

Who Benefits from Which Driving Assistance? A Large-Scale Cross-Sectional Study on the Psychological Effects of Driving Assistance

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1. INTRODUCTION

Drivers differ in the situations that cause anxiety and in the amount and type of assistance they perceive as useful. Therefore, psychological responses to the same driver-assistance function may vary according to driver characteristics. This study examined whether the psychological effects of driving assistance differ according to both driving attention performance and driving self-efficacy, including cases in which measured performance and self-perception are mismatched.

2. METHODS

Participants were 876 current drivers (mean age 53.9 ± 13.2 years) from the 2025 Iwaki Health Promotion Project. Driving attention performance was assessed using a touch-display right-turn task, with scores reflecting attention to visible hazards, anticipatory attention, and attention switching. Driving self-efficacy was assessed using the 12-item Japanese Adelaide Driving Self-Efficacy Scale (ADSES-J) and standardized within sex. Participants were classified into four groups using median splits: G1, high attention/high self-efficacy; G2, low attention/high self-efficacy; G3, low attention/low self-efficacy; and G4, high attention/low self-efficacy.

The task was performed twice: first without assistance and then with Attention, Attention + Spatial Cognition, Executive Function, or no assistance. Six outcomes were assessed on 0-100 visual analog scales: anxiety, peace of mind, confidence, appreciation, irritation, and pleasure in response to positive feedback. Anxiety, peace of mind, confidence, and pleasure were expressed relative to the no-support control condition. A 4×3 two-way ANOVA tested driver-group and support-type main effects and their interaction; significant main effects were followed by Holm-adjusted comparisons.

3. RESULTS

Driver-group main effects were significant for peace of mind ($p < 0.001$), confidence ($p = 0.002$), and pleasure in response to positive feedback ($p = 0.001$). G2 showed less improvement in peace of mind than G1, G3, and G4, and its mean response indicated a decrease in peace of mind. G4 showed a greater increase in confidence than G2. G3 showed greater pleasure in response to positive feedback than the other three groups. A support-type main effect was found only for appreciation ($p = 0.013$), with Executive Function rated lower than Attention and Attention + Spatial Cognition. No significant driver group $\times$ support type interaction was found for any of the six outcomes. Thus, psychological effects differed across driver characteristics, but no group-specific optimal assistance type was statistically established.

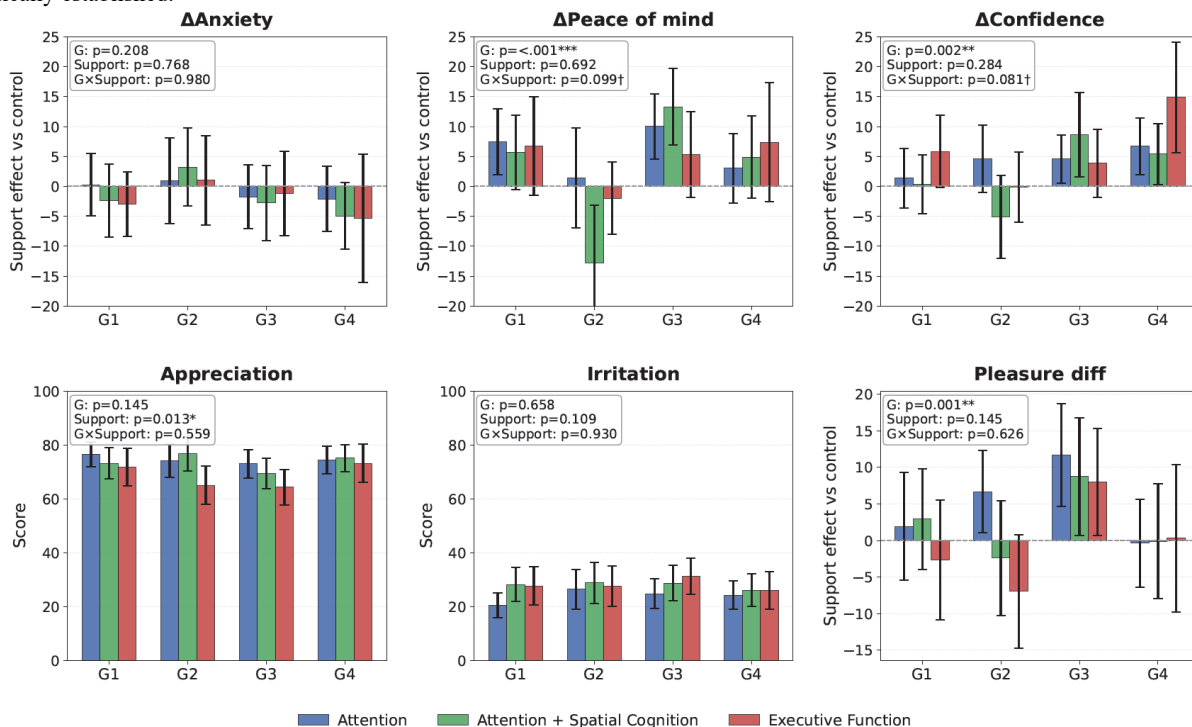


Fig. 1 Psychological effects by driver group and support type. Error bars indicate 95% confidence intervals.

4. CONCLUSION

Psychological effects of driving assistance differed according to driver characteristics defined jointly by attention performance and self-efficacy, whereas differences among assistance types were limited and no interaction was significant. Personalized driver assistance should therefore consider both driver characteristics and assistance content; further study is needed to identify the most suitable assistance for each driver profile.