



The effect of stress and personality on dangerous driving behavior among Chinese drivers



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ABSTRACT

The relationship between stress and road safety has been studied for many years, but the effect of global stress and its joint effect with personality on driving behavior have received little attention in previous studies. This study aimed to elucidate the impact of global stress and various personality traits on driving behavior. 242 drivers completed the Perceived Stress Scale-10 (PSS-10), the Dula Dangerous Driving Index (DDDI), and several personality trait scales related to anger, sensation seeking, and altruism. The results showed that perceived stress and sensation seeking were significantly correlated with the four subcategories of dangerous driving behavior, namely, negative cognitive/emotional driving (NCED), aggressive driving (AD), risky driving (RD), and drunk driving (DD). Moreover, anger was positively correlated with negative cognitive/emotional driving, aggressive driving, and risky driving, and altruism was negatively correlated with aggressive driving and drunk driving. Hierarchical multiple regressions were applied to analyze the mediating effect of personality traits, and the results showed that anger mediated the relationship between stress and dangerous driving behavior and that this mediating role was especially strong for negative cognitive/emotional driving and aggressive driving. Collectively, the results showed that stress is an important factor that can affect people's driving behavior but that personality traits mediate the effect of stress on driving behavior. The findings from this study regarding the relationship among stress, anger, and dangerous driving behavior could be applied in the development of intervention programs for stress and anger management in order to improve drivers' ability to manage emotional thoughts and adjust their behavior on the road.

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1. Introduction

Stress is a modern phenomenon that affects almost everyone. Researchers commonly conceptualize stress as the body's response to any demand that exceeds individuals' adaptive capacity (Selye, 1936; see Kopp et al., 2010 for a review). Stress has been shown to have an obvious impact on attention (Ellenbogen et al., 2002), anxiety (Caplan, 1994; Graeff et al., 1996), working memory (Ashcraft and Kirk, 2001), and perceptual-motor performance (van Galen and van Huygevoort, 2000). Moreover, evidence from cognitive neuroscience has revealed that stress hormones affect prefrontal brain regions and dopaminergic pathways (Moghaddam and Jackson, 2004; Wang et al., 2005). As a daily activity, driving behavior is influenced by various stressors (Gulian et al., 1989; Rowden et al., 2011).

Previous studies have explored the relationship between driving-related stress and road safety. Driving-related stress mainly arises from personal and environmental factors that make drivers feel stressed when they are driving (Rowden et al., 2011). Driver stress is an important factor in research on the relationship between driving-related stress and driving behavior. Driver stress mainly occurs when an individual perceives his or her driving ability to be insufficient to manage the demands and dangers of driving, and it may induce a dislike of driving and hazard monitoring (Gulian et al., 1989; Matthews, 2002). Dislike of driving encompasses a driver's feelings of anxiety, tension, frustration, and joylessness and lack of confidence, especially in complicated driving situations (Matthews et al., 1998). Matthews et al. (1998) found that a dislike of driving is associated with diminished control skills in simulated driving tasks. Other studies have revealed that high levels of driver stress are associated with increased self-reported mistakes and violations during driving (Kontogiannis, 2006; Westerman and Haigney, 2000). Another factor in driving-related stress is the driving environment, which generates stressors related to time pressure, congestion, and road conditions (Hennessy

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and Wiesenthal, 1999; Hill and Boyle, 2007; Lucas and Heady, 2002).

In addition to stressors related to driving and the driving environment, other stressors that are extraneous to the driving situation, such as life events and daily frustrations, may influence driving behavior and the occurrence of traffic violations. Lagarde et al. (2004) found that drivers who are going through separation or divorce are more likely to be involved in serious traffic accidents. High job stress has also been shown to be an effective predictor of future vehicle accidents (Norris et al., 2000). A study of military personnel found that participants who had recently returned from combat zones reported significantly higher scores on risk and aggressive driving measures than other drivers did, and the results indicated that stress could be a significant predictor of their traffic violations (Mitra-Sarkar and Andreas, 2009). Rowden et al. (2011) provided further evidence of the impact of stress from various sources on driving behavior and road safety. They found that daily hassles that are extraneous to the driving environment could affect driving lapses and violations. However, previous studies have generally focused on one specific event only. In fact, numerous life events, such as taking an important exam or experiencing certain diseases, can affect individuals' stress levels, but exhaustively studying all of these life events is impossible. Moreover, stress is common in modern society; it can arise from everyday stressors that are ignored or poorly managed. Global stress refers to subjective, perceived psychological stress arising, for instance, from an individual's feelings that his/her life has become unpredictable, out of control, or overwhelming; however, the stressors causing such stress are general in nature rather than specific to a particular event or experience (Cohen et al., 1983; Cohen and Janicki-Deverts, 2012). Further, to our knowledge, no study has directly explored the influence of global stress on driving safety.

