GreenDino's prerecorded library was used for the test drive. This scenario involved various traffic elements, such as obstacles, intersections, other drivers, cyclists, and traffic lights, and lasted approximately 6 min. For the experimental drive, a slow traffic scenario was selected to avoid inducing emotions unrelated to the experiment. In this scenario, participants navigated several short roads connected by intersections, roundabouts, and traffic signals, with a speed limit of 50 km/h.

During the experiment, participants first completed the DBQ and PVQ questionnaires. They then began the experimental drive. After driving for 4 min, they received a negative text message. Five minutes later, they received a positive text message. The total duration of this experimental drive was 13.5 min. Participants then started a second scenario (the same as the test drive). After driving for 3 min in the new scenario, they received a phone call from the researcher, thanking them for their participation and providing additional praise. The order of the positive and negative text messages was randomized across participants, but the phone call always occurred last. Participants used their own mobile phones, which were placed on a shelf under the screen.

Although participants knew they would receive two text messages and a phone call, they were unaware of the exact content of these messages. They also did not know that the messages were standardized for all participants and unrelated to their actual performance in the driving simulator.

At the end of the experiment, participants were debriefed. They were asked to describe how the simulated drive compared to real-life driving and to report the emotions elicited by the positive and negative messages. Sixty percent of participants reported experiencing emotions such as anger, sadness, or joy in response to the messages. Even though 40 % reported no emotional reaction, all participants could recall the main themes of the messages: negative feedback indicating poor driving and positive feedback suggesting they were excellent drivers.

Table 1

Descriptive statistics and Pearson correlations for DBQ scales (*Violations, Errors, Lapses*), Values (*Power, Universalism, Security*), and simulator variables: Speed (*Speed in control drive, Speed when receiving negative text message, Speed when receiving positive text message, Speed before the call, Speed during the call, Speed after the call*) and Deviation from the Centre (DFC) (*DFC in control drive, DFC when receiving negative text message, DFC when receiving positive text message, DFC before the call, DFC during the call, DFC after the call*) ($n = 62$).

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1_DBQ_Violations	3.25	0.67	–														
2_DBQ_Errors	2.19	0.44	.04	–													
3_DBQ_Lapses	2.30	0.59	−.11	.57***	–												
4_Value_Power	3.27	1.07	.34**	−.09	−.05	–											
5_Value_Universalism	5.46	1.49	−.32*	−.07	.04	−.03	–										
6_Value_Security	4.18	1.02	−.10	−.25	−.13	−.06	.51***	–									
7_Speed[a]_Control	9.22_a	1.62_A	.20	−.04	−.01	.10	.04	.09	–								
8_Speed[a]_Neg_Text	9.56_a	2.10_B	.16	.07	.06	.10	−.25	−.26*	.26*	–							
9_Speed[a]_Posit_Tex	9.45_a	$1.80_{A,B,C}$	.19	.04	−.02	.34**	.07	.06	.15	.29*	–						
10_Speed[a]_During Call	9.03_a	$2.78_{D,E}$	.13	.27*	.03	.06	−.06	−.07	.08	.28*	.14	.27*					
11_Speed[a]_After Call	11.17_b	2.55_E	.08	.29*	.17	.16	−.01	.01	.14	.33*	.22	.15	–				
12_DFC[b]_Control	0.62_1	0.20_α	.21	−.19	−.25	.09	−.14	−.13	.13	−.33**	.001	−.08	−.15	–			
13_DFC[b]_Neg_Text	0.60_1	$0.18_{\alpha,\beta}$	.03	.03	−.05	−.04	−.18	−.03	.03	−.32*	−.30*	−.15	.02	.56***	–		
14_DFC[b]_PositText	$0.61_{1,2}$	$0.19_{\alpha,\beta}$	.08	.01	−.21	.05	−.37*	−.22	.12	−.12	.001	.13	−.10	.58***	.50***	–	
15_DFC[b]_During Call	0.44_3	0.45_δ	.21	.26	−.03	−.03	−.23	−.18	.12	.21	.27*	.33*	.36**	.20	.18	.22	–
16_DFC[b]_After Call	$0.52_{2,3}$	0.26_ε	.04	.001	−.07	.03	−.05	−.04	−.01	−.05	.18	.05	.25	.40**	.37**	.39**	.29*

