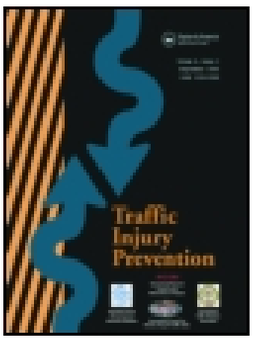

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# What is the relationship between self-reported aberrant driving behaviours, mindfulness and self-reported crashes and infringements?

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## Abstract

**Objectives:** This study investigated the relationship between self-reported aberrant driving behaviours, mindfulness and self-reported crashes and infringements. **Methods:** Three hundred and eighteen participants (M = 46.0 years, SD = 13.7 years; Female: 81.8%) completed an online survey that assessed aberrant driving behaviours, mindfulness (including regular mindfulness meditation [MM]) and self-reported crashes and infringements across the past two years. Structural Equation Modelling (SEM) was used to examine the relationship between self-reported aberrant driving behaviours and mindfulness simultaneously, as well as with participants' age and estimated kilometres driven over the past year. **Results:** The results of the SEM showed that mindfulness was negatively related to each self-reported aberrant driving behaviour, with the strongest relationships being between mindfulness and driving-related lapses (-0.58) and errors (-0.46). Participants who practice MM had significantly fewer crashes in the past two years and reported significantly fewer driving-related violations and lapses compared to participants who did not practice MM (crashes: 9.3% vs. 18.8%, $p<0.05$; violations: M = 6.66 [SD = 3.44] vs. M = 7.68 [SD = 4.53], $p<0.05$; errors: M = 5.17 [SD = 3.44] vs. M = 6.19 [SD = 4.12], $p<0.05$). **Conclusions:** More research is needed to understand whether MM results in more mindful and attentive drivers or whether individuals who practice MM may have other traits or behaviours that are linked to improved safety.

## Introduction

Aberrant driving behaviours pose a threat to road safety (Singh, 2015; Gras et al., 2006; Parker et al., 1995; Rimmö & Åberg, 1999; Singh, 2015). Reason, Manstead, Stradling, Baxter and Campbell (1990) developed the Driving Behaviour Questionnaire (DBQ; Reason, Parker, Stradling, 1990) to measure types of aberrant behaviours that increase crash risk. A common version of the DBQ contains four broad types of dangerous behaviour: violations, aggressive violations, errors and lapses (Lawton et al., 1997; Stephens & Fitzharris, 2016). These have been associated with increased crash risk (Parker et al., 1992).

Aberrant driving behaviours have different psychological origins (Reason, et al., 1990). While errors and lapses have been found to coincide with reductions in driver attention, violations have been associated with deliberate behaviours that contravene driving laws (Stephens & Fitzharris, 2016). The construct of 'mindfulness' may help to increase drivers' attention to the roadway and to adopt safer driving styles, thereby reducing aberrant driving behaviours and their associated crashes. Although various definitions exist, mindfulness is often described as an individual's ability to focus their attention on the present moment in a non-judgemental manner (Brown & Ryan, 2003). Relevant to driving, mindfulness meditation (MM) has been shown to be associated with increased situation awareness (Kass et al., 2011), reduced engagement in mobile phone use (Feldman et al., 2011; Terry & Terry, 2015), predictive of speeding behaviour (Abdul Hanan, King & Lewis, 2010), and may be related to aberrant driving behaviours (Barraclough, 2017; Burdett, Charlton & Starkey, 2016). For example, Barraclough (2017) used a 20-item 3-factor (violations, speed/aggressive violations, errors) DBQ and examined the relationship between aberrant driving behaviours (i.e., DBQ scores), mindfulness (i.e., Mindfulness Attention Awareness Scale [MAAS] scores, Brown & Ryan, 2003) and self-reported crashes and infringements. They found moderate negative relationships between DBQ and MAAS scores and weak relationships between MAAS scores and self-reported crashes and infringements. Burdett et al., (2016) also investigated the relationship between mind wandering, or task-unrelated thoughts, and scores on the DBQ (28-item version) and the MAAS. They found that all participants reported having task-unrelated thoughts while driving. They also found that higher levels of mind wandering were more likely to be reported by younger drivers, drivers with lower MAAS scores, and drivers with more frequent violations and lapses. In addition, MAAS scores were negatively related with DBQ

scores.

