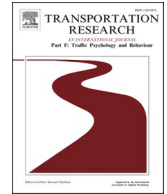


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Do you really want to hurt me?: Exploring the role of Narcissism, driver comparison and ego threat in driver aggression using a conceptual definition of aggression

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ABSTRACT

The present study examined the extent to which narcissism and driver comparisons contribute to driver aggression and aimed to determine whether these relationships were moderated by threats to one's driving ego. In doing so, the research sought to define and operationalise driver aggression by replicating how it is defined in the general aggression literature - as behaviour intended to harm. A total of 286 participants (188 women) were recruited from a community sample of Australian drivers who completed an online questionnaire and watched a video vignette showing a provocative driving event. As expected, narcissism and driver comparison predicted higher levels of driver aggression, and aggression was higher in conditions where a driver's ego was threatened. However, there was no interactive effect of ego threat and narcissism or driver comparison on driver aggression. Our findings have implications for the development of a consistent, theoretically grounded definition of driver aggression that focuses on intention to harm, and for the development of measures that operationalise the construct in this manner.

1. Introduction

Road crashes are a leading cause of death and injury worldwide with 1.25 million people killed each year (World Health Organisation, 2013, 2017). In Australia, road fatalities and injuries have economic costs estimated at 27 billion dollars per annum (Department of Infrastructure Regional Development and Cities, 2018). In 2014, approximately 35,552 people in Australia were hospitalised with non-fatal injuries due to road crashes, with this figure increasing to 37,082 in 2015 (Bureau of Infrastructure, 2018). Without effective, evidence-based interventions, road traffic crashes and their associated costs are expected to increase even further (World Health Organisation, 2017).

Road safety interventions to reduce crashes have traditionally focused on observable behaviours such as speeding, distraction (e.g., mobile phone use), and drink and drug driving. These studies typically examine deterrence-based interventions, such as fines and penalties, to dissuade drivers from engaging in dangerous on-road behaviour (National Road Safety Strategy, 2017; World Health Organisation, 2017). While such interventions are effective for observable driving behaviours, more subtle, covert behaviours such as

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driver aggression may require alternative interventions that target the psychological processes that give impetus to the behaviour (Smorti & Guarnieri, 2016).

1.1. Driver aggression

Driver aggression is a multifaceted construct that, relative to issues such as speeding or drink driving, has received comparatively little attention within the road safety literature (Lennon et al., 2011). However, it is a growing concern for motorists and evidence suggests it is strongly associated with increased crash risk and involvement, particularly in rear-end crashes (AAA Foundation for Traffic Safety, 2009; Przepiorka et al., 2014; Sullman et al., 2015; Zhang et al., 2017). One factor that makes driver aggression challenging to study is the definitional ambiguity surrounding the construct (Dula & Geller, 2003; Herrero-Fernández, 2013; Lustman et al., 2010; Vanlaar et al., 2008). Specifically, driver aggression research has been hindered by the lack of a universally accepted definition of the construct, resulting in a body of literature marred with extensive disparity in the way it is conceptualised, defined, and operationalised. As a result, establishing an accurate indication of the prevalence of driver aggression has been problematic, as prevalence rates will vary according to the definition adopted. For instance, Wickens et al. (2013) definition of driver aggression was based on violations of traffic laws and milder anger directed towards others. Alternatively, Mizell (1997) defined driver aggression as a continuum of behaviours ranging from mild (e.g., confrontations, roadside arguments) to extreme (e.g., malicious assaults or shootings).

This definitional ambiguity has also seen considerable variation in the terminology used to describe the construct emerge in the literature (e.g., road rage, driving anger, driver hostility). Although incidents of ‘road rage’ tend to be violent and receive more media attention, they appear to be rare (Dula & Ballard, 2003; Galovski & Blanchard, 2002; Lustman et al., 2010), with less than 18 percent of drivers surveyed in Australia reporting having instigated acts of driver aggression that involve violence, yet more than 70 percent reporting that they instigate milder behaviours (e.g., horn honking, rude gestures, tailgating; Australian Associated Motor Insurers, 2011, 2013). While milder forms of driving aggression may not pose a danger in isolation, their inherent danger lies in how they are responded to. If a horn honk is responded to with another ostensibly aggressive behaviour (e.g., a rude gesture), a “tit-for-tat” cycle could ensue, with behaviours escalating from minor to something more serious (Shaw, 2016; Soole et al., 2011).

To that end, in the absence of a universally accepted, conceptual definition of driver aggression, some studies appear to have adopted a behaviourist perspective by defining driver aggression according to a list of behaviours deemed aggressive (Dula & Geller, 2003; Soole et al., 2011). In doing so, these studies assume that these behaviours, such as tailgating, excessive speeding, and horn use, reflect underlying aggressive motivations (Dula & Geller, 2003). However, these behaviours can have many different motives that may or may not reflect underlying aggressive intentions. For instance, honking the horn after the traffic light turns green may be one driver’s polite gesture, intended to refocus a distracted driver, however, the same horn gesture may be intended to demonstrate frustration by another or even the same person on a different day. Therefore, it is important to consider the critical element of intent when determining if behaviour can be meaningfully regarded as aggressive (Allen & Anderson, 2017; Anderson & Bushman, 2002; Baron & Richardson, 2004).

