



Accident involvement among Iranian lorry drivers: Direct and indirect effects of background variables and aberrant driving behaviour



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ABSTRACT

Road accident rates among Iranian lorry drivers are considerably high and, according to empirical evidence, aberrant driving behaviours, summed to certain demographic, psycho-social and work-related factors, may explain their accident involvement. Consequently, the main aim of the study was to examine the direct and indirect effects of background variables (i.e. annual mileage, lorry driving experience, demographic and socioeconomic factors) on accident involvement mediated through aberrant driving behaviour among Iranian lorry drivers. A cross-sectional questionnaire survey was conducted in 2012 among 914 lorry drivers in 10 selected provinces in Iran. The 27-item Driver Behaviour Questionnaire (DBQ) was used to measure aberrant driving behaviour. Results from valid observations ($n = 785$) confirmed a four-factor solution (including ordinary violations, aggressive violations, errors, and lapses) of the DBQ. Errors, ordinary violations and aggressive violations were positively associated with accident involvement. However, lapses were not significantly associated with accident involvement. The results of structural equation modeling (SEM) further showed that, in addition to direct effects of background variables on accident involvement, several variables had indirect effects mediated by three-DBQ factors; ordinary violations, aggressive violations, and errors. Higher age, having more lorry driving experience, having higher educational attainment, and married drivers were indirectly related to less accident involvement. Annual driving mileage and the resting rate of drivers was both directly and indirectly related to accident involvement. Higher income and car ownership were directly related to fewer accidents. Interventions could aim to decrease ordinary violations, aggressive violations and errors among younger, less educated and single lorry drivers. Initiatives targeted to increase the scheduled resting frequency of lorry drivers may also hold promise.

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1. Introduction

Human factors are recognized as critical variables in the analysis of road traffic accidents (Lewin, 1982; World Road Association, 2003). Several studies have surveyed aberrant driving behaviour as a manner of explaining road accidents in

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the general driving population with standardized instruments such as the Driver Behaviour Questionnaire (DBQ). Among different groups of drivers, freight lorry drivers have certain characteristics and driving behaviours that may increase their risk exposure. For instance, most of them are male, drive in a work-related context with long work hours and tight schedules, generally spend more time in road traffic and the average age of lorry drivers is higher than in the general driving population (Copsey et al., 2010; Sullman, Meadows, & Pajo, 2002; Walton, 1999; Öz, Özkan, & Lajunen, 2010). Furthermore, heavy freight vehicles are more likely to have a higher fatality rate and injury risk in an accident than light transport vehicles (Copsey et al., 2010).

More specifically, road accident rates may be even more elevated in developing countries with low transport safety performance, where the road conditions, environment and safety of vehicles are not as developed as in more developed countries. For example, the World Health Organization (WHO) estimated a 32.1 death rate per 100,000 population (age-adjusted death rates) for Iran, which is substantially higher than the overall worldwide average rate of 16.5 (WHO, 2015). In Iran, heavy freight vehicle accidents were ranked second as the cause of death with 17%, after accidents by four-wheeled cars or light vehicles with 32% of the road traffic accidents in 2005 (Naseh, Kermanchi, & Sotoode, 2006). Hence, identification and quantification of the relationships between aberrant driving behaviour, background variables (i.e. annual mileage with a lorry, lorry driving experience, demographic and socioeconomic characteristics of drivers) and accident involvement of lorry drivers when driving a lorry themselves is interesting to focus in countries with low traffic safety performance, such as Iran. Lorry here refers to heavy trucks with three or more than three-axle single unit trucks (class 6–13 of the FHWA vehicle classification scheme).

1.1. Predictors of aberrant driving behaviour and road accidents in previous studies

Several previous studies have investigated driving behaviour, socio-demographic and work-related variables as potential explanatory factors of road traffic accidents. The DBQ is recognized as the most applied instrument for measuring aberrant driving behaviour and for predicting accidents (de Winter and Dodou, 2010; Af Wählberg, Barraclough, & Freeman, 2015). As shown in Table 1, most of the studies have used the extended 28- or 27-item DBQ in recent works. These studies mostly reported a four-factor solution for the DBQ including violations (rule or ordinary violations), aggressive violations, errors, and lapses (Gras et al., 2006; Harrison, 2009; Stephens and Fitzharris, 2016). Violations refer to an intention to behave against regulations related to safe driving (e.g. disregard the speed limit on a residential road). Aggressive violations refer to hostile motives to conduct aggressive driving (e.g. use your horn to indicate your annoyance to another road user). Errors are judged as a kind of driving mistakes including misjudgments and observational failures (e.g. brake too quickly on a slippery road), while lapses are defined through limitations in memory and attention (e.g. to forget where the truck was left in a truck park).

Previous studies found that ordinary violations (Gras et al., 2006; Rowe et al., 2015; Mallia, Lazuras, Violani, & Lucidi, 2015; Sullman et al., 2002), aggression and pushing-speeding as well as errors and lapses were associated with self-reported accident involvement or risk (Bener, Özkan, & Lajunen, 2008) (see also Table 1). Moreover, de Winter and Dodou (2010) meta-analyzed a total of 174 studies using the DBQ and found that age and driving exposure could be important predictors of violations and errors. Older drivers had fewer violations and errors, while driving exposure was positively related to violations and errors. Regarding background variables, younger drivers had a higher rate of accident involvement (Lourens, Vissers, & Jessurun, 1999; Sullman et al., 2002), while increased annual mileage increased the accident risk (Lourens et al., 1999; Davey, Wishart, Freeman, & Watson, 2007). However, several previous studies have not reported significant and definitive relationships between drivers' age, mileage, the level of education and accident risk (Newnam, Mammo, & Tulu, 2014; Nordfjærn, Jørgensen, & Rundmo, 2012; de Winter and Dodou, 2010; Gras et al., 2006; Oltedal and Rundmo, 2006).

1.2. Research gaps

A comprehensive review of previous studies (Table 1) showed that most of the research has been conducted in countries with good levels of safety. A large body of recent studies has tested the DBQ in Western European countries, such as Spain (Gras et al., 2006), Finland (Mattsson, 2012), Denmark (Martinussen, Hakamies-Blomqvist, Møller, Özkan, & Lajunen, 2013), the United Kingdom (UK) (Rowe et al., 2015), France (Guêho, Granie, & Abric, 2014), and Italy (Mallia et al., 2015). Several studies using the DBQ have been also conducted in New Zealand (Sullman et al., 2002), Australia (Davey et al., 2007; Newnam and VonSchuckmann, 2012; Stephens and Fitzharris, 2016), North America (Beanland, Sellbom, & Johnson, 2014; Cordazzo, Scialfa, & Ross, 2016), Eastern Europe (Kontogiannis, Kossiavelou, & Marmaras, 2002; Sucha, Sramkova, & Risser, 2014), and Eastern Asia (Xie and Parker, 2002; Shi, Bai, Ying, & Atchley, 2010). Very few, if any, studies have examined the applicability of the extended 27-item DBQ in rapidly developing countries in Asia, which could shed further light on the cultural generality regarding the operationalization of aberrant driving behaviour. Iran is an interesting case because this country has poor traffic safety levels and poor road facilities and conditions compared to most developed and high income countries (Mehdizadeh, Nordfjærn, Mamdoohi, & Shariat-Mohaymany, 2017). Warner, Özkan, Lajunen, and Tzamalouka (2011) also reported that different countries might have diverging aberrant driving behaviour, which highlights the need for testing the DBQ in new contexts.

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