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Aggression, emotional self-regulation, attentional bias, and cognitive inhibition predict risky driving behavior

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ABSTRACT

The present study explored whether aggression, emotional regulation, cognitive inhibition, and attentional bias towards emotional stimuli were related to risky driving behavior (driving errors, and driving violations). A total of 117 applicants for taxi driver positions (89% male, *M* age = 36.59 years, *SD* = 9.39, age range 24–62 years) participated in the study. Measures included the Ahwaz Aggression Inventory, the Difficulties in emotion regulation Questionnaire, the emotional Stroop task, the Go/No-go task, and the Driving Behavior Questionnaire. Correlation and regression analyses showed that aggression and emotional regulation predicted risky driving behavior. Difficulties in emotion regulation, the obstinacy and revengeful component of aggression, attentional bias toward emotional stimuli, and cognitive inhibition predicted driving errors. Aggression was the only significant predictive factor for driving violations. In conclusion, aggression and difficulties in regulating emotions may exacerbate risky driving behaviors. Deficits in cognitive inhibition and attentional bias toward negative emotional stimuli can increase driving errors. Predisposition to aggression has strong effect on making one vulnerable to violation of traffic rules and crashes.

1. Introduction

The World Health Organization (2015) reported that motor vehicle crashes (MVCs) were the third leading cause of death in 2012 in Iran. Risky driving behavior is a significant contributor to MVCs (Iversen, 2004; Lawton et al., 1997; Parker et al., 1995). One theoretical framework to study risky driving behavior proposed by Reason et al., (1990) emphasizes two types of risky driving behaviors having two distinctive psychological constructs: errors and violations. Errors refer to the inability to perform a series of designed actions to achieve an optimal outcome. Violations are behaviors performed with the intention of violating traffic regulations. Moreover, research suggested that errors can be split into slips (failure of attention), lapses (failure of memory) and mistakes (failure of intention). Violations can be aggressive containing an interpersonally aggressive component whereas "ordinary" violations are deliberate deviations from safe driving without intention of harm (Lajunen et al., 2004; Özkan et al., 2006). Further studies of risky driving behavior resulted in a more detailed taxonomy of driver errors, which is based on underlying psychological mechanisms including action errors (action execution), cognitive and decision making errors (e.g., perception & attention), observation errors (e.g., memory & recall), information retrieval errors and violations (e.g., planning & intention) (for more details on driver error taxonomy see, Salmon et al., 2010; Stanton and Salmon, 2009). Nevertheless, the distinction between errors and violations of Reason et al. (1990) can be located in "driver error" category of Stanton and Salmon (2009).

A psychological factor particularly relevant to risk taking behavior in driving is feeling of anger and aggression (Deffenbacher et al., 2002; Gonzalez-Iglesias et al., 2012; King and Parker, 2008). Aggression refers to intended action to harm another person, and that the target wills to avoid that. Literature on general aggression has distinguished reactive aggression driven by anger and proactive aggression driven by an ultimate goal other than harm (instrumental) (Berkowitz 1993). However, Anderson and Bushman (2002) stated that the intention of all types of aggression is harming and that such taxonomy is limiting and is not able to consider aggressive acts with multiple motives. Also, in driving situation distinguishing such dichotomy is often not possible due to inability to ascertain the goal and intent of other drivers (King and Parker, 2008). The present study draws upon the general aggression model (GAM), a model of aggression that is equally applicable to both reactive and proactive aggression to examine the relevance of aggression to risky driving (Anderson and Bushman, 2002). The general

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aggression model (GAM), provides two points of entry for outcome aggressive behavior. The initial is as either situational (aggressive cues and provocations) or personal factors (e.g., aggressive trait). The second is as an influence on appraisal and decision making, wherein accessibility of hostile concepts in memory and emotions hinders a thoughtful reevaluation of the situation, which may produce an aggressive action (Anderson and Bushman, 2002; Roberton et al., 2012). Roberton et al. (2012) draws upon GAM and explain the impact of maladaptive emotion regulation on aggression. Some research has shown that the cognitive processes of inhibition and emotional self-regulation underlie the experience of the aggression (Anderson and Bushman, 2002; Denson et al., 2012; Pond et al., 2012).

Accepting the concept of aggression within the GAM we tested the following psychological constructs to explain risky driving behavior: Aggression trait, attentional bias, inhibition and emotional self-regulation.

1.1. Personal and situational factors of aggression and risky driving behavior

Previous studies using various methodologies have consistently linked aggressiveness to risky driving behavior (Deffenbacher et al., 2002; Lajunen and Parker, 2001; Mesken et al., 2007; for review, Nesbit et al., 2007). Relying on self-report measures, King and Parker (2008) found that drivers with relatively high levels of trait aggressiveness committed both aggressive and Highway Code violations more likely and that accident-involved drivers were more angry and hostile than accident-free drivers. Studies using a more 'direct' observation of behavior such as simulated driving, replicated earlier subjective/self-report findings. For example, Schwebel et al. (2006) found that anger/hostility predicted risky driving in a computer-simulated, virtual environment, even after accounting for the effects of sex and years licensed. Other researchers have also demonstrated risky driving among anger-prone drivers (Deffenbacher et al., 2003; Garrity and Demick, 2001).