A focus on the intention to harm in determining if behaviour can be regarded as aggressive aligns with how aggression is conceptualised in the general human aggression literature, where it is broadly defined as any behaviour directed towards another person that is intended to cause physical or psychological harm (Anderson & Bushman, 2002; Baron & Richardson, 2004; Shaver & Mikulincer, 2011). In the driving context, this may include drivers who try to irritate other drivers by speeding up excessively to overtake; or try to insult or somehow inflict psychological harm with verbal abuse or rude gestures (Smorti & Guarnieri, 2016; Zhang et al., 2017). As these examples show, it is the intention of the behaviour that distinguishes driver aggression from risky driving such as speeding or running red lights (Vanlaar et al., 2008; Zhang et al., 2017). Therefore, the current study defines driver aggression as any behaviour directed towards another motorist that is intended to cause physical or psychological harm and is associated with negative emotions (Shaw, 2016; Soole et al., 2011).

Much of the driver aggression research to date has focused on exploring demographic and other individual-difference predictors of the behaviour. Perhaps as a reflection of the definitional and methodological limitations that have hampered driver aggression research, this research is characterised by mixed, varied findings. For instance, Ellison-Potter et al. (2001) found gender, aggressive stimuli, and anonymity were associated with driver aggression, yet found no relationship between driver aggression and trait driver anger. Meanwhile, Dula and Ballard (2003) found that individuals with greater trait aggression and anger were more likely to show aggressive behaviours across numerous different scenarios and were, therefore, more likely to also be aggressive drivers. Alternatively, a meta-analysis by Nesbit et al. (2007) found an association between anger and driver aggression, however, found no relationship between vehicle crash risk and anger. Wickens et al. (2016) found that driver anger and aggression were associated with a higher crash risk comparable to other risky behaviours such as driving after substance use.

1.2. Narcissism

Of interest to the current research is trait narcissism, which has demonstrated a robust association with aggression in other contexts and has been shown to have increased in the general population in recent decades (Twenge et al., 2008). Narcissism is a personality trait associated with pervasive cognitive distortions of self-importance and grandiosity (Gentile et al., 2013; Ohmann & Burgmer, 2016; Zeigler-Hill et al., 2011). There is extensive research indicating that higher levels of narcissism are associated with higher levels of aggression. Locke (2009) found that aggression related positively to narcissism, and negatively to self-esteem, while Rasmussen (2016) found that narcissistic entitlement was a significant predictor of aggression. Further, Barnett and Powell (2016) found that

narcissism was positively associated with verbal and physical aggression and that self-esteem mediated the relationship between narcissism and aggression among females but not males.

Bushman and Baumeister (1998) proposed the theory of threatened egotism to account for the association between narcissism and aggression. The theory argues that those high in trait narcissism respond aggressively when they perceive their ego has been threatened to restore their self-image. The theory has received strong empirical support. For instance, Barry et al. (2006) explored the relationship between narcissism and aggression following performance feedback and found that aggressive responses were greatest when participants with higher levels of narcissism received negative feedback. A meta-analysis of studies examining narcissistic aggression by Rasmussen (2016) found that where ego is threatened, those high in trait narcissism are more likely to respond with provoked aggression, with a weighted average Spearman's rho of $\rho = 0.25$.

There is also some evidence demonstrating an association between narcissism and aggression in the driving context. Lustman et al. (2010) found that narcissism was a significant predictor of driver aggression, demonstrating that increased anger in those high in narcissism also increased aggression. Similarly, Przepiorka et al. (2014) investigated the association between narcissism, driver aggression, anger and vengeance, finding that narcissism was a significant predictor of aggression, vengeance, and driving anger, with individuals high in narcissism more likely to react vengefully and respond more frequently with aggression on the roads. Although it was not directly tested, Przepiorka et al. (2014) suggested that the theory of threatened egotism may be able to account for these findings.

Further, Edwards et al. (2013) examined the relationship between driver aggression and narcissism, and whether narcissism would predict driver aggression above driver anger and found that driving anger and narcissism were both significant predictors of driver aggression. Interestingly, despite driving anger being the stronger predictor, the relationship between narcissism and driving aggression was uniquely related beyond driver anger such that participants who scored high on trait narcissism reported stronger aggressive responses when provoked while driving, more so than those with driving anger (Edwards et al., 2013). These findings further lend support to the argument that those high in narcissism may misinterpret and perceive insults as a challenge to their favourable self-views and may therefore react aggressively to protect and restore their ego (Edwards et al., 2013). More recently, research by Bushman et al. (2018) and Dobrucali and Özkan (2021) also found bivariate associations between narcissism and driving aggression.

Considered collectively, there is evidence the association between narcissism and aggression extends to the driving environment, but the underlying mechanism that can account for this association in the driving context, such as the theory of threatened egotism, is underexplored. It is possible that when drivers high in narcissism feel criticized or somehow wronged by other motorists, they respond aggressively to “right the wrong”. Alternatively, some emerging evidence also indicates that driver aggression may be independent of narcissism and instead, related to drivers' self-perceptions of their own skills (Delhomme, 1991; Lennon & Watson, 2011; Lennon et al., 2011; Shaw, 2016).

1.3. Driver comparison

It is well-documented in the traffic psychology literature that, regardless of levels of narcissism, motorists underestimate the likelihood of being involved in a crash, overestimate their own driving skills, and compare their own driving performance more favorably to that of others (Delhomme, 1991; Glendon et al., 1996; Harré et al., 2005; Lajunen & Summala, 1995; Martinussen et al., 2014; Wohleber & Matthews, 2016). Research suggests these biases may be almost universal, with approximately 90 percent of Americans considering themselves as having above-average or better driving skills than other drivers, as well as 85 percent of New Zealand drivers and 60 percent of French drivers (Delhomme, 1991; Walton & Bathurst, 1998). Such biases have even been found in samples of expert or professional drivers, such as police drivers, where participants rated their skills as superior to equally qualified or experienced drivers (Waylen et al., 2004).