Findings from Barraclough (2017) and Burdett and colleagues (2016) are based on participants' MAAS scores which allowed the authors to examine the role of self-reported frequency of mindful states in participants' psychological wellbeing. Measurement of an individual's actual engagement in MM, for instance as part of a training program or therapeutic intervention, has also been associated with their increased subjective wellbeing, metacognitive insight or self-awareness (Brown & Ryan, 2003), sustained and executive attention (Chambers, Lo & Allen, 2007), and reduced emotional reactivity (Ortner, Kilner & Zelazo, 2007). For instance, in relation to driving, MM and concentration techniques have been associated with increased situation awareness while driving (Kass et al., 2011). Hence, there are benefits to investigating whether MM, rather than participants' self-reported frequency of mindful states, are associated with reductions in driving errors and crash risk. The current study investigated the relationship between self-reported aberrant driving behaviours (e.g., DBQ scores), mindfulness and self-reported crashes and infringements. In addition, the study explored the relationship between MM, self-reported aberrant driving behaviours, and crashes and infringements.

## Material and methods

### *Participants*

Participants were eligible to participate if they: a) were aged 18 years and over; b) held a valid driver's license; c) were an 'active' driver (i.e., drove at least 2--3 times per week), and d) were proficient in English.

### *Materials*

Participants completed an online survey (approximately 15 minutes) which is described below.

*Demographic and Driving characteristics:* Participants provided information about their age, gender and education. They also responded to items about their licensing history, annual mileage, crash involvement and previous driving infringements.

Aberrant driving behaviour was measured using the 28-item DBQ based on Reason et al., (1990). The 28-item DBQ includes four broad categories of driver behaviour: violations, aggressive violations, errors and lapses (Özkan et al., 2010; Reason et al., 1990; Stephens & Fitzharris, 2016). Participants are asked to consider each item and indicate how frequently they have engaged in each behaviour on a six-point Likert

response scale (where: 0 = Never, 5 = All the time). Higher subscale scores equate to more frequent aberrant driving behaviour. The DBQ has good internal consistency (Composite reliabilities ranging from 0.79 to 0.89; Stephens & Fitzharris, 2016).

*Mindfulness:* Participants' mindfulness was measured using two scales – the MAAS (Brown & Ryan, 2003) and the Freiburg Mindfulness Inventory (FMI; Walach et al., 2006). The MAAS is a 15-item scale that measures participants' awareness of and attention to what is occurring in the present moment. Participants are asked to consider each item (e.g., 'I find it difficult to stay focused on what's happening in the present', etc.) and indicate how frequently they experienced each situation on a six-point Likert response scale (where: 1 = Almost always, 6 = Almost never). Higher average MAAS scores equate to higher levels of mindful attention and awareness. The MAAS is reported to have good internal consistency (Cronbach's alpha = 0.87; Brown & Ryan, 2003). The FMI is a 14-item scale that measures participants' mindfulness within generalised contexts. Participants are asked to consider each item (e.g., 'I am open to the experience of the present moment', etc.) and characterise their experience of mindfulness within the last seven days on a four-point Likert response scale (where 1 = Rarely, 4 = Almost always). Higher total FMI scores equate to higher levels of mindfulness. The FMI is reported to have good internal consistency (Cronbach's alpha = 0.86; Walach, et al., 2006).

*Current MM practices:* Participants were asked: if they had previously participated in a mindfulness course (where: 0 = No; 1 = Yes); if they currently practice MM on a regular basis (where: 0 = No; 1 = Yes); how often they practice MM on a five-point Likert response scale (where: 1 = Daily; 5 = Less than once per week), and the average duration of their MM practice (mins).

***Procedure***

The study was approved by the Monash University Human Research Ethics Committee (MUHREC). Participants were recruited through a range of online and social media advertising; including the MUARC Facebook page and Twitter feed, the Monash University Insider newsletter etc. In addition, given that one of the research aim was to explore the relationship between MM and self-reported aberrant driving behaviours,

crashes and infringements, participants were also recruited through Smiling Mind[1]. The advertising directed participants to an online survey link. In order to improve recruitment, participants who completed the online survey were able to opt into a draw to win an iPad Air 2.

***Data Analysis & Handling***

Missing data on DBQ items were treated with five percent trimmed mean imputation based for that item. This occurred for < 0.1 percent of the cells.

Descriptive statistical analyses were conducted to describe the sample. Bi-variate correlations explored the relationships between demographic characteristics, DBQ, MAAS and FMI scores. Mann-Whitney U tests were conducted to explore the relationships between DBQ and MAAS scores, and self-reported crashes and speeding infringements.

Structural Equation Modelling (SEM) was used to examine the model proposed in Figure A-1. To reduce the number of observed variables and for compatibility with the sample size (Little et al., 2002) composite variables were used as indicators for latent constructs of MAAS and DBQ factors of violations, errors and lapses. In each case, three indictors were assigned for each latent construct. For the MAAS, composite indicators included five items each. For the DBQ factors, composites included three, three and two items for violations, four, four and three items for errors and two, two and two items for lapses.