Note: Subscripts a and b indicate a within-group comparisons for speed, subscripts 1, 2 and 3 indicate a within-group comparisons for DFC, means that do not share at least one common subscript letter or number are significantly different (Bonferroni test, $p < .05$, Cohen's d for comparisons ranged from .50 to .70 for speed, and from .38 to .40 for DFC). Subscripts A, B, C, and D indicate the comparisons of standard deviations of speed, standard deviations that do not share at least one common subscript letter are significantly different, $p < .05$ Subscripts α, β, γ, δ, and ε indicate the comparisons of standard deviations of DFC, standard deviations that do not share at least one common subscript letter are significantly different, $p < .05$* $p < .05$, **$p < .01$, ***$p < .001$.

[a] Speed – measured in metres per second.

[b] DFC (deviance from the centre of the lane, measured in meters.

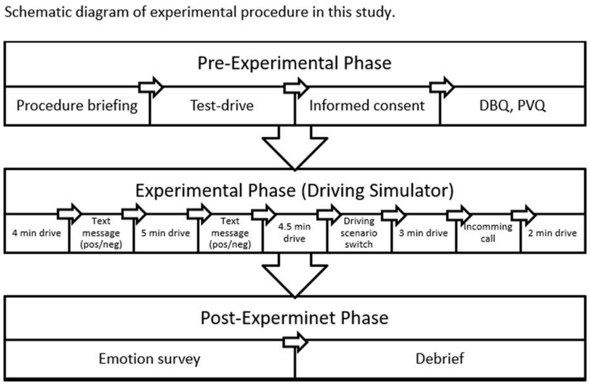

Fig. 1. Schematic diagram of experimental procedure in this study.

3.5. Measures

The Observer XT software recorded the exact times each text message and phone call were made. Data on two key variables—speed (measured in meters per second) and deviation from the centerline (DFC, measured in meters)—were collected via DriveLab.

The Driver Behavior Questionnaire (DBQ) [34], adapted into Latvian by Renge, Austers, and Muzikante [41], was used to measure violations (e.g., "disregard speed limit on motorways"), lapses (e.g., "forget where you left your car in the parking lot"), and errors (e.g., "misjudging the speed of another vehicle when overtaking"). The Cronbach's alphas for violations, lapses, and errors were .84, .84, and .82, respectively.

To assess basic values, the Portrait Values Questionnaire [42], as adapted by Renge, Austers, and Muzikante [41], was used. The shorter version of the PVQ, employed in the European Social Survey [43], measured three values: power, universalism, and security. The internal consistencies (Cronbach's alphas) for these scales were as follows: power = .51, universalism = .46, and security = .60. Although these alphas are relatively low, Cronbach's alphas between .40 and .76 have been reported as acceptable in similar studies [43,44]. The lower alphas in this case were attributed to the use of only two items per value.

3.6. Data analysis

We first checked the normality of the distributions for the dependent variables (speed and DFC) using the Kolmogorov-Smirnov test. Four out of ten measures (speed following the positive text, negative text, and phone call, and DFC following the positive text) were not normally distributed. However, as repeated measures ANOVA relies on the method of least squares, the assumption of normality is less critical, particularly when confidence intervals are not the primary focus [45]. We further checked for normality of the error distributions using Q-Q plots, which indicated an even distribution of errors. Since sphericity is more important than normality in repeated measures ANOVA [46], we tested the sphericity assumption for both ANOVAs. In both cases, the sphericity criterion was met ($p > .05$).

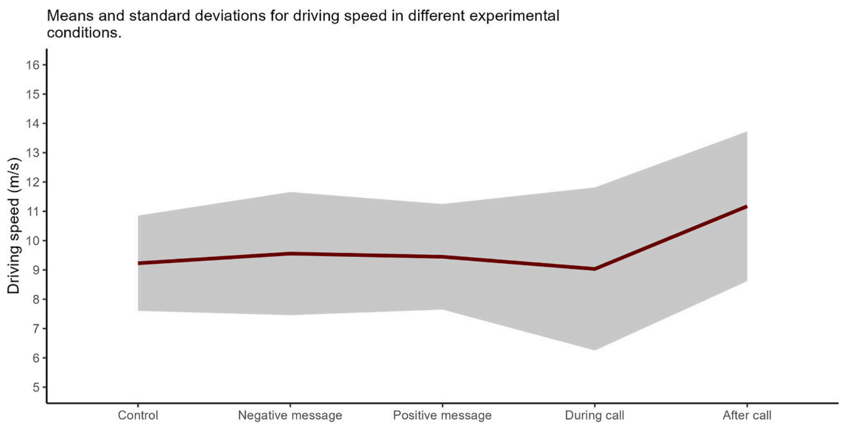

Fig. 2. Means and standard deviations for driving speed in different experimental conditions.