This phenomenon, often referred to as the illusion of superiority (Horswill et al., 2004) or the above-average effect (AAE; Wohleber & Matthews, 2016), has important implications for road safety, as it can generate a sense of invincibility that may undermine the effectiveness of road safety campaigns. For instance, Walton and McKeown (2001) found that drivers who reported stronger self-enhancement bias were more likely to believe road safety messages were intended for other drivers, rather than themselves. Unsurprisingly, these biases have also been linked to heightened potential for crash involvement and risky driving (Lajunen & Özkan, 2021; Măirean & Havarneanu, 2018; Williams, 2003). Harré and Sibley (2007) found that implicit and explicit attitudes toward one's driving ability were associated with greater crash-risk optimism, with males displaying a slightly stronger effect. Moreover, Horswill et al. (2004) found that such biases were most pronounced for hazard-perception skills, suggesting that drivers tend to most strongly overestimate their abilities in areas that relate to crash involvement. More recently, Wohleber and Matthews (2016) found that even after controlling for gender and risky driving, the above-average effect was linked to a greater number of driver errors.

There is emerging evidence to suggest that the perception of oneself as a superior driver may also be linked to driver aggression (Stephens & Ohtsuka, 2014). For instance, Măirean and Havarneanu (2018) found that the above-average effect was positively associated with driver aggression and that there were some moderating effects of driver aggression on the relationship between the above-average effect and risky driving. Using qualitative techniques, Shaw (2016) found that drivers who described engaging in an aggressive response to an on-road provocation also tended to perceive the driving skills of others as substandard and their own as superior. In finding that parallel the tenants of the theory of threatened egotism, Shaw also found that when these same drivers reported being the victim of driver aggression, they perceived the instigator's behaviour as an unjustified criticism of their driving skills, responding with their own aggressive behaviour to counter the perceived criticism.

Shaw's (2016) finding mirrors that of Lennon and Watson (2011), who also used qualitative methods to investigate underlying

motivations and cognitions for driver aggression. Lennon and Watson found drivers reported two different motives for their own aggressive behaviour, both of which suggest they perceive themselves as better drivers than the motorist it was directed towards. The first motive was to convey disapproval or criticism to the driver for their ostensibly poor driving behaviour (e.g., honking the horn at a driver to ‘teach them a lesson’ for not driving appropriately). The other motive was justified retaliation, which, like Shaw (2016), appeared to be used in situations where the instigating driver perceived the target driver’s provocation was a deliberate, yet unjustified provocation or criticism of their driving behaviour (e.g., perceiving that being tailgated was a criticism of their driving slowly and driving even slower in response to again, teaching the driver to not tailgate). In sum, there is evidence to suggest that drivers may respond aggressively when they feel criticized by a motorist whom, based on the literature regarding illusory beliefs, they are likely to perceive as subpar to them.

1.4. The present study

The present study aims to explore the extent to which both narcissism and driver comparisons of themselves to others contribute to driver aggression as individual constructs and to determine if these relationships are affected by threats to one’s driving ego. The conceptual models being tested are shown in Figs. 1a and 1b below. In doing so, the research also seeks to define and operationalise driver aggression in a manner that better aligns with how it is conceptualised in the general aggression literature, by focusing on the intention to harm.

It is hypothesised that trait narcissism and driver comparison will be positively associated with driver aggression, as measured by intention to harm. It is also hypothesised that ego threat will moderate the relationship between driver comparison and driver aggression. Specifically, when presented with an ego threat, those with (i) greater driver comparison; or (ii) greater trait narcissism, will report greater scores of driver aggression. Similarly, when presented with an ego threat, those with greater trait narcissism will report greater scores of driver aggression.

2. Method

2.1. Participants

A convenience sample of drivers was recruited from the general Australian driving population via paid and unpaid social media advertising. Participants were required to be over 18 years old, hold a valid open Australian driver’s license for a minimum of one year, and currently reside and drive in Australia. A total of 286 participants voluntarily completed the survey, 188 of whom were female, with 3 participants who preferred not to disclose their gender identity. Participant ages ranged from 19 to 77 years, with a mean age of 42.1 years ($SD = 13.27$ years). The study was described as investigating the role of personality and perception in driving in all advertising to avoid priming effects and minimise social desirability responding. Participants had approximately 23 years’ experience driving ($SD = 13.77$ years) and reported driving for approximately 10 h per week ($SD = 9.2$ h). Recruitment ran for six weeks in the middle of 2018. Participants were offered the opportunity to win one of three AUD\$50 Gift Vouchers as an incentive for completing the survey.

2.2. Design

To explore the effect of ego threat on driver aggression, the study used a quasi-experimental, between-groups design where the experimental manipulation was a potentially provocative driving event that could be perceived as a criticism of one’s driving skills. A between-groups design was chosen to reduce the threat of fatigue or order/history effects and reduce the likelihood that participants’ anger/ aggression may be affected by viewing more than one provocative event (Bettencourt et al., 2006). As participants only received one experimental condition, counterbalancing was not necessary. To reduce the likelihood of confounding participant characteristics, participants were randomly assigned to experimental conditions (Mitchel & Jolley, 2012).

