Accident Analysis and Prevention 51 (2013) 33–41

Contents lists available at SciVerse ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

The relationship of dangerous driving with traffic offenses: A study on an adapted measure of dangerous driving

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ARTICLE INFO

Article history:
Received 4 April 2012
Received in revised form
11 September 2012
Accepted 22 October 2012

Keywords:
Dangerous driving
DDDI
Test adaptation
Predictive models

ABSTRACT

Using data from three different samples and more than 1000 participants, the current study examines differences in dangerous driving in terms of age, gender, professional driving, as well as the relationship of dangerous driving with behavioral indicators (mileage) and criteria (traffic offenses). The study uses an adapted (Romanian) version of the Dula Dangerous Driving Index (DDDI, Dula and Ballard, 2003) and also reports data on the psychometric characteristics of this measure. Findings suggest that the Romanian version of the DDDI has sound psychometric properties. Dangerous driving is higher in males and occasional drivers, is not correlated with mileage and is significantly related with speeding as a traffic offense, both self-reported and objectively measured. The utility of predictive models including dangerous driving is not very large: logistic regression models have a significant fit to the data, but their misclassification rate (especially in terms of sensitivity) is unacceptable high.

1. Introduction

Dangerous driving is a widespread phenomenon, hypothesized to be one of the main causes of traffic accidents (Dahlen and Ragan, 2004; Dahlen and White, 2006; Dula and Ballard, 2003; Iversen and Rundmo, 2002). In Romania, a study over the past four years (2008–2011) has shown that about 10,000 road accidents occur each year, claiming nearly 3000 deaths and over 9000 injuries (National Statistical Institute, 2011). Some of the main causes of these accidents are speeding, failure to yield right of way to pedestrians or to other vehicles, reckless driving, illegal overtaking, drunk driving and tailgating (Traffic Direction, 2011). Because most of these road behaviors can be labeled as dangerous driving behaviors, there is an acute need for properly developed or adapted research instruments that measure dangerous driving in Romania.

Dangerous driving consists of driving behaviors that endanger or have the potential to endanger others. Three dimensions of dangerous driving have been delineated: aggressive driving, risky driving and negative cognitive/emotional driving (Dula and Geller, 2003). Aggressive driving was defined as "any behavior emitted by a driver while driving, that is intended to cause physical and/or psychological harm to any sentient being" (Dula and Geller, 2003). The main behavioral manifestations of aggressive driving are: verbal aggressive expressions, physical aggressive expression and the usage of the vehicle for aggressive expression (Deffenbacher et al., 2002).

On the other hand, risky driving consists of deliberate risk-taking behaviors that endanger the safety of both the driver and of other road users. Behaviors such as speeding, general tailgating, frequent lane changing and running red lights are included in this class (Dula and Geller, 2003). Risky driving is different from both aggressive driving and negative cognitive/emotional driving because it may occur without any intention to harm and without the presence of negative emotions.

Negative cognitive/emotional driving includes emotions associated with anger, frustration and irritation related to driving. While the mechanisms that connect negative emotional driving to aggressive driving are still unclear, a meta-analysis shows that anger experienced while driving is positively related to aggressive road behaviors (Nesbit et al., 2007). Also, while not necessarily resulting in actual aggressive behavior, anger, frustration and related rumination are distractions which can interfere with the attention required for safe driving, thus increasing the risk of accidents (Willemsen et al., 2008).

Because various aspects of dangerous driving are of important practical and empirical concern, several instruments have been developed for the measurement of dangerous driving. These measures include the Driving Anger Scale (DAS, Deffenbacher et al., 1994), the Propensity for Angry Driving Scale (PADS, DePasquale et al., 2001) and the Driving Anger Expression Inventory (DAX,

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http://dx.doi.org/10.1016/j.aap.2012.10.014

Deffenbacher et al., 2002). While the first two scales measure driving anger (defined as a situation-specific form of trait anger), the last one measures aggressive driving.

A vast majority of research related to aggressive driving focuses on the structural, criterion-related and incremental validity of these measures. Different factor structures underlining a strong unidimensional domain factor were identified in several studies (Herrero-Fernández, 2011; Lajunen et al., 1998; Sullman, 2006), and positive links between aggressive driving and specific driving outcomes, such as accidents involved in or tickets received, were reported by several authors (Constantinou et al., 2011; Dahlen et al., 2012). The incremental validity of aggressive driving in predicting road safety criteria was supported by the amount of variance added to the prediction, after controlling for demographic variables and trait anger (Deffenbacher et al., 2004, 2007).

Dangerous driving is also related to age and gender. Younger drivers tend to drive more aggressively than older drivers, while women report driving less aggressively than men (Deffenbacher et al., 2002; Dula and Ballard, 2003; Herrero-Fernández, 2011; Shinar and Compton, 2004).

