T-Consciousness and the Evolution of Transportation Safety: A Human-Centered Paradigm Shift Beyond Technology

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Introduction

❑Artificial intelligence and autonomous vehicles are transforming transportation safety.

❑System failures, cybersecurity risks, unpredictable conditions, and user overreliance remain concerns.

❑Human attention, adaptability, intuition, and judgment remain essential in complex driving situations.

❑T-Consciousness Fields (TCFs) are proposed as a non-technological approach to supporting attention and cognitive resilience.

❑This study examined whether TCF exposure could improve alertness, reduce attentional disengagement, and support safer driving-related performance.

Methods

❑Design: Experimental comparison of a control group and a TCF-exposure group.

❑Research Stages: Initial in-person pilot testing followed by remote online testing and an expanded online Flanker.

❑Tasks: Attention Network Test (ANT) and Flanker Task.

❑Participants:

- ANT: Adults age:18–65; target sample of 200.
- Flanker: Adults age:18 and older; target sample of 400.

❑Measures: Alerting, reaction time, accuracy, and performance under cognitive conflict.

❑Procedure: Participants provided consent and completed both attention tasks under standardized conditions.

❑Ethics: Approved by the University of Maryland Institutional Review Board (IRB), including applicable amendments.

Results

❑TCF exposure was associated with stronger attentional regulation and greater resilience under cognitive demand.

❑Benefits were most evident during alerting, high-interference conditions.

❑Results were preliminary and require confirmation in larger, controlled studies.

ANT

❑TCF exposure significantly improved the alerting effect, suggesting enhanced readiness and situational awareness ($p = 0.008$), shown in **Figure 1**.

❑Slightly slower reaction times (RT) may reflect more deliberate, less impulsive responding ($p = 0.02$), shown in **Figure 2**.

❑Overall accuracy did not differ significantly between groups.

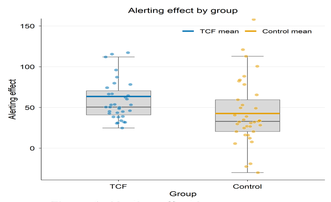


Figure 1: Alerting effect by group.

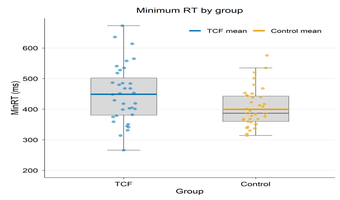


Figure 2: Minimum Reaction Time by group.

Flanker

❑Overall reaction time was similar between groups.

❑Under the highest cognitive load, the TCF group maintained higher accuracy ($p = 0.008$).

❑Accuracy declined less from easy to difficult conditions in the TCF group ($p = 0.014$), shown in **Figure 3**.

❑Timeout rates were lower for the TCF group under high interference ($p = 0.038$), shown in **Figure 4**.

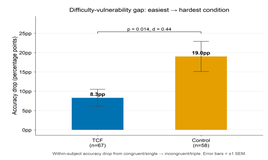


Figure 3: Accuracy decline under cognitive load.

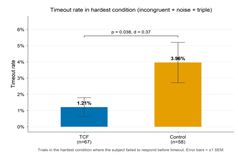


Figure 4: Timeout rate in the challenging condition.

Discussion

❑Human error, fatigue, distraction, and stress can compromise driving safety despite advances in automation.

❑TCFs may complement automation by supporting attention, emotional regulation, and cognitive resilience.

❑Human adaptability and judgment remain essential when automated systems encounter complexity, failure, or unpredictable driving situations.

Summary

❑TCF exposure was associated with stronger alerting and improved cognitive resilience under attentional demand.

❑ANT results indicated enhanced alertness and more deliberate response patterns.

❑Flanker results indicated better accuracy and fewer performance breakdowns under high cognitive load.

❑TCFs may complement automation by supporting human readiness rather than replacing human abilities.

❑These preliminary findings support further investigation of consciousness-based approaches to transportation safety.

References

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