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Dimensions of driving anger and their relationships with aberrant driving

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ABSTRACT

The purpose of this study was to investigate the relationship between driving anger and aberrant driving behaviours. An internet-based questionnaire survey was administered to a sample of Chinese drivers, with driving anger measured by a 14-item short Driving Anger Scale (DAS) and the aberrant driving behaviours measured by a 23-item Driver Behaviour Questionnaire (DBQ). The results of Confirmatory Factor Analysis demonstrated that the three-factor model (hostile gesture, arrival-blocking and safety-blocking) of the DAS fitted the driving anger data well. The Exploratory Factor Analysis on DBQ data differentiated four types of aberrant driving, viz. emotional violation, error, deliberate violation and maintaining progress violation. For the anger–aberration relation, it was found that only "arrival-blocking" anger was a significant positive predictor for all four types of aberrant driving behaviours. The "safety-blocking" anger revealed a negative impact on deliberate violations, a finding different from previously established positive anger–aberration relation. These results suggest that drivers with different patterns of driving anger would show different behavioural tendencies and as a result intervention strategies may be differentially effective for drivers of different profiles.

1. Introduction

Road traffic accidents (RTAs) are a major cause of deaths and injuries throughout the world, with nearly 1.24 million people killed and between 20 million and 50 million more injured in road traffic crashes each year. If no action is taken, road accident deaths are predicted to rise to around 1.9 million people per year by 2020 (World Health Organization, 2013). Unfortunately, the mortality rate for RTAs is much higher in China than in Western countries such as the United Kingdom and United States. In 2010, the traffic accident mortality rate was 32.8 per 100,000 motor vehicles in China, whereas the numbers in the UK and USA were 5.4 and 12.8, respectively (British Department for Transport, 2013; National Highway Traffic Safety Administration, 2013). According to statistics on road accidents in China (China Road Traffic Accident Statistics, 2011), there were 219,521 RTAs in China in 2010, resulting 65,225 fatalities and 254,075 nonfatal injuries. The road traffic accidents have also resulted in large economic losses and become a serious public health problem in China (Zhang et al., 2011).

One of the main factors threatening road safety is the aberrant driving behaviours of drivers. It has been estimated that aberrant driving behaviours such as speeding and running red lights accounted for approximately 25.1% of all traffic deaths in 2010 in China (China Road Traffic Accident Statistics, 2011). Although an accurate definition is lacking, it is generally accepted that aberrant driving behaviours can be categorized as driving violations (sometimes used synonymously with the term "driving aggression" or "risky driving") and driving errors. According to Reason et al. (1990), "violations" are defined as "*deliberate infringement of some regulated or socially acceptable code of behaviours*"; and "errors" are "*misjudgements and failures of observations that may be hazardous to others*". In road safety literature, the Driver Behaviour Questionnaire (DBQ), with good construct and predictive validity (Reason et al., 1990; De Winter and Dodou, 2010), has been commonly used in measuring aberrant driving behaviours (Shi et al., 2010; Martinussen et al., 2013).

The DBQ, initially developed by Reason et al. (1990), contains 50 common aberrant driving behaviours such as "sound horn to indicate your annoyance to other road users". Respondents are required to indicate how frequently they have themselves used

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each type of aberrant driving behaviour during the previous year on a scale between 0 (never) and 5 (nearly all the time). Reason et al. (1990) investigated the factor structure of DBQ and identified three different aspects of driving behaviours (violations, errors and lapses) with this instrument. In later research on DBQ, various versions with different numbers of items and different factor structures were used or reported by other researchers. For example, "lapses" and "errors" were not differentiated by Xie and Parker (2002); "errors" were divided into "inattention errors" and "inexperience errors" by Shi et al. (2010); "violations" were further split into subscales such as "emotional violations" (sometimes known as "aggressive violations") (Lawton et al., 1997; Shi et al., 2010; Guého et al., 2014), "ordinary violations" (Guého et al., 2014), or "parking violations" (Kontogiannis, 2006). Despite all these variations for different factor models, the psychological distinction between "errors" and "violations" has always been clearly conveyed.

1.1. Driving anger and violations

Driving anger is a commonly experienced negative emotion while driving (Mesken et al., 2007). An online survey on 9620 Chinese drivers showed that 60.7% of the respondents had experienced anger during driving, especially when they encountered inappropriate behaviour by other drivers or when they got involved in traffic congestion (Sohu, 2008). There are a number of ways of measuring driving anger. One of the frequently used scales is the short version of the Driving Anger Scale (DAS). This scale was first developed by Deffenbacher et al. (1994) in the United States to assess the propensity of drivers to become angry while driving. It contains 14 anger-provoking traffic scenarios and respondents are asked to rate the level of anger triggered by each condition on a 5-point scale. This short DAS is considered to be a one-factor structure (Deffenbacher et al., 1994; Sullman and Stephens, 2013), the overall score of which has been shown to have a positive association with driving violations in a number of studies (Dahlen et al., 2005; Stephens and Groeger, 2009; Sullman and Stephens, 2013).