4. Results

The first aim of the study was to examine the relationship between different modes of mobile phone use (talking and receiving text messages of varying valances) while driving, and their effects on driving parameters. To assess the impact of message valence and phone calls during driving in a simulator, we conducted a one-way repeated measures ANOVA with experimental manipulations on driving speed and deviation from the centerline (DFC). Both ANOVAs were significant, indicating distinct driving patterns for speed ($F(4, 232) = 11.64$, $p < .001$, $\eta^2p = .14$) and DFC ($F(4, 232) = 6.53$, $p < .001$, $\eta^2p = .10$). For detailed results from the Bonferroni post-hoc test, refer to Table 1.

The overall pattern indicated that driving speed remained stable after receiving text messages and during the phone call but increased after the conversation ended. However, an interesting pattern emerged when examining the standard deviations. A pairwise comparison of the standard deviations (see Table 1) revealed that during the initial control drive, participants drove at relatively similar speeds. In contrast, during the experimental conditions, variability in speed increased—some participants drove faster, while others drove slower. Notably, larger differences were observed during and after the phone conversation (see Fig. 2 for a visual representation of these differences).

In terms of DFC, a similar pattern was observed. Variability in the distance from the centerline was minimal during the initial driving period and after receiving text messages of both valences, but it increased considerably during the phone conversation (see Fig. 3 for a visual representation of these differences).

The second and third aims of the study were to identify correlational patterns between driving behaviors following mobile messages of different valences, phone conversations while driving, and participants' preferences for basic values—power, security, and universalism. Additionally, we aimed to establish correlation patterns between individual differences in risky driving behaviors, such as violations, errors, and lapses, and different modes of mobile phone use while driving. A correlational analysis (see Table 1) showed that changes in driving patterns after receiving text messages and phone conversations were associated with the importance placed on certain values and individual differences in risky driving behaviors. Specifically, participants who prioritized power values tended to drive faster after receiving a positive message (see also Fig. 4). In contrast, those who valued security drove more slowly after receiving a negative text message (see the earlier discussion on differences in speed standard deviations and Fig. 5).

Differences in universalism did not result in speed differences (see Fig. 6). However, universalism values were negatively correlated with DFC after receiving the positive text message—participants who placed less importance on universalism deviated more from the centerline after receiving a positive message (or, alternatively, those who rated universalism lower showed greater deviation; see Fig. 7).

Finally, neither security values nor power values showed significant relationships with DFC (see Figs. 8 and 9). However, errors, as measured by the DBQ, were positively correlated with driving speed during and after the phone call—participants who reported more frequent errors in everyday driving tended to drive faster. Similarly, lapses were positively correlated with speed after the phone call—those who experienced lapses more often also drove faster. An interesting correlation pattern emerged: drivers who drove faster after receiving text messages also tended to drive faster during and after the handheld phone call.

5. Discussion

The present study examined the impact of reading emotionally-laden text messages and engaging in handheld phone conversations while driving, as well as how these behaviors correlate with individual differences in basic human values and self-reported risky driving patterns (violations, errors, and lapses) in a driving simulator. Specifically, we addressed three aims:

1. To establish the link between different modes of mobile phone use (talking and receiving text messages of varying emotional valence) while driving and various driving parameters.