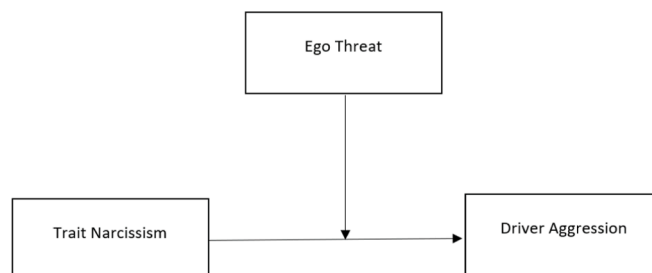


Fig. 1a. Conceptual Model the Association between Narcissism and Driver Aggression as moderated by Ego Threat.

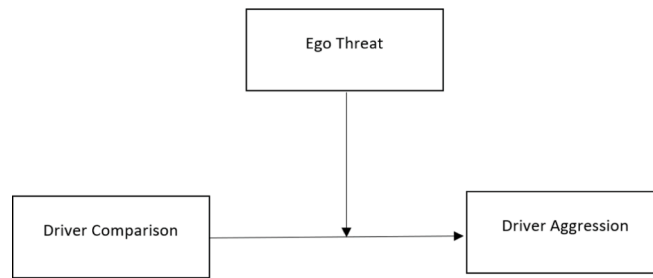


Fig. 1b. Conceptual Model the Association between Driver Comparison and Driver Aggression as moderated by Ego Threat.

2.3. Materials & procedure

First, participants completed the Narcissistic Personality Inventory – 13 (NPI-13; Gentile et al., 2013), which consists of 13 paired statements from the NPI-40 (Raskin & Terry, 1988; e.g., “I find it easy to manipulate other people”). The NPI-13 was selected over the full-length NPI-40 for its brevity to reduce survey fatigue. Cronbach’s α was acceptable at 0.63.

Several studies that have examined driver comparison have adapted measures such as the Driver Behaviour Questionnaire (Reason et al., 1990) or the Driver Skill Inventory (Lajunen & Summala, 1995). However, purpose-design measures also appear to be common (e.g., Horswill et al., 2004; Măirean & Havârneanu, 2018; Waylen et al., 2004). Given the strict 6-week data collection period and the length of our study, we also opted for a purpose-designed measure of driver comparison to ensure brevity and mitigate survey fatigue. We measured driver comparison (DCM; see Appendix 1 for items) using five items that asked participants to indicate how their driving compares to that of other motorists (e.g., “my driving skills are superior to that of other motorists”). Responses were measured on a 5-point Likert scale where 5 – ‘strongly agree’. As expected, an exploratory Principal Components Analysis on the DCM items showed a unidimensional solution, with the single component accounting for over 50% of the variance. Reliability of the DCM was good, with $\alpha = 0.75$. Participants then completed the Buss-Perry Aggression Questionnaire (AQ; Buss & Perry, 1992), which is a 28-item measure of trait aggression (e.g., “I have trouble controlling my temper”); $\alpha = 0.87$).

Ego threat was then manipulated using a video vignette with a short, written description accompanying the video. The video footage was obtained by placing a high definition ‘GoPro’ camera in the personal vehicles of two research assistants and filming their daily commutes to find potentially provocative events. The footage used in the study shows the car with the GoPro in it travelling behind a small truck in the right-hand lane of a two-lane suburban street, where the left-hand lane is about to end (thus requiring drivers in the left-hand lane to merge). After five seconds, a small silver hatchback appears in the left-hand lane, speeds up and abruptly cuts in front of the vehicle just as the lane ends, causing the driver to brake abruptly. Fig. 2 below shows a screenshot of this video. Additional screenshots of this video can be found in Appendix 1.

In the experimental condition, the accompanying written description states that seconds after the footage ends, the driver of the silver hatchback later yelled “learn how to drive” to the driver of the car with the GoPro. In the control condition, the driver of the silver hatchback does not interact with the driver. The accompanying written description that appeared before participants viewed their randomly allocated video can be found in Appendix 1. Seven items (see Appendix 1) were included as a manipulation check that asked participants to indicate the extent to which they believe their driving skills had been criticised by the driver of the silver hatchback (e.g., “I would feel like I’ve been reprimanded”). Participants responded to these items on a 4-point scale (4 – strongly agree).

Participants were asked to visualise themselves as the driver of the vehicle containing the camera and to imagine how they would react to the situation shown in the vignette, and why. Aggressive Driving Intentions (ADI) in response to the events in the vignette were then measured using responses to 13 purpose-design items adapted from Shaw (2016) that captured the underlying intentions for a response to an on-road event (i.e., whether participants would want their response to cause physical or psychological harm). Using this



Fig. 2. Screenshot of the provocative event used as stimulus material.

measure, participants were asked to think about their most likely response to the event and indicate the extent to which they would want their response to achieve 13 different outcomes (e.g., “make the driver feel threatened or intimidated”; “inconvenience or annoy the driver”). Reliability of the ADI was excellent, with $\alpha = 0.92$ and showed some evidence of construct validity through its correlation with AQ scores ($r = 0.36$). The ADI items can be found in [Appendix 1](#). Participants then provided basic demographic information and were thanked for their time. The study took approximately 20 min to complete.

3. Results

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics are displayed in [Table 1](#). A two-way Chi-square analysis found no significant relationship between gender type and the ego threat conditions, $\chi^2(3, N = 286), p = .319$, Cramer’s $V = 0.11$. Independent samples t -tests between age, NPI-13, DCM, and the ego threat conditions revealed no statistically significant differences.