Other lines of research considered state of anger, emphasizing that anger in traffic may be caused by situational factors. Researchers assessed driving behavior of typical (non-anger prone) drivers in anger-provoking driving situations (Mesken et al., 2007; Stephens and Groeger, 2011). Results showed that anger-provoking situations are often influenced by recent driving constraints such as road construction (Mesken et al., 2007; Stephens and Groeger, 2011). Mesken et al. (2007) recorded driving speed and emotional state of drivers while they were actually driving, showing that even low levels of anger may impact driving behavior such as an increased speed.

The interrelationship between personal and situational factors in traffic situations have also been widely examined (Roidl et al., 2014; Stephens and Groeger, 2009; Stephens et al., 2012). Anger provocation in a sample of non-anger prone individuals lead to an increased tendency to underestimate the potential traffic hazards in a simulated driving task. In low anger-provoking situations, drivers higher in trait anger reported more anger and frustration and drove at higher speeds (Stephens and Groeger, 2009). High trait anger drivers show higher state anger, more aggression, and more risky behavior than low trait anger drivers (Deffenbacher et al., 2003; Roidl et al., 2014). Despite this finding, Stephens and Groeger (2009) found that in their sample those drivers displaying average aggression levels demonstrated no relationship between anger predispositions and general driving behaviors.

1.2. Inhibition, aggression, and risky driving behavior

Inhibition, the ability to prevent a strong, prepotent response, is an essential prerequisite for a variety of cognitive functions. Impaired inhibition might be a source of impulsivity, attention deficits, aggression, poor self-regulation and decision making (Aron, 2007; Denson et al., 2012; DeWall et al., 2011). Impulsivity refers to a general tendency towards quick, unthoughtful actions without a consideration of the consequences of these actions (Moeller et al., 2001). Also, some driving parameters may negatively be affected by impaired inhibition (e.g., Cheng et al., 2012; Constantinou et al., 2011; Dahlen et al., 2005; Galovski and Blanchard, 2004; O'Brien and Gormley, 2013; Poó and Ledesma, 2012; Rizzo et al., 2003; Thompson et al., 2007; Wickens et al., 2008). For example, compared to young drivers with no offenses, those with offenses showed poorer inhibitory control as measured by the Go/No-go task (O'Brien and Gormley, 2013). In Iran, a study showed that individuals with poor inhibitory control made more errors and violations in driving, and may experience a higher number of motor vehicle crashes (Tabibi et al., 2015).

1.3. Selective attention and risky driving behavior

Driving performance may be impaired if drivers are not paying adequate attention to driving tasks in critical moments (Zhang et al., 2014; Wickens et al., 2008). Driver distraction is estimated to be one of the leading causes of MVCs (National Highway Traffic Safety Administration, 2010).

Some studies have examined driver distraction resulting from performing secondary tasks while driving, such as cell phone conversations, eating, and adjusting in-vehicle controls (e.g., Stavrinos et al., 2015; Strayer and Johnston, 2001; Stutts et al., 2005). Recent studies have pointed to the impact of emotions on distractions (Pêcher et al., 2009). Research shows that attention can be biased, or shifted, toward emotional, task-irrelevant stimuli while performing a cognitive task. Such effect is called attentional bias.

1.3.1. Attentional biases

One cognitive deficiency induced by anger is attentional bias (Eckhardt and Cohen, 1997). Attentional bias is a phenomenon in which despite efforts to ignore irrelevant stimuli, attention is directed toward it (Fadardi and Ziaee, 2010; Williams et al., 1996). Williams et al. (1996) noted that increasing emotional valence, the extent to which an individual is attracted or repelled by an object, event or person is accompanied by processing bias of that stimuli coding. Considerable evidence suggests that emotional stimuli compete with other stimuli for attentional resources (Fadardi and Cox, 2005; Fadardi and Ziaee, 2010; Williams et al., 1996). Some studies have measured attentional bias in different groups of participants with the expectation that one group of participants displays greater bias than another group due to differing personality traits. For example, aggressive participants showed attentional bias in emotional Stroop tests and Go/No-go tasks. Such attentional bias is observed toward face stimuli and aggressive terms (Bertsch et al., 2009; Smith and Waterman, 2003, 2005; Williams et al., 1996). Also, people experiencing anxiety or depression display a higher level attentional bias (Eckhardt and Cohen, 1997). Fadardi and Cox (2005) demonstrated that beyond the impact of cognitive performance and general inhibition of ability, stimuli related to one's preoccupations are more likely to be influenced by selective attention.

Whether individual differences in attentional bias in emotional situations alters driving behavior is not fully understood. In the context of driving, there are studies proposing that emotional states, such as anger, sad or happy may misdirect attention and lead to driver distraction (Chan and Singhal, 2013; Neale et al., 2005; Pêcher et al., 2009). The results are however, equivocal. For example, in a driving situation, it is found that sad music led to risk-free driving whereas happy music was associated with more dangerous driving such as higher driving speed, and higher frequency of traffic violations, including disregarding red traffic-lights, lane crossings, and collisions in a simulated driving task (Brodsky, 2002; Pêcher et al., 2009).

1.4. Emotional self-regulation, aggression and risky driving behavior

Emotional self-regulation involves strategies to manage current