



# The moderating effect of trait anxiety on anxiety-related thoughts and actions whilst driving

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## ABSTRACT

Whilst there is evidence for the impact of driving anxiety on behaviour, less exists for the impact of trait anxiety and what does exist is inconclusive. The current study explored the possibility that trait anxiety interacts with driving anxiety to impact the frequency of negative on-road thoughts and behaviours. An online survey was administered to drivers, and the State-Trait Inventory for Cognitive and Somatic Anxiety, the Driving Cognitions Questionnaire, and the Driving Behaviour Survey, were completed. Moderation analyses suggested that in addition to an increase in social concerns and aggressive responses, high trait anxiety reduced positive associations between driving anxiety and exaggerated safety-cautious behaviours, as well as the general use of maladaptive reactions to stressful situations. As scores on these subscales were still higher regardless of the reduced associations, it is argued that both drivers with a generally anxious personality and those with high levels of driving-specific anxiety should be made aware of their potential to violate traffic norms in stressful situations.

## 1. Introduction

According to research and national statistics (Department for Transport, 2014; Dula & Geller, 2003), negative emotions increase the likelihood of dangerous driving behaviours and crash involvement. The UK's Department for Transport revealed that over 5000 crashes in 2013 were preceded by negative emotional experiences behind the wheel, with 1900 of these accounted for by nervousness, uncertainty or panic. This suggests that emotions associated with anxiety may be a significant risk factor for traffic crash involvement.

Those with an anxious driving style tend to feel distress and anxiety when driving, and express a lack of confidence in their skills (Taubman-Ben-Ari, Mikulincer, & Gillath, 2004). Whilst they often report lower levels of sensation-seeking, suggesting a reduced risk of crash involvement due to avoidance of high-risk situations (Ulleberg, 2001), empirical evidence suggests that this subgroup may be more dangerous on the road. Those associated with this driving style have shown lapses in attention and memory (Lucidi et al., 2010), a greater number of on-road errors (Taylor, Deane, & Podd, 2007), and a greater likelihood of crash involvement (Marengo, Settanni, & Vidotto, 2012).

Those with driving anxiety may perceive their abilities as insufficient to deal with the environment they have encountered, resulting in increased stress and use of emotion-focused coping (Lazarus & Folkman, 1984). Transportation research confirms this suggestion by

demonstrating that increased levels of stress contribute towards increased errors, lapses, and dangerous driving (Ge et al., 2014; Rowden, Matthews, Watson, & Biggs, 2011). However, recent evidence has also acknowledged the relationship between personality and the appraisal-emotion relationship; neuroticism, a trait associated with anxiety, has demonstrated a moderating and exacerbating relationship between appraisals and negatively valenced emotions (Tong, 2010). Thus when evaluating the ways in which drivers cope with stressful situations, the role of personality should not be ignored.

Yet there is a lack of focus in, or consensus on, the relationship between trait anxiety and driving. Whilst self-report evidence associates higher trait anxiety with more violations, errors, and lapses (Pourabdian & Azmoon, 2013; Shahar, 2009), behavioural research looking at areas such as hazard perception (Barnard & Chapman, 2016) and speeding compliance (Stephens & Groeger, 2009) have found it has either no detrimental effects, or actually make drivers safer.

It is possible that trait anxiety, rather than consistently affecting driver behaviour, has more of an impact on the negative thoughts associated with driving. Processing theories such as Attentional Control Theory (Eysenck, Derakshan, Santos, & Calvo, 2007), propose that an increased occupation with worrisome thoughts reduces processing efficiency without necessarily impacting behaviours. Research into how this is associated with driving is limited, although it does accord with the observation that trait anxiety is associated with increased reaction

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times on *n*-back tasks as well as increased errors and lapses (Wong, Mahar, & Titchener, 2015).

Recent questionnaires assessing the effects of anxiety on driver behaviour have referred to some of the principles discussed within Attentional Control Theory. For example, recent research looking at the Driving Cognitions Questionnaire (DCQ- Ehlers et al., 2007) acknowledged the high probability of trait anxiety producing a higher frequency of dysfunctional thoughts in phobic participants (da Costa, de Carvalho, Cantini, da Rocha Freire, & Nardi, 2014). Furthermore, the Driving Behaviour Survey (DBS- Clapp et al., 2011) includes a subscale on anxiety-based performance deficits, defined as behaviours that occur due to an increase in worrisome or anxious thoughts that increase cognitive load. Notably, some of the previously discussed research emphasised an association between an anxious driving style and lapses in attention, suggesting that the principles of the theory could apply to anxious drivers, as well as those with dispositional anxiety.

What has received less focus in the literature is the way in which trait and state anxiety may interact with each other. This issue was highlighted in a recent review on anxiety (Wilt, Oehlberg, & Revelle, 2011). It was suggested that the dichotomisation of anxiety into these two dimensions may result in the potential to reduce our understanding of how they exist in a concurrent fashion. The idea of interaction has been supported more recently in research into phonological and set-shifting processing efficiencies (Edwards, Edwards, & Lyvers, 2015, 2016). Research within the field of transportation would benefit from a similar integration of personality and state. Whilst previous research has investigated the relationship between trait and driving anxiety, this has merely confirmed the existence of higher trait anxiety in those with driving anxiety (Taylor et al., 2007), without further exploration of the relationship between the two.