However, there has been increasing evidence that suggests the currently established, seemingly simple, positive anger-violation relationship may be problematic. In one review on the relationship between driving anger and aggression, Nesbit et al. (2007) found that driving anger was a heterogeneous construct, and suggested a re-evaluation of existing driving anger questionnaires to explore possible different dimensions of driving anger. Also, according to the appraisal theory, anger is provoked when a stimulus is appraised as against the goals of the individual (Roseman and Smith, 2001). In the context of driving, drivers can be anger-provoked by events that are incongruent with the arrival goal (e.g. traffic congestion), safety goal (e.g. sudden braking of the front vehicle) or general survival goal (e.g. obscene gestures from other drivers) (Deffenbacher et al., 1994; Mesken et al., 2007; Roidl et al., 2013). The general aggression model (GAM, Anderson and Bushman, 2002) further contends that the relationship between emotional experience and behavioural expression is moderated by cognitive appraisals. Finally, a recent study by Zhang and Chan (2015) demonstrated that the 14 items in DAS could be classified into three subscales (hostile gesture, arrival-blocking, and safety-blocking) according to their goal-blocking features. More importantly, it was found that the associations of the three types of driving anger with aggressive driving differed in both the level of significance and magnitude. To sum up, the above evidence suggests that there is a need to examine how specific dimensions of driving anger are related to driving violations.

1.2. Driving anger and errors

Apart from triggering aggressive behaviour, anger can have other adverse effects on driving. Recent research has demonstrated that the cognitive performance of drivers, such as judgement and reasoning, can be impaired by anger (Blanchette and Richards, 2010), which may increase the probability of making errors. The effects of driving anger on errors have been investigated in both simulation-based and questionnaire-based studies. For the driving simulation studies, Jeon et al. (2014) found that angry drivers made more errors (e.g. deviations from centre line or changing lane with no signal) than the control group, and Stephens et al. (2013) showed that drivers who had reported a higher level of anger in a simulated driving situation were also more likely to miss critical traffic hazards. For questionnaire-based studies, Lucidi et al. (2010) and Stephens and Groeger (2009) both reported a positive anger-error relationship. However, none of these studies have considered the potential effects of different dimensions of driving anger.

1.3. Aim of this study

Using a Chinese driver sample, this study aimed to investigate whether the dimensions of driving anger are distinct and have different relationships with driving violations and errors. Specifically, driving anger was measured using a 14-item Driving Anger Scale (DAS), and driving violations and errors were measured using a newly proposed 23-item Driver Behaviour Questionnaire (DBQ) which is explained in Section 2.3. Results from this study are expected to contribute to driver behaviour research by providing a more in-depth understanding of the relations between driving anger and aberrant driving behaviours. Such findings can serve to inform researchers and policy makers about whether intervention strategies may be differentially effective for drivers of different profiles. It is expected that this study will provide useful information to assist in the development of interventions aimed at improving road safety in China.

2. Methods

2.1. Procedure

An internet-based questionnaire survey was used to collect data for this study. Due to the high Internet penetration rate in China, this method was considered to be practical in order to reach a large number of Chinese drivers at a relatively low cost (Shi et al., 2010). Driver behaviour data collected from internet surveys have been proved to be similar to data collected through traditional paper-based methods (Shi et al., 2010; Hassan and Abdel-Aty 2013; Guého et al., 2014). Invitations to participate in this survey were posted on Autohome Forum (www.autohome.com.cn), which is one of the biggest driver forums in China. Those interested were directed to complete the questionnaire published on Sojump (www.sojump.com), a professional online survey platform.

2.2. Questionnaire

The questionnaire used here consisted of three parts, viz. the short Driving Anger Scale (DAS), the newly proposed Driver Behaviour Questionnaire (DBQ), and demographic information. The short Driving Anger Scale (DAS) developed by Deffenbacher et al. (1994) is one of the most frequently used instruments for assessing the tendency of drivers to become angry (González-Iglesias et al., 2012). In this scale, 14 anger-provoking driving scenarios are described in text and participants are required to rate the amount of anger they feel when encountering each condition on a 5-point scale (1 = not at all, 2 = a little, 3 = some, 4 = much and