

ABSTRACT

TITLE:

Matching in-Car Voice with Driver State: Impact on Attitude and Driving Performance

OBJECTIVES:

Predicting a person's behavior requires attention to the user's state, that is, the particular feelings, knowledge, and physical situation of the person. While traits provide the general trajectory of an individual's life, every specific attitude, behavior, and cognition can be influenced by momentary states. Of all the types of states that predict how a person will behave, the most powerful is emotions [1]. Rich emotions are a fundamental component of being human. Although emotion was one of the primary foci of the early field of psychology, the study of emotion has lain dormant for a long time [2]. This avoidance of the study of emotions has extended to the realm of voice interfaces. Addressed here is the question "how does user emotion and voice interface emotion interact to influence drivers' performance and attitudes?"

METHODS:

In a 2 (driver emotion: happy or upset) x 2 (car voice emotion: energetic or subdued) experimental study, participants (N=48 gender balanced) had emotion induced through watching video clips. Participants then used a driving simulator for approximately 20 minutes. While they were driving, a voice in the car spoke 36 questions (e.g., "How do you think that the car is performing?") and comments ("My favorite part of this drive is the lighthouse") in either an energetic or subdued voice

The effectiveness of the emotion manipulation and the emotional status after driving was measured using a Differential Emotion Scale [3]. Number of accidents was automatically tabulated by the simulator.

Driver's attention was assessed by determining the driver's reaction time to a task-relevant stimulus.

Driver's engagement with the system was measured by the amount of time drivers spent talking back to the car voice while driving.

RESULTS:

Matching the car voice to the drivers' emotions had enormous consequences. Drivers who interacted with voices that matched their own emotional state (energetic voice for happy drivers and subdued voice for upset drivers) had less than half as many accidents on average as drivers who interacted with mismatched voices! ($M=4.15$ vs. $M=8.95$, $F(1,36)=4.10$, $p<.05$). The effect of voice was so strong that it eliminated the inevitably significant difference in accident rate between happy and upset drivers. Drivers paired with matched voices also communicated much more with the voice, (the voice said exactly the same thing in all conditions) $F(1,36)=4.50$, $p<.04$. Although drivers who heard emotion-matched voices spoke much more to the car voice, they paid more attention to the driving task and were better able to avoid accidents.

CONCLUSIONS:

The effects of matching emotion versus mismatching emotion were so powerful that neither driver emotion nor voice emotion by itself had a consistent effect on drivers. Although there was a slight tendency for happy drivers to be better drivers, even this effect was minimal compared to the effects of matching. In other words, finding the appropriate in-car voice for the driver's emotion stood out as the most critical factor in enabling a safe and engaging driving experience.

REFERENCES:

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