The SEM was conducted in IBM© AMOS© v.22 using Maximum Likelihood (ML) estimation. An initial assessment of the distribution of MAAS and DBQ items showed that a number were outside normal range for skewness and kurtosis. Mardia's normalized co-efficient on the full sample was also greater than 5.00, which indicated non-normal multivariate distribution. Given the distribution of the data, overall model fit was assessed with the Bollen-Stine p value obtained through bootstrap analysis on 2000 samples as suggested by Bollen and Stine (1992). Traditionally, a non-significant p value indicates model fit. However, significant p values are common with large sample sizes (see Byrne, 2013) and therefore other goodness of fit indices were used to assess model fit. These included: Chi-Squared ($\chi^2$), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) with 90% CI and pclose values. Acceptable model fit is

[1] Smiling Mind is a not-for-profit that has created a free mindfulness meditation app. Based in Melbourne, Australia, it had over 2 million downloads at the time of publication.

denoted by a non-significant $\chi^2$ statistic with values > 0.90 and > 0.95 indicating good and exceptional fit, respectively (Hu & Bentler, 1995). Acceptable RMSEA values equal or are less than 0.06 with a non-significant pclose (Hu & Bentler, 1999).

## Results

### *Demographic characteristics*

Three hundred and eighteen participants completed the online survey. As shown in Table 1, most participants were: middle-aged (84.1%; M = 46.0 years, SD = 13.7, Range = 18.0 -- 86.0 years), female (81.8%), married / defacto relationship (66.7%), and had completed an undergraduate or postgraduate university degree (27.4%, 44.0%, respectively). Most participants reported that they: drove a car / SUV / 4WD (99.1%), drove daily (57.2%), and had driven between 5,001 and 15,000 km in their vehicle over the past year (50.3%).

In terms of their licences, most participants reported that they held a car licence (96.9%), had not had their licence revoked or suspended (93.1%) and did not have a condition or restriction on their licence (79.9%). Of those participants who reported that they had their licence revoked or suspended, most reported that this was due to speeding offences (42.9%) or drink driving (33.3%). Of those participants who indicated that they did have a condition or restriction on their licence, most reported that the condition or restriction was having to wear corrective lenses while driving (93.5%).

Over the past two years, most participants reported that they had not been involved in a motor vehicle crash (83.6%) or an at-fault crash (93.1%), and had not been cited for failing to stop (94.3%), speeding (81.1%) or other driving infringements (94.7%). In terms of citations or other driving infringements, most participants reported having received an infringement for using a mobile phone while driving (23.5%), parking illegally (23.5%) or driving with an expired vehicle registration (17.6%).

### *Relationship between demographic characteristics, self-reported aberrant driving behaviours and mindfulness scores*

Participants' responses for the DBQ, MAAS and FMI are presented in Table 2 and the relationships between demographic characteristics (age and gender) and DBQ, MAAS and FMI scores are presented in Table 3.

Age was negatively correlated with DBQ violation scores; Older participants reported lower levels of

violations. Age was positively correlated with MAAS scores and FMI scores; Older participants reported higher levels of mindful attention and awareness in everyday life and in generalised situations. MAAS scores and FMI scores were negatively correlated with all DBQ subscales, however the relationship between MAAS scores and lapse and error subscale scores were strongest; Participants with lower levels of mindful attention and awareness in everyday life were more likely to report higher levels of errors and lapses. MAAS scores and FMI scores were positively correlated; Participants with higher levels of mindful attention and awareness in everyday life also reported higher levels of mindfulness in generalised situations. Gender was not significantly related to DBQ, MAAS or FMI scores.

***Relationship between MM, mindfulness scores, self-reported aberrant driving behaviours, crashes and infringements***

A significant proportion of participants reported that they had previously participated in a mindfulness course (45.8%, n = 142), and of those participants, over two thirds reported that they practiced MM (68.3%, n = 97). Most of these participants reported that they practiced MM daily (25.8%, n = 25) or 4--6 times per week (21.6%, n = 21), and that their MM lasted for an average of 16:20 minutes (SD: 14:01; Range: 3.0-85.0 minutes).

Participants' responses to the DBQ, MAAS, FMI and self-reported crashes and infringements were compared across participants who practiced MM and those participants who did not (see Table 4).