Means, standard deviations, confidence intervals, and standard errors for the variables used in the study’s statistical analyses can be found in [Table 2](#). Correlations between the study’s predictor and outcome variables can be found in [Table 3](#). Where significant correlations were observed, they were positive, albeit weak ([Hills, 2011](#)). An independent samples t -test on the manipulation check data between the two conditions indicated that, as intended, the experimental group ($M = 16.97, SD = 3.93$) reported that they perceived the scenario as a greater threat to their ego, $t(284) = 9.75, p < .001$, than the control group ($M = 12.86, SD = 3.13, d = 1.15$). Therefore, the ego threat manipulation was considered successful.

An independent samples t -test examined whether ADI scores were significantly higher in the ego threat condition compared to the control condition. The results indicated a significant difference between the experimental and control groups, $t(282.30) = -2.93, p < .004$, such that the mean ADI scores were significantly higher in the experimental condition ($M = 22.96, SD = 8.29$) than in the control condition ($M = 20.28, SD = 7.15$), with a difference in means of 2.67, 95% CI [-4.47, -0.88]. This represented a medium effect size, $r^2 = 0.35$ ([Field, 2013](#); [Hills, 2011](#)).

Two moderation models were tested using the Hayes PROCESS Macro to examine the effect of ego threat on the relationships between driver comparison and driver aggression, narcissism, and driver aggression ([Hayes & Rockwood, 2017](#)). For the driver comparison model, the results indicated that the overall moderation model was significant and accounted for 6.75% of the variance in driver aggression ($R^2 = 0.0675$). There was a significant main effect of DCM on ADI and ego threat on ADI. However, the DCM \times Ego Threat interaction was not significant. The results are displayed in [Tables 4 and 5](#) respectively.

For the narcissism model, results indicated the overall model was significant and accounted for 5.03% of the variance in driver aggression ($R^2 = 0.0503$). There was a significant main effect of NPI-13 on ADI and ego threat on ADI. However, the NPI-13 \times Ego Threat interaction was not significant.

4. Discussion

Driver aggression is an increasing concern for motorists, with evidence suggesting that it is associated with increased crash risk ([Przepiorka et al., 2014](#); [Sullman et al., 2015](#); [Zhang et al., 2017](#)). While previous research has explored the influence of personality traits on driver aggression, limited research has examined the underlying psychological mechanisms that can account for these associations. Moreover, inconsistencies in the definition and operationalization of driver aggression have hindered the advancement of knowledge about the construct ([Dula & Geller, 2003](#); [Shaw, 2016](#)). The current study aimed to examine the extent to which narcissism and driver comparison contribute to driver aggression as individual constructs and to determine whether these relationships were moderated by ego threat, using a definition and operationalisation of driver aggression that better aligns with the key element of aggression: intention to harm. Considered collectively, the results of the study indicate that narcissism, driver comparison and, threats to driving ego all have weak to moderate, independent effects on driver aggression; however, there is no moderating effect of ego threat on driver aggression.

As predicted, trait narcissism was associated with higher levels of driver aggression as measured by intention to harm. This finding aligns with research showing that narcissism is a predictor of aggression in many contexts and extends on them to show that they are observed in the driving context, even when a measure that may better capture the underlying nature of aggression is used (e.g., [Barry et al., 2006](#); [Bushman & Baumeister, 1998](#); [Lustman et al., 2010](#)). While this association was significant, it must be noted that the effect size was low based on standard statistical conventions for interpreting effect sizes. However, although this association is low by statistical standards, it is not clear whether it is small with respect to the extant literature, as many earlier studies do not appear to report effect sizes (e.g., [Lustman et al., 2010](#)). [Bushman and colleagues \(2018\)](#) reported a moderate effect of narcissism and driving aggression using the NPI-40, while similar to the current study, [Przepiorka et al \(2014\)](#) also found narcissism to be a significant, yet

Table 1
Mean Age, Age Range, and Gender Across Total Sample and Ego Threat Conditions.

	<i>N</i>	<i>M</i> Age	(<i>SD</i>)	Age Range	Gender: U M F
Total Sample	286	41.95	(13.26)	19–77	3 95 188
No Ego Threat (Control)	138	41.20	(12.87)	19–77	1 49 88
Ego Threat (Experimental)	148	42.65	(13.62)	20–75	2 46 100

Note: U = Unknown as gender was not disclosed.

Table 2
Means, Standard Deviations, Confidence Intervals and Standard Errors for ADI, NPI-13 and DCM Variables.

Scale	M	SD	95% CI	SE
Total				
NPI-13	1.94	1.95	[1.72, 2.17]	0.12
ADI	21.67	7.86	[20.75, 22.58]	0.47
DCM	17.43	3.24	[17.06, 17.81]	0.19
No Ego Threat (Control)				
NPI-13	1.93	1.99	[1.60, 2.27]	0.17
DA	20.28	7.15	[19.08, 21.49]	0.61
DCM	17.25	3.21	[16.71, 17.79]	0.27
Ego Threat (Experimental)				
NPI-13	1.95	1.93	[1.64, 2.27]	0.16
DA	22.96	8.29	[21.61, 24.30]	0.68
DCM	17.60	3.27	[17.07, 18.13]	0.27
N = 286				

Note: NPI-13 = The Narcissistic Personality Inventory – 13; ADI- Aggressive Driving Intentions – 13; DCM = The Driver Comparison Measure.

Table 3
Bivariate Correlations between DA, NPI-13, DCM and Ego Threat.

Variable Name	Variable		Number	
	1	2	3	4
1. NPI-13	–			
2. ADI	0.13*	–		
3. DCM	0.16**	0.21**	–	
4. Ego Threat	0.01	0.17**	0.05	–

N = 286 *p < 0.05, **p < 0.01. Ego threat condition 0 = control (no ego threat) 1 = experimental (ego threat).