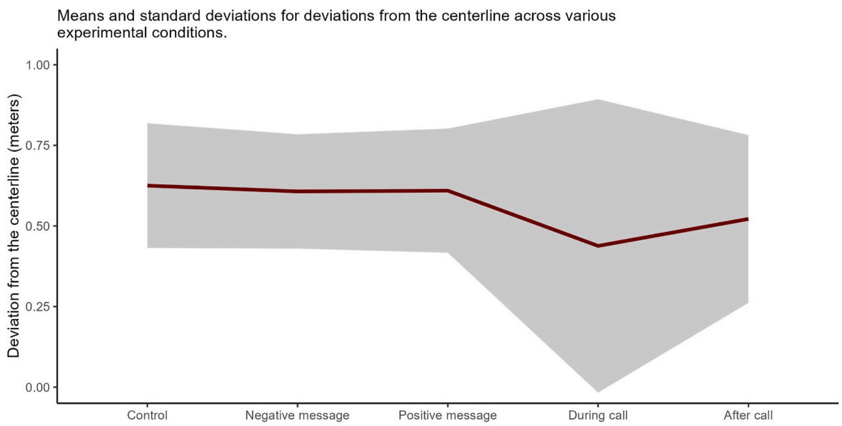

Fig. 3. Means and standard deviations for deviations from the centerline across various experimental conditions.

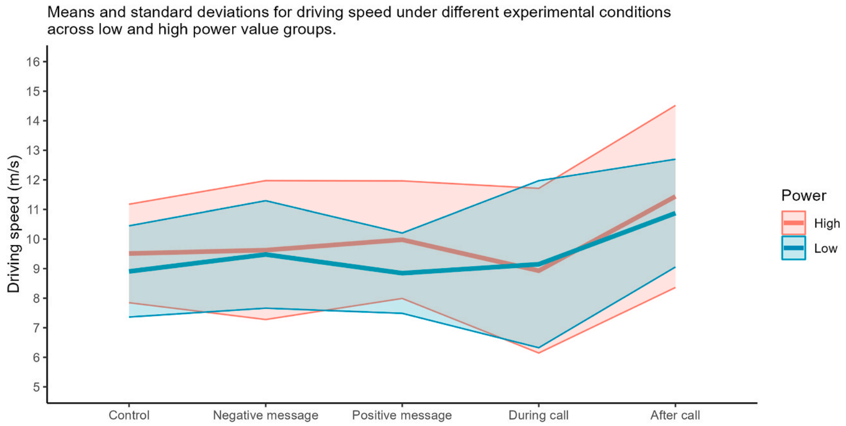

Fig. 4. Means and standard deviations for driving speed under different experimental conditions across low and high power value groups.

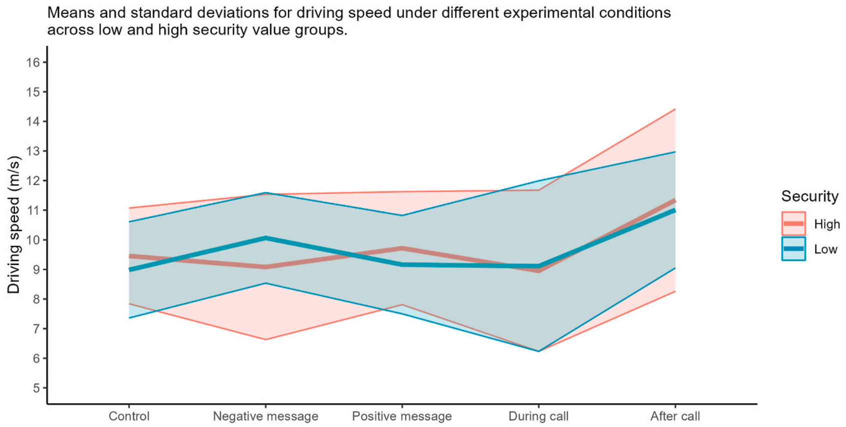

Fig. 5. Means and standard deviations for driving speed under different experimental conditions across low and high security value groups.

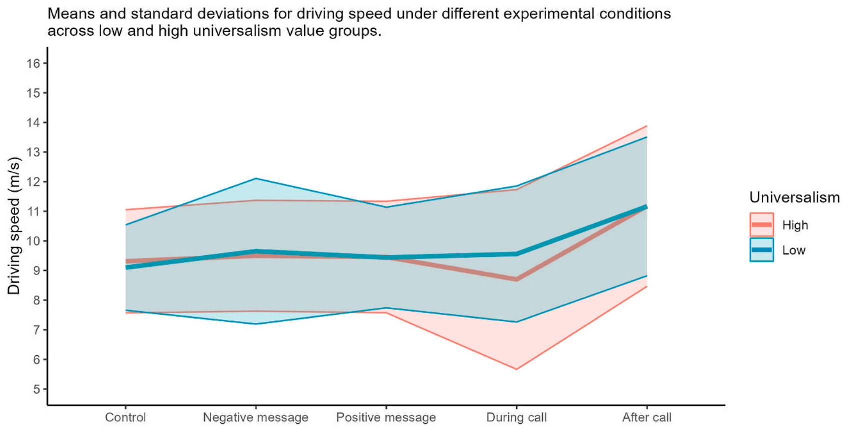

Fig. 6. Means and standard deviations for driving speed under different experimental conditions across low and high universalism value groups.