Participants who practiced MM reported significantly lower violation and error scores compared to participants who did not. Participants who practiced MM tended to have higher MAAS and FMI scores compared to participants who did not – however this difference failed to reach statistical significance. Participants who reported that they practiced MM were significantly less likely to report that they were involved in a crash while driving over the past two years compared to participants who did not. There were no other significant differences across the two groups. Interestingly, there were no significant differences in terms of age, gender, education level or participants' estimated kilometres driven in their vehicle over the past year between participants who practiced MM and participants who did not (age: $\chi 2$ (2) = 1.046, p>0.5; gender: $\chi 2$ (1) = 0.630, p>0.5; education: $\chi 2$ (5) = 4.898, p>0.1; estimated kilometres driven: (X(2) = 4.932, p > 0.05).

***Relationships between MAAS and self-reported aberrant driving behaviour***

Given that DBQ scores had stronger relationships with MAAS scores compared to FMI scores, DBQ scores and MAAS scores were examined simultaneously using SEM (see Figure 1). Crashes were originally included in the model, but given the small number of those who had crashed, this variable was removed. Age was also included in the model, given the significant correlations found between age with both MAAS scores and DBQ scores. Participants' estimated kilometres driven over the past year (i.e., mileage) was also included in the model as this has previously been found to be related to DBQ scores (Stephens & Fitzharris, 2017). The SEM showed good fit to the data: $\chi 2$ (109) = 234.92, $p<0.001$; CFI = 0.93; RMSEA = 0.06, 90% CI = 0.05, 0.07; pclose = 0.05; Bollen-Stine $p<0.001$. All composite indicators significantly loaded on their associated factor.

The final SEM is displayed in Figure 1. As expected, MAAS scores were negatively related to DBQ scores, with the strongest relationships being between MAAS and lapses (-0.58) and errors (-0.46). MAAS scores alone explained 21 percent of the variation in error scores, with neither age nor mileage contributing to the frequency of errors. Violation scores could be explained by lower MAAS scores, younger age and higher mileage. In contrast, 37 percent of the variation in lapses was derived from a combination of MAAS scores and age, with more frequent errors being reported by older, less mindful drivers.

Mann-Whitney U tests were also conducted to explore the relationships between DBQ scores, MAAS scores and self-reported crashes and speeding infringements. Although self-reported crashes were unable to be included in the SEM, it is important to understand if relationships exist between these variables. Table 5 shows that DBQ error and violation scores were significantly related to self-reported crashes; Drivers who had been involved in a crash reported more frequent errors and violations than drivers who had not been involved in crash. DBQ violation scores were also significantly related to speeding infringements; Drivers who had received a speeding infringement reported more frequent violations than drivers who had not received a speeding infringement. In addition, MASS scores were significantly higher for participants who had not received a speeding infringement compared to participants who had received a speeding infringement.

**Discussion**

This study aimed to investigate the relationship between self-reported aberrant driving behaviours, mindfulness and self-reported crashes and infringements. Aberrant driving behaviours were chosen to be a focus of this study because they are one of the main threats to road safety (Singh, 2015). Mindfulness was chosen to be a focus of this study because previous research has shown associations between MM and increased situation awareness (Kass et al., 2011), reduced engagement in mobile phone use (Feldman et al., 2011; Terry & Terry, 2015), and may be related to aberrant driving behaviours (Barraclough, 2017; Burdett, et al., 2016).

Self-reported aberrant driving behaviours were negatively related to mindful attention and awareness in everyday life and in generalised situations. The strongest relationship was between MAAS and DBQ lapse and error scores; Participants with lower levels of mindful attention and awareness in everyday life were more likely to report higher levels of driving-related errors and lapses. This finding is somewhat consistent with that reported by Barraclough (2017) who observed a significant, negative relationship between DBQ violation, speed/aggressive driving and error scores and MAAS scores. However, it should be noted that Barraclough used a shorter (20-item) version of the DBQ, with lapse items removed. The current findings are also consistent with that of Burdett et al., (2016) who also observed a significant, negative relationship between DBQ and MAAS scores.

When the relationships between DBQ and MAAS were examined simultaneously, as well as with participants' age and estimated mileage, MAAS scores were negatively related to DBQ scores, with the strongest relationships being between MAAS scores and lapses and errors. This suggests that participants with higher levels of mindful attention and awareness reported less frequent driving-related lapses and errors. This finding is consistent with previous research that has demonstrated that aberrant driving behaviours have different psychological origins (Reason et al., 1990). While errors and lapses have been found to be associated with reductions in driver attention, violations have been associated with deliberate behaviours that contravene driving laws (Stephens & Fitzharris, 2016). The findings from the current study suggest that more mindful drivers may be more likely to focus their attention on the roadway and are therefore less likely to commit driving-related lapses and errors (i.e., unintentional driving behaviours). Interestingly, MAAS scores alone explained 21 percent of the variation in error scores, with neither age nor

mileage contributing to the frequency of errors. Violation scores could be explained by lower MAAS scores, younger age and higher mileage. In contrast, 37 percent of the variation in lapses were derived from a combination of MAAS scores and age, with more frequent errors being reported by older, less mindful drivers. The finding that older participants were more likely to commit lapses, as opposed to violations, is consistent with the errors observed during on-road driving assessments of older drivers (Koppel et al., 2016; Koppel et al., 2017).