Table 4
Linear Moderation Model of DCM and Ego Threat Predictors of ADI.

Variable	b	SEb	t	p	95% CI
Driver Comparison					
Constant	21.67	0.45	47.73	p < .001	[20.77, 22.56]
Ego Threat (centred)	2.51	0.90	2.77	p < .006	[0.73, 4.29]
DCM (centred)	0.48	0.14	3.32	p < .001	[0.19, 0.76]
DCM × Ego Threat	-0.02	0.28	-0.09	p = .932	[-0.58, 0.53]
N = 286					

Note: DCM = The Driver Comparison Measure; Dependent Variable: ADI- Aggressive Driving Intentions; b = unstandardized b weight; SEb = standard errors; t = t distribution; CI = confidence interval.

Table 5
Linear Moderation Model of NPI-13 and Ego Threat Predictors of ADI.

Variable	b	SEb	t	p	95% CI
Trait Narcissism					
Constant	21.66	0.46	47.16	p < .001	[20.76, 22.57]
Ego Threat (centred)	2.66	0.91	2.91	p < .004	[0.86, 4.47]
NPI-13 (centred)	0.54	0.26	2.06	p < .040	[0.02, 1.06]
NPI-13 × Ego Threat	0.49	0.52	0.94	p = .349	[-0.54, 1.51]
N = 286					

Note: NPI-13 = Narcissistic Personality Inventory – 13; Dependent Variable: ADI- Aggressive Driving Intentions. b = unstandardized b weight; SEb = standard errors; t = t distribution; CI = confidence interval.

weak predictor of driver aggression. As such, it is possible that the association between narcissism and driver aggression, particularly when measured as the intention to harm, may only be a weak-moderate one. Alternatively, the small effect size in the current study could also be attributable to the low levels of narcissism observed in the sample. The current study chose the NPI-13 over the full-length NPI-40 for its brevity to reduce survey fatigue; however, found a mean narcissism score of 2, which represents less than a quarter of the total possible score. While it is acknowledged that the low scores could reflect social desirability responding, it is also possible that higher levels of narcissism and a more sensitive measure are required to show a stronger effect on aggression.

To that end, while the NPI-13 has been validated and shown good reliability (Gentile et al., 2013), an acceptable, yet low,

Cronbach's alpha was found in the current sample. A study by [Kajonius and Björkman \(2020\)](#) that looked at the effect of malevolent traits such as narcissism on perceived stress also found issues with the internal consistency of the NPI-13, reporting a Cronbach's alpha of $\alpha = 0.56$. Therefore, the NPI-13 may have issues with reliability in measuring narcissism in some samples, which could also account for the small effect size observed in this study. Nevertheless, the results do show that even at low levels of narcissism, weak effects on driver aggression are observed, though replicating the study using the NPI-40 may help to further elucidate the nature of the association.

Our prediction that driver's favourable comparison of their own skills would be positively associated with driver aggression was supported by the data. These findings lend support to the emerging body of literature that has linked favorable self-comparisons to driver aggression, even when utilising a measure that may better align with the underlying nature of aggression. In particular, our results corroborate the qualitative interpretations offered by [Lennon and Watson \(2011\)](#) and [Shaw \(2016\)](#). [Lennon and Watson \(2011\)](#) reported that, for drivers in their sample, the motivation for engaging in driver aggression appeared to be a desire to modify or manage the other motorists' ostensibly poor behaviour by criticising it, thus teaching them a lesson to not repeat the behaviour. [Shaw \(2016\)](#) also reported this same theme but also found that a common core belief among drivers who reported engaging in any act of aggression was that other drivers were substandard, rude, 'bad', drivers, implying that these drivers perceived their own driving skills to be better than that of other motorists.

Although our results support an association between driver comparison and aggression, the association was not moderated by ego threat, suggesting there may be other psychological mechanisms that can exacerbate aggressive responses. Consistent with [Lennon and Watson's \(2011\)](#) interpretation of their qualitative findings, it is possible that rather than seeking to restore one's own driving ego, driver aggression may be a corrective response such that drivers use aggression to modify 'bad' driving behaviour. Alternatively, there is some evidence linking just world beliefs (the perception that people get what they deserve) to driver aggression ([Nesbit et al., 2012](#)) and such beliefs may strengthen the association between favourable self-comparisons and driver aggression.

However, like the association between narcissism and driver aggression, the association between driver comparison and driver aggression was also low by statistical standards and it is not known how this effect size compares to previous studies. Although the driver comparison measure items used in the current study were reliable, they were purpose-designed for this study. It is possible that the small number of items used could partly account for the weak effect size. Future research could consider replicating our study by using more items or adapting validated measures, such as the Driver Behaviour Questionnaire or Driver Skill Inventory, to ask participants to compare their driving skills to those of others.

Further supporting the argument that driver aggression may be related to the tendency of drivers to compare themselves more favourably to other motorists, driver aggression was significantly higher in conditions where participants' driving skills were threatened or insulted. Interestingly, participants were shown the same provocative event (being cut off by another driver), but aggression in response to this was significantly higher in conditions where the accompanying written description stated that the offending motorist yelled an insult ("learn how to drive"). This suggests that there may not be specific types of driving events that elicit aggression, but rather, situations that involve an interpersonal provocation may be more predictive.