2. To establish correlations between driving behaviors following emotionally-valenced text messages and phone conversations, and individual preferences for basic values.
3. To identify correlations between individual differences in risky driving behaviors (violations, errors, and lapses) and modes of mobile phone use (talking and receiving text messages of varying valence) while driving.

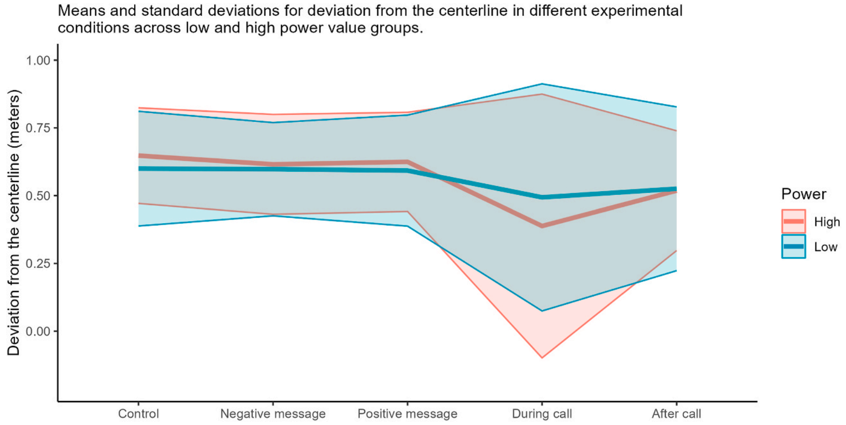

Fig. 7. Means and standard deviations for deviation from the centerline in different experimental conditions across low and high power value groups.

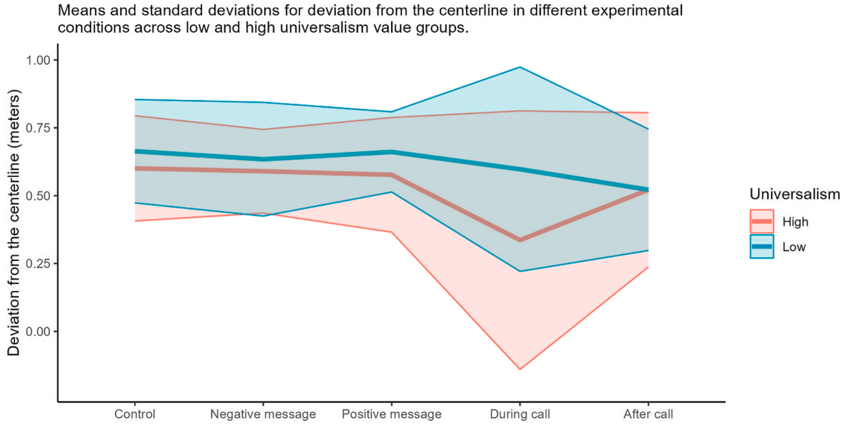

Fig. 8. Means and standard deviations for deviation from the centerline in different experimental conditions across low and high universalism value groups.

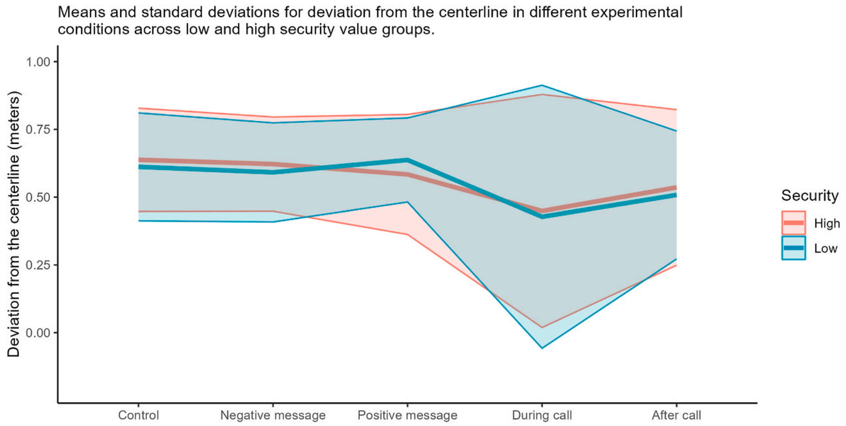

Fig. 9. Means and standard deviations for deviation from the centerline in different experimental conditions across low and high security value groups.