A second aim of the study was to explore the relationship between MM, self-reported aberrant driving behaviours, and self-reported crashes and infringements. Participants who reported that they practice MM tended to have higher MAAS and FMI scores compared to participants who did not – however this difference failed to reach statistical significance. In terms of the MAAS, this finding may be due the fact that several researchers have suggested that the MAAS may only measure one specific aspect of mindfulness (i.e., acting with awareness, Coffey & Hartman, 2008) because it does not measure the 'acceptance' component of mindfulness (Sauer et al., 2013), nor the non-judgmental awareness component of mindfulness (Baer, et al., 2006). In addition, participants who reported that they practice MM reported significantly lower levels of driving-related errors and violations and were significantly less likely to report that they were involved in a crash while driving over the past two years compared to participants who did not. We cannot say what the essential reason for the lower crash rate is from the present data, but it may relate to improved attention or that more mindful drivers are less likely to multitask, hurry less or have greater emotional regulation while driving. Conversely, participants who practice MM may have other traits or behaviours that are linked to improved safety. More research is needed to understand these relationships further and to inform the potential usefulness of designing, implementing and evaluating mindfulness-based interventions to modify driving behaviour.

Higher MAAS scores alone did not significantly discriminate between those participants who reported that they had and had not been involved in a crash; rather, MM was significantly related to lower crashes. While this finding seems paradoxical, perhaps the self-rating of trait mindfulness (how mindful the individual thought they were in daily life) was less important than actually practicing MM where the individual was actually making a consistent effort to focus or train their attention. More specifically, individuals may

overestimate their level of mindfulness whereas individuals who practice MM may be more conscious of, and more likely to report, their distractibility and so may not rate more highly on a mindfulness scale despite the fact that they are more mindful. More experimental research is needed to explore the specific type and duration of MM that will have the largest impact on reducing aberrant driving behaviours, and therefore crash risk. In addition, it should be noted that due to the similarity between some of the items on the DBQ and MAAS the correlation between the two will be obvious but possibly not causal, that is, although training in mindfulness can increase trait mindfulness, it may or may not change driving behaviour. More research is also needed to explore whether MM interventions are associated with reductions in other risky driving behaviours. For example, DBQ scores have different psychological underpinnings, with errors and lapses being unintentional behaviours, and violations being deliberate behaviours contravening road laws. The results of this study showed that MM was associated with significantly lower levels of both errors and violations, indicating that MM may have the ability to target both intentional and unintentional driving behaviours. It may be that MM targets the underlying thought processes behind intentional violation behaviours, such as negative schemas or judgemental thoughts that encourage unsafe behaviour. Furthermore, drivers who practice MM may be involved in fewer crashes due to increased emotional regulation and less hurrying, stress and rumination (default mental activity) which may impair executive functioning (Brown & Ryan, 2003; Feldman et al., 2011; Chang et al., 2004). As mindfulness has been shown to increase sustained attention (Chambers et al., 2007), MM may also reduce vigilance decrements caused by monotony during automated driving (Körber et al., 2015). More research is needed to understand these relationships further.

Several limitations should be noted. First, the findings regarding aberrant driving behaviours, crashes, infringements and MM practice are based on self-report. Previous research has shown that participants can minimise the extent of their socially unacceptable behaviours in their survey responses (Swann et al., 2005). However, underreporting of socially unacceptable behaviours is likely to have been reduced given that participants were assured of confidentiality and anonymity. Further, DBQ scores obtained in this study were similar to those reported in previous research (e.g., Stephens & Fitzharris, 2016). Future research should validate the self-reported responses with more objective measures such as those collected through