These findings are consistent with early driving aggression research but extend on them to take steps towards overcoming some methodological limitations. For instance, similar to the current findings, [Deffenbacher et al. \(2003\)](#) found evidence across three studies (field study diaries, driving simulations, and self-report surveys) that drivers high in trait anger reported greater levels of anger in response to another driver shouting at the participant for their driving behaviour ([Deffenbacher, Deffenbacher, et al., 2003](#); [Deffenbacher, Lynch, et al., 2003](#); [Deffenbacher, Petrilli, et al., 2003](#)). However, these studies appear to focus on driver anger rather than aggression. Although anger and aggression are closely related, anger does not always result in aggressive behaviour - a driver may feel anger, but not respond aggressively and instead vent their frustrations in another manner ([Lajunen & Parker, 2001](#)). Similarly, using an experimental design, [Ellison-Potter et al. \(2001\)](#) found that participants responded more aggressively to frustrating on-road events (e.g., multiple jaywalking pedestrians walking in front of participants during a simulated drive) when exposed to aggressive stimuli throughout the drive (e.g., aggressive messages on billboards). However, the authors operationalised driver aggression using the behaviourist approach, whereby specific behaviours (e.g., speeding), that may or may not reflect aggressive intentions, were considered to be indicative of aggression. For instance, some participants may have sped to complete the drive within the limited timeframe, without any intention to harm, or, some participants may have been sensation seeking, which evidence has linked to speeding ([Tay et al., 2003](#)). Therefore, the current results extend upon early driver aggression research by demonstrating that threats to ego do appear to be associated with aggression and not just anger, even when measured with a focus on intention to harm.

Our predictions that the relationships between narcissism, driver comparison, and driver aggression would both be moderated by threats to ego were not supported by the data. The lack of moderating effect could be due to discrepancies in how people report they are likely to behave and how they actually behave. A 2011 survey of Australian drivers asked respondents to indicate how they believe they should respond to provocative on-road events and how they actually respond ([Australian Associated Motor Insurers, 2011](#)). While 87% of drivers indicated that they should respond by either ignoring the provocation or signalling an apology, over 50% of those same drivers said they actually respond to provocations by verbally abusing the offending driver. Moreover, 82% of these drivers reported that they believe the response was justified. Extrapolating this to the results of the current study, drivers in this sample may have under-reported the extent to which they regarded the hypothetical situation as a threat to their ego and how they would respond to it in real life.

In the case of the narcissism-driver aggression association, these findings do not align with the extant literature, as it is well-documented that the relationship between narcissism-aggression increases in response to ego threats. This discrepancy could be accounted for by the fact that the current study operationalised aggression in terms of intent to harm. Many of the seminal studies that have shown that threats to ego increase aggression in those high in narcissism (e.g., [Bushman and Baumeister, 1998](#)) have used

experimental designs, where the operationalisation of aggression was somewhat ambiguous and was assumed to imply aggressive intent (e.g., administering a loud noise). Those high in narcissism may have had other motivations for engaging in what was deemed to be an aggressive act, that may or may not have reflected an underlying intention to cause physical or psychological harm.

Alternatively, the lack of moderating effect could be explained by the fact that, while there is still some debate, more recent directions in the narcissism literature are beginning to report two distinct manifestations of the construct, grandiose and vulnerable narcissism. Grandiose narcissism is characterised by behaviours such as exploitation, exhibitionistic behaviours, grandiosity, and more stable self-esteem, while vulnerable narcissism is characterised by self-criticism, interpersonal sensitivity, and negative emotional experiences and reactivity (Freis, 2018; Rose, 2002). The NPI, including the NPI-13 used in the current study, tends to measure the grandiose manifestation of narcissism, which, given its more stable self-esteem, may be less likely to perceive threats to ego and/or respond to a perceived threat with aggression compared to vulnerable narcissism (Brown et al., 2009; Miller et al., 2011; Rasmussen, 2016). As such, the lack of moderating effect could be explained by the fact that the study measured grandiose narcissism, when the vulnerable manifestation of it may hold more relevance in the driving context. Future research may benefit from exploring both types of narcissism, using the NPI-40 to measure grandiose narcissism.

4.1. Strengths and limitations

The current study has several strengths. Most notably, our attempt to use a definition of driver aggression that focuses on the underlying intention to harm and therefore, better aligns with how aggression is defined in general human aggression research, represents a strength (Baron & Richardson, 2004; Soole et al., 2011). Further, the use of naturalistic video footage as part of the stimulus materials represents a strength of the study. While video footage is still not the same as actually experiencing a provocative event in real life, and there are still limitations with the use of naturalistic footage, it is likely that the realism of the events presented to participants in these events was greater than if the same event was presented using just a written description.

There are also several limitations to the study that need to be considered. First, because the research explored thoughts and processes that are internal, it relies on data that is self-reported by drivers themselves. Given that it is human nature to present oneself in the best possible light, the results may be skewed by social desirability biases. While future research may want to consider incorporating measures designed to detect social desirability responding, such as the Marlowe-Crowne social desirability scale (Crowne & Marlowe, 1960), as both Shaw (2016) and Lennon and Watson (2011) highlight, acts of driver aggression are often regarded as justified retaliation to the poor driving behaviour of others. Therefore, while self-presentation biases are still likely to be present, it is possible that some drivers may not feel the need to adjust their descriptions of their on-road behaviour to appear more socially acceptable. Second, while the use of naturalistic footage represents a strength, the footage was only able to offer a limited perspective, as it was not able to capture sound and was only able to capture events occurring directly in front of the driver. The rear-view and side-view perspectives, in conjunction with audio cues that would ordinarily provide drivers with additional information to help contextualise driving events, could not be captured by this footage, which may impact how drivers interpreted the event. Third, as discussed earlier, while the NPI-13 does have evidence of reliability and validity in the wider literature, (Gentile et al., 2013) it returned a low mean narcissism score in this sample as well as an acceptable, albeit low, Cronbach's alpha. Finally, while our driver comparison measure and driver aggression measure served the purpose of this exploratory study, we acknowledge that the use of measures that have not undergone rigorous validation may limit the findings.

