# Development of a short form of the driving anger expression inventory

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ABSTRACT

The present study developed a revised version of the driving anger expression inventory (25-items) and a short (15-item) version using data from 551 drivers. Split half factor analyses on both versions confirmed the original four factors; personal physical aggressive expression, use of a vehicle to express anger, verbal aggressive expression and adaptive/constructive expression. The two DAX versions were strongly correlated, demonstrating the suitability of both forms of the scale and the aggressive forms of expression were higher for drivers who reported initiating road rage interactions. Total aggressive expression was also higher for drivers who reported recent crash-related conditions, such as: loss of concentration, losing control of their vehicle, moving violations, near-misses and major crashes. The revised DAX and DAX-short provide shorter versions of the 49-item DAX that can more easily be combined with other questionnaires and require smaller sample sizes to analyse. Further research is required to validate these tools among different samples and populations.

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## 1. Introduction

Driving aggressively increases a driver's chances of becoming involved in a motor vehicle crash and also their chances of a serious crash. A survey of Irish drivers found that 40% shout or become angry behind the wheel on a weekly basis and 13% had left their car to confront another driver (Automobile Association Ireland, 2011). Moreover, in 2011 aggressive driving was a factor in 3% of all reported traffic crashes; 3% of minor crashes; 4% of major crashes and 7% of all fatalities in the UK (DfT, 2011). It is also likely that the actual contribution of aggression to traffic crashes is considerably higher, as crash statistics rely on a police officer being called to the scene and specifically noting aggression as a contributory factor. Moreover, anger can result in behaviours that are also independently considered to contribute to motor vehicle crashes, such as: careless, reckless or hurried driving, losing control of one's vehicle, sudden braking, excessive speed and close following (DfT, 2011). These are all behaviours that may be aggressive expressions of anger and are consistently found by researchers to result from driving anger (Deffenbacher et al., 2002; Stephens and Ohtsuka, 2014; Sullman et al., 2013). Indeed in studies not measuring

aggression directly, driving anger has been found to relate to self-reported crashes (Deffenbacher et al., 1994; Sullman and Stephens, 2013) and near crashes (Underwood et al., 1999) and to increase the likelihood of crashing in driving simulator scenarios (Deffenbacher et al., 2003; Stephens, Trawley, Madigan & Groeger, 2013; Stephens and Groeger, 2011).

The majority of self-report studies on the expression of driving anger have used the Driving Anger Expression Inventory (DAX; Deffenbacher et al., 2002). The most commonly used version of the DAX comprises 49-items and four factors, which are: verbal aggressive expression (VAE) – verbally expressing anger (e.g. yelling at the other driver); personal physical aggressive expression (PPAE) – using themselves to express anger (e.g. make hostile gestures); use of the vehicle to express anger (UoV) (e.g. drive a little faster); and adaptive/constructive expression (A/C) – constructive behaviours the driver can engage in (e.g. try to ignore it). These four factors have been found to have good internal reliability ($\alpha$ = 0.80–0.90; Deffenbacher et al., 2002). A total aggressive expression (TAE; summed scores for VAE, PPAE and UoV) is also used. The validity of the DAX has also been shown through correlations with self-reported driver aggression (see Deffenbacher et al., 2007).

The DAX has been administered to drivers from France (Villieux and Delhomme, 2010), Malaysia (Sullman et al., submitted for publication), Romania (Sarbescu, 2012), Serbia (Jovanović et al., 2011), Spain (Herrero-Fernández, 2011), Turkey (Esiyok et al., 2007) and the USA (Deffenbacher et al., 2002). Surprising, the

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DAX has not been administered in either of the two countries in the British Isles[1] (Ireland or the UK). Recently, Özkan et al. (2011) reported a cross-cultural study comparing aggressive driving behaviour among British, Dutch, Finnish and Turkish drivers. Aggressive expression was measured using a bespoke index, which did not include adaptive mechanisms to reduce anger. This omission is important as research using the DAX shows adaptive mechanisms are the most commonly reported response to driver anger. Furthermore, it is equally important to understand the trait or state factors influencing the use of positive coping strategies.

There have been a number of different structures used with the DAX. Initial development of the DAX produced a 53-item, five factor model, which included an additional four item factor labelled displaced aggression. However, low reliability of the factor led the authors to advise against use of this factor in future research (Deffenbacher et al., 2002). Recently, using Confirmatory Factor Analysis (CFA), Herrero-Fernández, 2011 found support for the longer five-factor model, which also included the *displaced aggression* factor. To achieve acceptable model fit, three items were dropped from the analysis. However, a 49 or 53 item scale is lengthy to administer, especially if used in conjunction with other scales. Further, given statistical assumptions regarding ratios of questionnaire items to number of participants, a large sample is required to appropriately analyse the longer form of the DAX.