naturalistic driving study (NDS) methodology. Second, the sample was overrepresented with participants who were female and who had completed an undergraduate or postgraduate university degree which is not representative of the Australian driving population and therefore may limit the generalisability of these findings (ABS, 2017). While the current sample of participants is perhaps less than representative of the population, this limitation is an inherent problem with surveys of this kind, and best overcome by sophisticated stratified sampling techniques to arrive at weighted survey estimates. In addition, it should be noted that some participants were recruited through the Smiling Mind website and these participants may be different to participants recruited through other venues. Unfortunately, we did not collect information regarding participants' recruitment source and were therefore unable to compare these differences statistically. Third, while the current study investigated the simultaneous relationships between the MAAS and the DBQ, because the MAAS has been widely used in the area of driving behaviour, this analysis considered mindfulness as a single construct – whereas previous research has suggested that mindfulness is a multidimensional construct (Baer, et al., 2006; Bishop et al., 2004). Future research should specifically explore these relationships as a multidimensional construct. Finally, we were unable to include self-reported crashes and infringements in the SEM due to low frequencies. It will be important to explore the potential simultaneous relationship between mindfulness, aberrant driving behaviours, crashes and infringements with a larger sample (i.e., more power).

Overall, the results have demonstrated that participants who reported higher levels of aberrant driving behaviours, particularly errors and lapses, were more likely to report lower levels of mindful attention and awareness. In addition, participants who practice MM had significantly fewer crashes in the past two years and reported significantly fewer violations and lapses compared to participants who did not. More research is needed to understand whether MM results in more mindful and attentive drivers who are less likely to multitask, hurry less or have greater emotional regulation while driving, or whether individuals who practice MM have other traits or behaviours that are linked to improved safety.

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## Table 1: Participants' demographic and driving characteristics

| **Demographic characteristics** | | **% (n)** |
|---|---|---|
| Age group | Younger drivers (18 – 25 years) | 6.3% (20) |
| | Middle-aged drivers (26 – 64 years) | 84.1% (265) |
| | Older drivers (65+ years) | 9.5% (30) |
| | Missing | 0.9% (3) |
| Gender | Male | 17.9% (57) |
| | Female | 81.8% (260) |
| | Other | 0.3% (1) |
| Current marital status | Single | 23.0% (73) |
| | Married/Defacto | 66.7% (212) |
| | Separated/Divorced | 8.5% (29) |
| | Widowed | 1.2% (4) |
| Level of education | Intermediate (Year 10 equivalent) | 1.9% (6) |
| | VCE/HSC (Year 12 equivalent) | 6.9% (22) |
| | Technical/TAFE (including trade certificate/apprenticeship) | 4.4% (14) |
| | Diploma | 11.9% (38) |
| | Undergraduate degree | 27.4% (87) |
| | Postgraduate degree | 44.0% (140) |
| | Other | 3.5% (11) |
| **Driving characteristics** | | **% (n)** |
| Frequency of driving | Daily | 57.2% (182) |
| | 4-6 times per week | 33.0% (105) |
| | 2-3 times a week | 9.7% (31) |
| Estimated kms driven in their vehicle over the past year | Less than 5,000 km | 12.6% (40) |
| | 5,001 – 15,000 km | 50.3% (160) |
| | More than 15,001 km | 37.1% (118) |
| Type of vehicle most frequently driven | Car/SUV/4WD | 99.1% (315) |
| | Motorcycle | 0.6% (2) |
| | Van | 0.3% (1) |

| | | |
|---|---|---|
| Type of licence currently held (NB Possible to hold multiple licences) | C (Car) | 96.9% (308) |
| | R (Motorcycle/Trike) | 9.1% (29) |
| | LR (Light Rigid) | 3.5% (11) |
| | MR (Medium Rigid) | 1.9% (6) |
| | HR (Heavy Rigid) | 1.3% (4) |
| | MC (Any motor vehicle or combination) | 0.6% (2) |
| Conditions or restrictions on licence | No | 79.9% (254) |
| | Yes | 19.5% (62) |
| | Missing | 0.6% (2) |
| Licence revoked or suspended | No | 93.1% (296) |
| | Yes | 6.6% (21) |
| | Missing | 0.3% (1) |
| Over the past two years, involved in a crash while driving (including minor crashes) | No | 83.6% (266) |
| | Yes | 16.4% (52) |
| Over the past two years, involved in an at-fault crash while driving (including minor crashes) | No | 93.1% (296) |
| | Yes | 6.6% (21) |
| | Missing | 0.3% (1) |
| Over the past two years, cited for failing to stop at a stop sign or traffic signal (including red light cameras) | No | 94.3% (300) |
| | Yes | 5.7% (18) |
| Over the past two years, cited for speeding | No | 81.1% (258) |
| | Yes | 18.9% (60) |
| Over the past two years, cited for any other driving offences | No | 94.7% (301) |
| | Yes | 5.3% (17) |