Individual differences such as age, gender, driving experience, and personality traits are important factors that may interact with stress in affecting driving safety (Mather et al., 2009; McLinton and Dollard, 2010; Öz et al., 2010; Simon and Corbett, 1996). Among these factors, personality traits have attracted the most attention in the literature. In particular, previous researchers have investigated the joint effect of personality and stress on driving safety. Hoggan and Dollard (2007) discussed the relationship between work stress and driving anger and the mediating effect of trait anger on this relationship. McLinton and Dollard (2010) also showed that trait anger fully mediated the relationship between work stress and road anger. Previous studies have also explored the effect of personality on driving performance under stress. For instance, Morton and White (2013) investigated the effect of a fear-based personality trait on drivers' performance under psychological stress. The authors used reinforcement sensitivity theory (RST) to show that stress may lead to riskier driving behavior in people with fearful personality types. Nevertheless, these studies have some limitations. First, each study focused on only one specific stressor. Whether these effects can be extended to other stressors remains unknown; thus, exploring individuals' perceived global stress levels, which are not based on any specific life event, could expand existing research. Second, the mediating effect of only one personality trait was explored in each study. Previous studies have found that other personality traits, such as sensation seeking and altruism, are significantly correlated with driving behavior (Dahlen et al., 2005; Machin and Sankey, 2008). These traits could interact with stress to affect driving behavior. Third, previous studies explored only one aspect of driving behavior, e.g., driving anger (Hoggan and Dollard, 2007; McLinton and Dollard, 2010) or performance in simulated driving (Morton and White, 2013). Aggressive and risky driving behavior could be jointly influenced by stress and personality. These issues thus require systematic and meticulous investigation.

Specific types of stress and road safety have received considerable attention individually in the literature, but the effect of global stress and its joint effect with personality on driving behavior have received little attention in previous studies. As a developing country with a short history of automobile usage, China presents a unique social and traffic environment (Zhang et al., 2010). Thus, drivers' behavior in such an environment needs to be investigated in order to reduce the potential influence of stress and related personality traits on dangerous driving behavior among Chinese drivers. The current study had two main goals. First, we aimed to explore the influence of drivers' global stress on their driving behavior. To date, no studies have explored the link between driving safety and stress in China. We used the Perceived Stress Scale (PSS-10) to measure the global stress that drivers perceive in their everyday life. This scale does not focus on any specific type or source of stress but captures the global stress derived from ongoing life circumstances and from expectations concerning future events (Cohen et al., 1983; Cohen and Janicki-Deverts, 2012). Second, we aimed to expand research on the combined effect of personality and stress on driving safety. Anger, sensation seeking, altruism, and normlessness are effective predictors of risky driving and traffic violations in China (Yang et al., 2013). Thus, these personality traits were examined in this study. The Dula Dangerous Driving Index (DDDI, Dula and Ballard, 2003; Qu et al., 2014) was used as the principle measure for unsafe driving behavior. This index includes four subcategories: negative cognitive/emotional driving (NCED), aggressive driving (AD), risky driving (RD), and drunk driving (DD). NCED refers to driving with negative feelings, such as anger or frustration; AD is defined as any behavior in which a driver intends to physically or psychologically harm others; RD refers to driving with potentially negative outcomes but not with the intention to cause harm to others, such as speeding; and DD is self-evident—driving after drinking (Dula and Ballard, 2003; Qu et al., 2014; Willemsen et al., 2008). This scale allowed us to analyze the effect of stress and personality on each of the four subcategories of driving behavior. Moreover, self-reported traffic violations were also measured, including the number of accidents over the previous three years and the number of penalty points and fines during the past year. The penalty point system is a measure that is used to punish drivers who have violated a traffic law. For example, a driver receives six penalty points for driving through a red light. If a driver receives 12 penalty points in one year, his or her driver's license is suspended.

2. Methods

2.1. Participants

In total, 309 drivers voluntarily participated in this study; the participants were recruited from residential living communities, train stations, the Commodity Wholesale Market Center, and the graduate school of the Institute of Psychology, Chinese Academy of Sciences. Each participant received a gift or 20 RMB as a reward for completing the survey. The final data set comprised 242 valid responses because some of the surveys were not filled out completely or seriously. The final sample included 119 males (49.27%) and 123 females (50.8%). The average age of the final sample was 35.75 years (SD = 8.08, ranging from 18 to 61). A total of 239 (98.8%) participants reported the number of years they had been driving, which averaged 6.38 ± 4.68 years (ranging from 0.5 to 25). A total of 236 (97.5%) participants reported the total number of traffic accidents that they were involved in while driving in the past 3 years; the average number was 1.99 ± 2.18 (ranging from 0 to 10). Further, 228 participants (94.2%) reported the total penalty points for traffic citations that they had received in the last year; the mean value was 1.89 ± 2.84 points (ranging from 0 to 12).

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