Other researchers have reduced the number of factors in the model. For instance, Sarbescu (2012) reported a 30-item three-factor model, which combined verbal and physical aggression into one factor. However, these results are contentious as the researchers performed Principal Components Analysis and CFA on the same data using a relatively small sample. In contrast, using data from French drivers, Villieux and Delhomme (2010) reported a three-factor solution using only 11 of the original 49-items. These researchers removed all personal physical aggression expression items, but found a three factor solution that included: adaptive/constructive, Verbal aggressive expression and use of a vehicle to express anger. Nonetheless, some research has supported the four-factor model, but only obtained acceptable fit after deleting one or two items and allowing a large number of error-pairs to co-vary (Sullman et al., 2013; Sullman et al., submitted for publication), which suggests some degree of redundancy across the 49-items.

Although the DAX has been validated across a variety of different driving populations there is some inconsistency regarding the driver characteristics that relate to the propensity to become aggressive while driving. Some researchers have found that females report more adaptive/constructive means of reducing anger (Esiyok et al., 2007; Jovanović et al., 2011). Males tend to engage more often in personal physical aggressive expression (Dahlen and Ragan, 2004; Esiyok et al., 2007). However, others have found no sex differences (Villieux and Delhomme, 2010). It is unclear whether this represents underlying differences in driving populations, sampling techniques or is an artefact of the differing factor structures used.

Age has consistently been found to be related to driving aggression tendencies. Jovanović et al. (2011) found a significant negative relationship between age and the total of all the aggressive expression items. Furthermore, age was found to be negatively related to personal physical aggressive expression, use of a vehicle and verbal aggressive expression, while adaptive/constructive expression was positively related to age (Deffenbacher et al., 2007). Total aggressive expression and verbal aggressive expression were also both negatively related to age amongst Turkish taxi drivers (Sullman et al., 2013). In fact, with the exception of Moore and Dahlen (2008), most

**Table 1**
Descriptive variables.

| Variable | Mean (*SD*) | Range |
|---|---|---|
| Annual mileage (miles) | 9543 (7081) | 0–200,000 |
| Mean age (years) | 37.85 (12.93) | 18–75 |
| Average length of licence (years) | 17.15 (12.63) | 0–55 |
| Minor crashes[a] | 0.18 (0.67) | 0–10 |
| Major crashes[a] | 0.03 (0.21) | 0–2 |
| Near-misses[a] | 1.53 (3.38) | 0–50 |
| Summons[a] | 0.17 (1.15) | 0–25 |
| Lost concentration[a] | 6.22 (20.07) | 0–365 |
| Lost control[a] | 0.94 (2.37) | 0–30 |
| Experienced road rage[a] | 1.81 (2.40) | 0–20 |
| Engaged in road rage[a] | 2.10 (2.59) | 0–20 |

[a] Past twelve months.

previous research has found some relationships between age and the DAX subscales (Esiyok et al., 2007; Herrero-Fernández, 2011; Villieux and Delhomme, 2010).

Aside from the inconsistencies in item inclusion mentioned above, the length of the 49-item DAX makes it unwieldy, reduces the ability to combine it with other measures and necessitates large sample sizes. Therefore, the main aims of the present research were to revise and reduce the DAX and to validate these scales using a sample of drivers from the British Isles. A further aim was to examine age and gender differences across the sample to provide additional evidence about the contribution of these to driver aggression.

## 2. Method

### 2.1. Participants

A total of 551 drivers from the British Isles (males = 49%) completed the online questionnaire. Of these, 52% were from the UK and 48% from the Republic of Ireland. Participants' had an average age of 38 (SD = 13) years, had held a driving licence for 17 (SD = 13) years and had an annual mileage of approximately 9543 (SD = 7081) miles (Table 1).

### 2.2. Materials

The 49-item four-factor DAX was used to measure how drivers express their anger whilst driving (Deffenbacher et al., 2002). This version was chosen as it is the most commonly used form of the DAX and the developers of the DAX had advised against the longer 53-item version. For each of the 49-items, respondents rate, on a four-point scale (1 = almost never, 4 = almost always), the frequency of each potential reaction to feeling angry while driving.

The 14-item Driving Anger Scale (DAS) provided an overall measure of trait driving anger (Deffenbacher et al., 1994). The DAS and the DAX have demonstrated moderate correlations (Deffenbacher et al., 2002) and as such the measure was included to support validation of the new forms of the DAX. Participants rate the level of anger elicited by each of the 14 potentially anger inducing situations on a five-point scale (1 = not at all, 5 = very much). Higher scores on the DAS indicate stronger tendencies towards anger while driving. The DAS short-form has demonstrated good internal consistency ($\alpha$ = 0.80; Deffenbacher et al., 1994). The validity of the DAS has been shown through correlations with Spielberger's (1988) Trait Anger Scale (Deffenbacher et al., 1994; Sullman and Stephens, 2013).

Six items from the Driving Survey (Deffenbacher et al., 2002), were used to measure how many times, in the last year, drivers had: been fined or prosecuted for a driving offence (excluding parking tickets), lost concentration, lost control of their vehicle, experienced a near-miss, had a minor crash or a major crash.

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[1] The British Isles is the geographic term for the group of islands off the north western coast of continental Europe, which includes the UK and Republic of Ireland.