## Table 2: Participants' responses to the DBQ, MAAS and FMI

| Participants' responses | n | Cronbach's α | Mean | SD | Range |
|---|---|---|---|---|---|
| DBQ – Lapses subscale (Max = 30) | 318 | 0.70 | 7.05 | 3.35 | 1.00-23.00 |
| DBQ – Violations subscale (Max = 40) | 318 | 0.72 | 7.39 | 4.31 | 0.00-23.00 |
| DBQ – Aggressive violations subscale (Max = 15) | 314 | 0.59 | 2.41 | 1.89 | 0.00-11.00 |
| DBQ – Errors subscale (Max = 55) | 316 | 0.78 | 5.94 | 4.06 | 0.00-24.00 |
| MAAS – Average score (Max = 6) | 314 | 0.91 | 3.67 | 0.80 | 1.53-5.87 |
| FMI – Total score (Max = 56) | 309 | 0.90 | 34.25 | 7.80 | 17.00-56.00 |

**Table 3: Correlation matrix for participants' demographic characteristics (age and gender) and DBQ subscale scores, MAAS average scores and FMI total scores[2]**

| | Age | Gender | DBQ - Lapses | DBQ – Violations | DBQ – Aggressive Violations | DBQ – Errors | MAAS | FMI |
|---|---|---|---|---|---|---|---|---|
| **Age** | - | -0.07 | 0.05 | -0.27*** | -0.09 | -0.07 | 0.22*** | 0.15** |
| **Gender** | - | - | 0.07 | -0.07 | -0.11 | -0.09 | -0.05 | -0.01 |
| **DBQ – Lapses** | - | - | - | 0.24** | 0.14* | 0.60*** | -0.45*** | -0.28*** |
| **DBQ – Violations** | - | - | - | - | 0.41** | 0.38** | -0.29*** | -0.22*** |
| **DBQ – Aggressive Violations** | - | - | - | - | - | 0.25** | -0.18** | -0.20*** |
| **DBQ – Errors** | - | - | - | - | - | - | -0.38*** | -0.27*** |
| **MAAS** | - | - | - | - | - | - | - | 0.67*** |
| **FMI** | - | - | - | - | - | - | - | - |

Gender codes were male = 1; female = 2;

* = p < 0.05,

** = p < 0.01,

*** = p < 0.001.



[2] Gender codes were male = 1; female = 2; * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

**Table 4: Participants' responses to the DBQ, MAAS and FMI and self-reported crashes and infringements across participants who report that they regularly practice mindfulness meditation and those participants who do not**

| | Participants who regularly practice mindfulness meditation | | Participants who do NOT regularly practice mindfulness meditation | | Statistics |
|---|---|---|---|---|---|
| | **n** | **M (SD)** | **n** | **M (SD)** | |
| DBQ – Lapses | 97 | 6.52 (3.21) | 213 | 7.27 (3.38) | $t(308) = 1.84$, $p = 0.07$ |
| DBQ – Violations | 95 | 6.66 (3.44) | 211 | 7.68 (4.53) | $t(234.31) = 2.16$, $p < 0.05$ |
| DBQ – Aggressive violations | 97 | 2.13 (1.66) | 213 | 2.47 (1.93) | $t(308) = 1.48$, $p = 0.14$ |
| DBQ – Errors | 96 | 5.17 (3.44) | 212 | 6.19 (4.12) | $t(217.05) = 2.28$, $p < 0.05$ |
| MAAS – Average score | 96 | 3.81 (0.74) | 210 | 3.62 (0.81) | $t(304) = -1.94$, $p = 0.05$ |
| FMI – Total score | 95 | 35.58 (7.89) | 207 | 33.70 (7.59) | $t(300) = -1.98$ $p = 0.05$ |
| | **No** | **Yes** | **No** | **Yes** | **Statistics** |
| | **% (n)** | **% (n)** | **% (n)** | **% (n)** | |
| Over the past two years, involved in a crash while driving (including minor crashes) | 90.7% (88) | 9.3% (9) | 81.2% (173) | 18.8% (40) | $X^2(1) = 4.52$, $p < 0.05$ |
| Over the past two years, involved in an at-fault crash while driving (including minor crashes) | 96.9% (94) | 3.1% (3) | 92.0% (195) | 8.0% (17) | $X^2(1) = 2.67$, $p = 0.10$ |
| Over the past two years, cited for failing | 93.8% (91) | 6.2% (6) | 94.8% (202) | 5.2% (11) | $X^2(1) = 0.13$, p |

| | | | | | |
|---|---|---|---|---|---|
| to stop at a stop sign or traffic signal (including red light cameras) | | | | | = 0.71 |
| Over the past two years, cited for speeding | 84.5% (82) | 15.5% (15) | 79.8% (170 | 20.2% (43) | $X^2(1) = 0.98$, p = 0.32 |
| Over the past two years, cited for any other driving offences | 97.9% (95) | 2.1% (2) | 93.4% (199) | 6.6% (14) | $X^2(1) = 2.77$, p = 0.10 |