1.1. The current study

The Dula Dangerous Driving Index (DDDI, Dula and Ballard, 2003) was developed in order to assess dangerous driving in all of its three forms: aggressive driving, risky driving, and negative cognitive/emotional driving. So far, the psychometric properties of the DDDI have been studied in the U.S.A. (Dula and Ballard, 2003), Belgium (Willemsen et al., 2008) and France (Richer and Bergeron, 2011). The current study focuses on the structure of the Romanian version of the DDDI, as well as on results obtained with the DDDI in various samples in order to investigate the relationship of dangerous driving with a number of variables.

The first objective of the current study is to contribute to the transportation safety research literature by examining the relationships between dangerous driving, as measured by the DDDI in high-stake and low-stake assessment contexts, and traffic offenses (both self-reported and objectively measured), age, gender, professional driving and mileage. Research results in this area may contribute to the literature not only by replicating previous findings, but also because of the specificity of the samples employed: a national representative sample, and two "specialized" samples of learners and professional taxi drivers.

> Objective 1: Explore differences in dangerous driving in terms of age, gender, professional driving, mileage and traffic offenses, as well as the incremental interplay of these variables in a common prediction model.

When an adapted measure is used in research, and especially when data about that specific adaptation has never been offered before, good practice requires the analysis of the psychometric characteristics and equivalence of the adapted with the original measure (van de Vijver and Poortinga, 2005; ITC, 2008). This is why the second objective of the current study is the evaluation of the psychometric properties of the Romanian adaptation of the DDDI.

Several psychometric considerations are of substance when establishing the measurement utility of a test translation (e.g., Paunonen and Ashton, 1998; Piedmont and Chae, 1997). First, each scale in the adapted measure should be internally consistent and have adequate test–retest reliabilities. Second, evidence for construct validity should be provided: the measure should correlate rationally with other constructs and the scale intercorrelations and factor structure should be consistent with their rational placement and should replicate the factor structure reported on other populations. To this end, we examined the reliability (both internal consistency and test–retest), and the factor structure of the Romanian version of the DDDI. Such research into the cultural adaptation of measures is incrementally important. The results of the adaptation reported on here may have limited generalizability internationally, because Romanian is spoken in just one medium-sized European country, but such reports offer supportive evidence for the cross-cultural usability of the adapted measure, as well as good practice guidelines for cultural adaptations which may be done in the future in other countries.

> Objective 2: Explore the psychometric properties of the Romanian version of the DDDI, in terms of reliability, factor structure, and stability across different subsamples.

While the first objective supercedes the second in terms of potential scientific contribution, the results section focuses first on the DDDI as a measure, in order to then explore the relationship of dangerous driving, as measured by the DDDI, with other variables.

2. Methods

2.1. Participants

Sample 1. The sample contains 953 participants, among them 599 males (63%); the age of the participants ranged from 18 to 77 years ($M = 33.2$, $SD = 9.9$). The average age is higher ($t[951] = 8.47$, $p < .001$) for women ($M = 37.4$, $SD = 9.8$) than for men ($M = 31.9$, $SD = 9.5$). The sample is balanced with respect to education: about 25% of the sample has elementary education, 38% has average education and the rest holds an university degree. The number of years since when the participants hold a driver's license is 0–52 years ($M = 10.7$, $SD = 9.2$). A number of 223 (23.4%) of the participants declared themselves "professional drivers", which means that they hold a job as drivers or a job which requires driving as the main part of their activity; this sub-sample contains 92% males. The data was collected in voluntary work by early-career licensed psychologists, active in academia and in private practices, and participants were recruited on a voluntary basis and were not paid for their participation. Data was collected in paper-and-pencil form, in-home, in the psychologist's practice or, in some cases, in more informal settings, a procedure which was acceptable, given the shortness of the questionnaire. The data covers all 8 statistical regions and 29 of the 41 counties in Romania and is representative for the Romanian population in terms of gender, age and ethnicity. The sample underrepresents rural population, as only about 35% of the participants stem from the rural area, as opposed with 50% in the Romanian population. Also, high education is slightly over-represented with 37% of the participants. The representativeness of the sample is discussed in more detail in Dula et al. (2009).

Test–retest reliability coefficients in Table 1 have been computed based on a small sample of only 35 in-home assessed participants, 26 of them males and 6 of them professional drivers, whose first administration is included in Sample 1. Ages are between 20 and 55 years ($M = 28.3$, $SD = 9.8$), and their continuance as drivers is between 1 and 36 years ($M = 7.4$, $SD = 8.6$). The retest has been done at exactly 4 weeks from the first testing.

Of the 953 participants, 860 declared that they had not committed and had not received a ticket for a speeding offense during the past 12 months, while 93 declared that they had received at least one ticket for a speeding offense during the past 12 months. Among the 93 speeding offenders are 81 males and 13 females, 65 occasional and 29 professional drivers. Age ranged in offenders between 20 and 47 years ($M = 30.8$, $SD = 7.1$), and the number of years since these participants hold a driver's license is 0–35 years ($M = 8.9$, $SD = 7.0$).

Sample 2. The second sample consists of students in a driving school, who have been assessed with the DDDI while still taking