The present study explores the potential influences of both driving anxiety, as well as trait anxiety, on the frequency of negative thoughts and behaviours on the road. This was achieved using an online survey. We investigate whether the previous suggestions from Wilt et al. (2011) could be observed within an applied context. Additionally, we provide data to help practitioners understand whether the frequency of specific thoughts and actions is additionally affected by an anxious personality, rather than simply being anxious about driving. Based on the previous literature, it was hypothesised that trait anxiety could have a moderating effect on the frequency of negative thoughts associated with driving, as well as potentially on behaviours associated with worrisome or anxious thoughts.

## 2. Methods

### 2.1. Participants

Participants were approached using social media invitations, advertising on a local newspaper website, advertising on a local study recruitment website, and through a University volunteering database. The study was completed online, and a total of 320 participants with full driver's licences expressed interest in the survey by going to the web link associated with the survey; however, only 227 completed their responses, resulting in a 71% retention rate (149 females, 76 males). Their ages ranged from 17 to 81, with an average age of 35 ( $sd = 18.44$ ). The majority were in employment or full-time study (80.2%), whilst the remainder of the sample was retired or unemployed (17.2%). Participants had held their full driving licence for 15.19 years ( $sd = 16.79$ ), and drove 6229.22 miles per year ( $sd = 5904.19$ ). Most reported driving at least a few times a week (69.46%). Ninety-five reported previous involvement in a crash in which they were the driver (41.85%).

### 2.2. Software

The survey was compiled and distributed to participants using

LimeSurvey version 2.05, an online open source software tool which can be used to create and publish surveys, as well as compile respondent statistics and collate responses for analysis.

### 2.3. Measures

#### 2.3.1. Demographic variables

The survey initially consisted of a standard information sheet and consent form, after which questions were asked regarding demographics and general driving behaviour. These included questions on licence duration, annual mileage and crash history. Once these had been completed, participants completed the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA-Grös, Antony, Simms, & McCabe, 2007), the DCQ, and the DBS.

#### 2.3.2. State-Trait Anxiety for Cognitive and Somatic Anxiety

The STICSA is a 42-item questionnaire, 21 of each measuring state and trait anxiety. Items are distinguished according to whether they measure cognitive (10 items) or somatic symptoms of anxiety (11 items). Items are administered on a 1 to 4 Likert scale, with 1 meaning 'not at all' and 4 meaning 'very much'. Total scores for state and trait range from 21 to 84. In all cases, a higher score indicates higher anxiety levels. However, to measure the effects of driving anxiety, the phrasing of the state STICSA was changed; instead of asking participants how they felt "at this moment", they were asked how they felt whilst driving. Whilst previous research has used the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) to obtain anxiety measures, recent research has suggested that the STICSA is more strongly correlated with anxiety than the STAI (Grös et al., 2007). Average driving anxiety scores were 29.43 ( $sd = 10.93$ ) and average trait anxiety scores were 31.8 ( $sd = 11.3$ ). Cronbach's  $\alpha$  was 0.946 for driving anxiety, and 0.941 for trait anxiety, indicating good internal consistency.

#### 2.3.3. Driving cognitions questionnaire

The DCQ is a 20-item questionnaire designed to assess the frequency of concerning thoughts whilst driving. Six items address social concerns, seven address accident concerns, and seven address panic concerns. Items are administered on a 5-point Likert scale, with "0" meaning "Never", and "4" meaning "Always". A minimum score of 0 and maximum score of 28 can be obtained for accident and panic concerns, whilst a maximum score of 24 can be obtained for social concerns. An overall maximum score of 80 can be obtained. In the current study, average scores for social, panic and accident concerns were 5.17 ( $sd = 4.9$ ), 1.98 ( $sd = 3.48$ ) and 6.34 ( $sd = 5.26$ ) respectively, whilst the overall average score was 13.49 ( $sd = 12.26$ ). Overall Cronbach's  $\alpha$  was 0.941, and for social, accident and panic concerns were 0.866, 0.897, and 0.888 respectively.

#### 2.3.4. Driving behaviour survey

The DBS is a 21-item questionnaire measuring the frequency of driving behaviours associated with a hypothetically stressful driving situation on three subscales consisting of seven items each. Anxiety-based performance deficits (ABPD) are related to changes in driving performance due to an anxiety-induced increase in cognitive load and include behaviours such as lane drifting and inappropriate speed adjustments. Exaggerated safety-cautious behaviours (ESCB) increase the perceived safety of a situation by maintaining larger headway distances and unnecessarily slowing down at traffic lights. Finally, the aggression subscale evaluates the 'fight' aspect of the fight-or-flight response and includes behaviours such as swearing and pounding on the steering wheel. Items are administered on a 7-point Likert scale, with 1 meaning "Never" and 7 meaning "Always". Item scores are averaged, meaning that for each subscale participants can obtain a minimum score of 1 and a maximum score of 7; this same principle is applied to the overall DBS score. Average scores for ABPD, ESCB behaviours, and aggression were

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