**Table 5: Mean scores (SD) for DBQ subscales and average MAAS scores across self-reported crashes and self-reported speeding infringements received in previous two years**

| | Self-reported crashes | | | Self-reported speeding infringements | | |
|---|---|---|---|---|---|---|
| | Yes | No | z | Yes | No | z |
| | (52; 16%) | (266; 84%) | | (60; 19%) | (258; 81%) | |
| DBQ – Errors | 7.25 (4.34) | 5.69 (3.95) | 2.65, $p < 0.01$, $r = 0.15$ | 6.47 (4.85) | 5.82 (3.85) | 0.60, $p = 0.55$, $r = 0.03$ |
| DBQ – Lapses | 7.75 (3.51) | 6.91 (3.31) | 1.58, $p = 0.11$, $r = 0.09$ | 7.52 (3.95) | 6.94 (3.20) | 0.86, $p = 0.39$, $r = 0.05$ |
| DBQ – Violations | 8.87 (4.84) | 7.09 (4.14) | 2.31, $p = 0.02$, $r = 0.13$ | 9.35 (4.90) | 6.92 (4.02) | 3.58, $p < 0.001$, $r = 0.20$ |
| DBQ – Aggressive violations | 2.63 (1.68) | 2.37 (1.68) | 1.34, $p = 0.18$, $r = 0.08$ | 2.85 (2.00) | 2.31 (1.85) | 2.01, $p = 0.05$, $r = 0.11$ |
| Average MAAS | 3.48 (0.88) | 3.71 (0.78) | 1.79, $p = 0.07$, $r = 0.10$ | 3.47 (0.86) | 3.72 (0.78) | 2.07, $p = 0.04$, $r = 0.12$ |

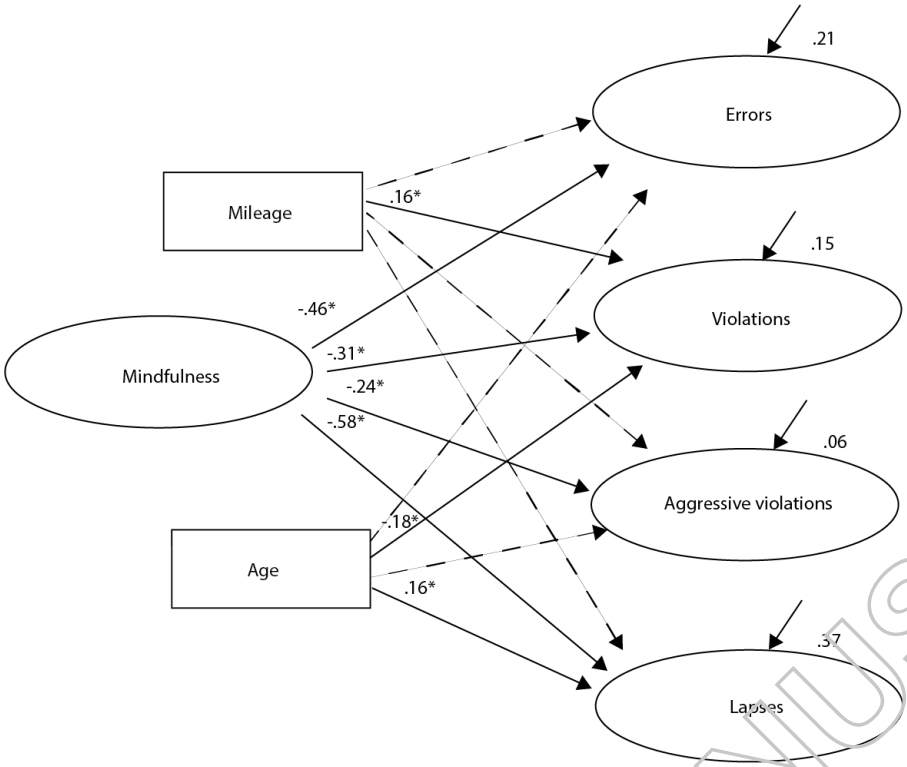


Figure 1: Relationships between Mindfulness (MAAS scores) and Driving violations, aggressive violations, errors and lapses (as represented by scores on the DBQ) showing standardised regression weights. Non-significant paths are displayed as dashed lines and not included in the final model. Disturbances for endogenous variables were correlated based on theoretical reasoning given the DBQ scale