It has been 20 years since Dula and Gellar (2003) highlighted that a consistently applied, conceptual definition of driver aggression was lacking, and if not addressed, this would hinder the communication of scientific knowledge about driver aggression and dramatically slow our understanding of why the behaviour occurs. However, it appears that little progress has been made towards developing an agreed-upon, conceptual definition of the construct and there is still considerable heterogeneity in the terms used to define and describe driver aggression. For instance, Stephens et al. (2021) used the term driver aggression to describe a study that appeared to measure driver anger; Love et al. (2022) used the terms road rage and driver aggression interchangeably, but again, focused on anger, as did Aktaş and Annette Akgür (2022). While the information gained from these studies is certainly valuable, the key issue identified by Dula and Gellar in 2003 is still apparent, and definitional and operational inconsistency has thwarted progress toward an understanding of its causes. To advance current knowledge to a point where it can meaningfully inform interventions to reduce driver aggression, a consistent definition with a solid theoretical underpinning is required to guide a systematic investigation of the phenomenon. Therefore, it would benefit future research to focus on ensuring that the construct is robustly defined using a definition that captures the key elements of aggression and that a purpose-built, fully validated measure that operationalizes the construct is a priority.

5. Conclusion

The current study explored the extent to which both narcissism and driver comparison contributed to driver aggression and explored a possible moderation effect of ego threat on both relationships. Consistent with previous findings, driver aggression was found to be associated with narcissism and driver comparison, however, no moderation effect of ego threat was found. Therefore, further research is needed to identify other possible underlying psychological mechanisms that can account for why these may influence driver aggression. Implications include the development of a consistent definition and operationalisation of driver aggression to reduce differences in driver aggression results across the literature. Suggestions for future research include the use of the NPI-40 to measure narcissism and the use of a purpose-designed fully validated measure of driver aggression that operationalises the construct as the intention to harm.

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CRedit authorship contribution statement

Penelope Mithen: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft. **Oliver Briant:** Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Lauren Shaw:** Conceptualization, Methodology, Supervision, Project administration, Resources, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix 1:. Study materials

1a. Driver comparison measure items

1. I am a better driver than most other motorists on the road
2. I am a more considerate and courteous driver than other motorists
3. Most other drivers need to improve their driving skills
4. My driving is no better or worse than that of other drivers*
5. My driving skills are superior to that of other drivers

1b. Control condition written text (appears before the video)

The footage you are about to see was obtained by attaching a small camera inside the windscreen of a vehicle. The camera was left in the vehicle for a month while the driver went about their usual, everyday driving. The following situation occurred on a two-lane road in a suburb 20 min out of the Central Business District. It was a 60KM zone on a weekend. The driver of the vehicle containing the camera was obeying the road rules. When you're watching the footage, visualise yourself as the driver of the vehicle containing the camera. Imagine what it would be like to be in their position when this happened. How would you feel? What thoughts would be going through your head? How would you react? Picture yourself driving along the road and the following happens:

1c. Experimental condition written text (appears before the video)

The footage you are about to see was obtained by attaching a small camera inside the windscreen of a vehicle. The camera was left in the vehicle for a month while the driver went about their usual, everyday driving. The following situation occurred on a two-lane road in a suburb 20 min out of the Central Business District. It was a 60KM zone on a weekend. The driver of the vehicle containing the camera was obeying the road rules. Approximately 30 s after the video you will see ends, the driver of the silver Corolla yelled 'learn how to drive' to the driver of the camera vehicle. When you're watching the footage, visualise yourself as the driver of the vehicle containing the camera. Imagine what it would be like to be in their position when this happened. How would you feel? What thoughts would be going through your head? How would you react? Picture yourself driving along the road and the following happens:

1d. Video scenario

Start of video (0 s)



(continued on next page)

(continued)

Start of video (0 s)



5 s



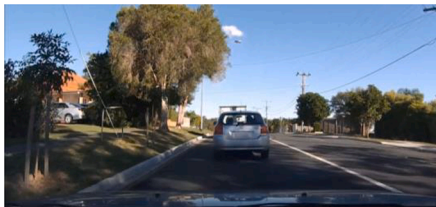
10 s



15 s



End of video (20 s)



1e. Manipulation check items

1. I would not be affected by this*
2. I would feel like my driving skills had been criticised
3. I would feel like I had been reprimanded
4. I would feel disrespected
5. I would feel like the driver had passed judgement on my driving
6. I would feel like I had been mocked
7. I would feel like the other driver blamed my driving skills

1f. Driver aggression items

1. Indicate to the driver that you don't approve of their behaviour
2. Alert, or warn the driver to a dangerous situation
3. Communicate your thoughts about the behaviour to the other driver
4. Indicate to the driver that they need to amend their driving immediately
5. Encourage the other driver to reconsider or think about their driving behaviour in future

6. Send the driver a message concerning their poor driving behaviour
7. Inconvenience, or annoy the other driver
8. Threaten or intimidate the other driver
9. Give the other driver a fright
10. Antagonise or irritate the other driver
11. Show the other driver how you feel about their driving behaviour
12. Let out your frustrations/anger
13. Criticise the other driver's behaviour

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