Regarding the first aim, no significant differences were found in average driving speed when participants received and read text messages. However, clear patterns of speed variation emerged among drivers with differing value preferences, illuminating the second aim. Drivers who placed higher importance on power values drove faster after receiving a positive message, while those who prioritized security drove slower after receiving a negative message. Individuals who value power may perceive positive feedback as a self-esteem boost, which could justify their tendency to showcase their abilities or power by driving faster. Conversely, messages targeting driving skills, closely tied to safety, may increase awareness of vulnerability, particularly for individuals valuing security, leading them to drive more cautiously. Other studies have found similar results, showing that values are related to driving behavior [47].

This finding suggests that emotional states, when filtered through personal values, significantly influence risk perception and behavior, adding depth to existing theories on emotion and decision-making in high-risk activities like driving. Another notable observation was that those with higher universalism values showed less deviation from the centerline after receiving a positive message. This aligns with previous research showing that values such as power, security, and universalism correlate with self-reported driving behaviors [31,41]. However, our findings indicate that values are more strongly correlated with objective driving measures than with self-reported behaviors.

These results fit Schwartz's theory of basic values [29,30], where power reflects a desire to influence others and control resources, security reflects a desire for safety and harmony, and universalism involves concern for others, tolerance, and social justice. The findings reinforce how individual value systems can directly influence driving behaviors, particularly in response to emotionally-laden stimuli like text messages. This supports the idea that value preferences not only influence general behavior but also manifest in specific contexts [48], such as driving. The study expands our understanding of how abstract value systems impact concrete actions, reinforcing the link between values and situational behaviors.

At the same time, other potential correlations did not reach significance. It is difficult to explain why certain driving measures correlated with value preferences, while others did not. Given that the likelihood of false positives increases with the number of comparisons (for further discussion see Ref. [49]), these results should serve as potential hypotheses for future research, rather than definitive evidence of the relationships observed.

Regarding violations, errors, and lapses, we found that errors correlated positively with driving speed both during and after phone conversations. Lapses also correlated positively with speed after the call. This adds to the body of research connecting Driver Behavior Questionnaire (DBQ) measures to various (mostly self-reported) variables [34,35]. The observation that violations, errors, and lapses are associated with increased driving speed after phone use strengthens existing theories on how risky behaviors, such as those measured by the DBQ, manifest in real-world settings [50]. This further validates the DBQ as a tool for predicting risky driving behaviors and highlights the role of individual differences in shaping such behaviors.

Theoretically, these findings suggest that interventions aimed at reducing distracted driving must address individual differences, not just external distractions. In this study, we demonstrated that both DBQ scores and basic values correlate with objective driving measures, supporting the notion that driving behavior, especially in distracted situations, is influenced by a complex interplay of factors [18], including individual differences in values, emotional states, and self-reported driving habits. This contributes to broader theories of behavior prediction, indicating that simple models—such as those focusing solely on environmental factors like distraction—do not fully capture the range of influences on risky driving.

Taken together, these findings highlight the complex structure of safe driving predictors. Mobile phone use interacts with individual driver differences, creating an interconnected set of causes. As a result, interventions aimed at reducing driving risks must consider this complexity and target multiple variables simultaneously.

The second limitation relates to the use of a convenience sample, which is common in social science research [51], but has inherent drawbacks. Convenience sampling involves selecting participants who are readily available and willing to participate, which can lead to a biased sample that may not accurately represent the target population. A major drawback is the potential for self-selection bias, where individuals who choose to participate differ from those who do not. In this case, random sampling was not feasible due to the time and logistical constraints associated with simulator studies, as participants must travel to the laboratory and some individuals experience motion sickness while using simulators, leading to their exclusion from the study. Although convenience sampling is easier to manage, future studies should strive to use representative samples.

The third limitation is that arousal was not measured using physiological tools. Instead, participants were asked, "Did you experience emotions when you received the message?" and "What emotions did you experience?" As a result, the analysis relied on self-reported emotional experiences, which may have been influenced by social desirability bias.

Despite these limitations, the present study offers several practical implications. First, by linking personal values—such as security, power, and universalism—to driving behavior, our findings suggest that psychological profiles could serve as a useful tool for identifying drivers who are more likely to engage in risky driving. This insight could be valuable for insurance companies and driving schools, enabling them to design targeted interventions for individuals at higher risk, particularly those who are more susceptible to reckless driving following emotionally charged messages. Additionally, our study emphasizes that strategies to combat distracted driving should not focus solely on external distractions, such as texting or phone calls, but also consider individual psychological traits. For instance, drivers who prioritize power may respond differently to certain emotional messages than those who place greater importance on security or universal values. Tailoring interventions to align with an individual's value system may therefore enhance the effectiveness of efforts to reduce distracted driving. A third promising practical application involves leveraging emotional context in driver education. Our findings suggest that messages with emotional content can influence driving behavior, with positive emotional cues leading some drivers to speed, while negative cues may encourage more cautious driving. This highlights the importance of incorporating emotional awareness into driver education and safety campaigns. Teaching drivers about how their emotional reactions to text messages, for example, can impact their driving behavior could be an effective strategy for curbing unsafe driving habits.

While the study provides valuable insights, demonstrating once again that smartphone use while driving can cause significant and dangerous deviations from typical driving behavior, several limitations should be acknowledged.

First, the study was conducted in a laboratory using a driving simulator. While simulators provide a safe and ethically appropriate environment for studying driving behaviors in various conditions—such as driving under the influence of alcohol or in near-accident situations—they do not fully replicate real-world conditions, where many other variables influence driver behavior [52]. A meta-analysis by Wynne and colleagues [40] concluded that simulator studies often yield different results compared to real-world driving, largely due to a lower perception of risk, which can lead to riskier behavior in simulators. Several studies [53,54] have shown that driving speed is higher in simulators than in real-world driving.

Further research on the impact of emotional valence on driving behavior is necessary, as emotions play a crucial role in daily life. Our study, in line with previous research, indicates that emotional valence can influence driving behavior, though this effect may vary depending on personality traits and values. This highlights the complexity of human behavior and underscores the need for continued investigation.

6. Conclusions

In conclusion, this study explored the effects of reading emotionally-laden text messages and engaging in handheld phone conversations on driving behavior in a simulator, as well as how individual differences in basic values and self-reported risky driving patterns correlate with these behaviors. The key findings include:

- Emotional Messages and Driving Behavior: While no general differences were observed in average speed when receiving and reading text messages, drivers with different value preferences responded differently. For example, drivers valuing power drove faster after receiving positive messages, while those valuing security drove slower after receiving negative messages, illustrating the influence of individual values on driving behavior.
- Values and Driving Performance: The study found correlations between specific driving behaviors and value preferences. Drivers valuing universalism deviated less from the centerline after receiving positive messages, suggesting that values such as power, security, and universalism correlate more strongly with direct driving behaviors than with self-reported behaviors, supporting existing theories on basic values.
- Risky Driving Patterns: Errors and lapses during driving were found to correlate with increased driving speed after phone use. This aligns with previous findings that self-reported risky driving behaviors (e.g., violations, errors, and lapses) relate to actual driving behavior, highlighting the complexity of safe driving predictors.
- Practical Implications: The findings suggest that mobile phone use while driving, especially in combination with individual values and personality traits, poses significant risks to driving safety. Therefore, interventions should account for these individual differences to effectively reduce distracted driving.

In summary, while this study highlights the complex interplay between mobile phone use, emotional responses, and individual differences in values on driving behavior, further research is needed to confirm these findings in real-world settings using more representative methodologies.

CRediT authorship contribution statement

Ivars Austers: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Inese Muzikante:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Ronalds Cinks:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization.

Ethical statement

The research reported in this paper is conducted in accordance with general ethical guidelines and has been reviewed and approved by Ethics Committee of Faculty of Education, Psychology and Art, University of Latvia, decision Nr. 30–47/20.

Data availability statement

Data will be made available on request. For requesting data, please write to the corresponding author.

Additional information

No additional information is available for this paper.

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Declaration of competing interest

The authors declare no conflict of interest.

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