

Do drivers respond emotionally and behaviourally differently to an intentionally anger provoking driving situation than to an ambiguous, but potentially provocative, one? Results of a self-report survey.

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Abstract

Aggressive driving is considered an important road-safety concern for drivers in highly motorised countries. However, understanding of the causes and maintenance factors fundamental to aggressive driving is limited. In keeping with theoretical advances from general aggression research such as the General Aggression Model (GAM), research has begun to examine the emotional and cognitive antecedents of aggressive driving in order to better understand the underlying processes motivating aggressive driving. Early findings in the driving area have suggested that greater levels of aggression are elicited in response to an intentionally aggressive on-road event. In contrast, general aggression research suggests that greater levels of aggression are elicited in response to an ambiguous event. The current study examined emotional and cognitive responses to two hypothetical driving scenarios with differing levels of aggressive intent (intentional versus ambiguous). There was also an interest in whether factors influencing responses were different for hostile aggression (that is, where the action is intended to harm the other) versus instrumental aggression (that is, where the action is motivated by an intention to remove an impediment or attain a goal). Results were that significantly stronger negative emotion and negative attributions, as well as greater levels of threat were reported in response to the scenario which was designed to appear intentional in nature. In addition, participants were more likely to endorse an aggressive behavioural response to a situation that appeared deliberately aggressive than to one where the intention was ambiguous. Analyses to determine if greater levels of negative emotions and cognitions are able to predict aggressive responses provided different patterns of results for instrumental aggression from those for hostile aggression. Specifically, for instrumental aggression, negative emotions and negative attributions were significant predictors for both the intentional and the ambiguous scenarios. In addition, perceived threat was also a significant predictor where the other driver's intent was clearly aggressive. However, lower rather than higher, levels of perceived threat were associated with greater endorsement of an aggressive response. For hostile aggressive behavioural responses, trait aggression was the strongest predictor for both situations. Overall the results suggest that in the driving context, instrumental aggression is likely to be a much more common response than hostile aggression. Moreover, aggressive responses are more likely in situations where another driver's behaviour is clearly intentional rather than ambiguous. The results also support the conclusion that there may be different underlying mechanisms motivating an instrumental aggressive response to those motivating a hostile one. In addition, understanding the emotions and cognitions underlying aggressive driving responses may be helpful in predicting and intervening to reduce driving aggression. The finding that drivers appear to regard tailgating as an instrumental response is of concern since this behaviour has the potential to result in crashes.

1. Background

Aggressive driving is a growing road safety concern for drivers in highly motorised countries (Lajunen & Parker, 2001; Shinar, 1998; Shinar & Compton, 2004). Mirroring these concerns, there is evidence demonstrating that driving with elevated levels of aggression increases the likelihood of being involved in a crash (Beirness, 1993; Chliaoutakis et al., 2002; King & Parker, 2008). Early research focused on identifying socio-demographic and person-related predictors of aggressive driving. As a result, it is well established that younger drivers and men are more likely to engage in aggressive on-road behaviours (e.g. tailgating, rude gestures, verbal abuse) (Beck, Wang, & Mitchell, 2006; Mizell, 1997; Roberts & Indermaur, 2005; Shinar, 1998; Simon & Corbett, 1996). Similarly, trait characteristics, in particular, high trait aggression has been found to be a robust predictor of aggressive driving (Dahlen & White, 2006; Deffenbacher, White, & Lynch, 2004; Hennessy &

Wiesenthal, 1997; Hennessy, Wiesenthal, & Kohn, 2000; O'Brien, Tay, & Watson, 2004; Smith, Waterman, & Ward, 2006).

However, the previous research has been weighed down by a range of conceptual shortcomings, such as inconsistency in defining and operationalising aggressive driving. In the driving area, some researchers (e.g., Dula & Geller, 2003) conceptualise aggressive driving as behaviours occurring on a continuum of severity, ranging from milder behaviours through to more extreme ones. Other researchers (e.g., Shinar, 1998; 2004; 2007) distinguish between two types of aggression. Hostile aggression is said to be impulsive, unplanned acts of aggression where the ultimate goal is harming the target, and is considered the more extreme type of aggression (Anderson & Bushman, 2002; Dodge & Coie, 1987; Geen, 2001; Shinar, 1998; 2004; 2007). Alternatively, instrumental aggression is behaviour designed to attain a goal or outcome such as removing an impediment or to vent frustrations rather than being motivated by harming a victim (Anderson & Bushman, 2002; Dodge & Coie, 1987; Geen, 2001). Inconsistencies such as these have resulted in a disjointed and fragmented body of research, that has identified *who* is likely to be an aggressive driver, but cannot adequately explain *why* such behaviour occurs. That is, understanding of the intentions, emotions and cognitive thought processes that underlie responses to on-road provocations that result in aggressive behaviour is limited.

Drivers are likely to act according to their perceptions of on-road events. Accordingly, examining the emotional and cognitive processes involved in perceiving an on-road event has the potential to better elucidate the motivations behind drivers' on-road aggressive behaviour. Differences in motives or intentions may be important in this area, as on-road behaviours commonly regarded as aggressive may not be underpinned by an intention to harm (e.g. tailgating that results from carelessness versus tailgating intended to intimidate). A focus on driver intention is in keeping with advances in general human aggression research, particularly the General Aggression Model (GAM; Anderson & Bushman, 2002) which focuses on the interaction between person-related, emotional and cognitive processes in explaining aggressive behaviour. The GAM proposes that the production of a behavioural response to an event occurs in stages, each influenced by a number of factors. In particular, the model proposes that individuals bring to any situation inputs comprising their socio-demographic characteristics (age, gender, etc.), person-related factors (such as trait aggression), and state-related characteristics. These then influence the individual's internal state, such as perceptions, emotions and cognitions. Emotional and cognitive processes then influence appraisal processes and decisions about how to respond, and these result in the particular behaviour the individual displays.

Researchers have begun to examine the cognitive processes involved in interpreting on-road events. Findings suggest that greater levels of aggression are elicited in response to events drivers perceive as deliberate. For example, Britt and Garrity (2006) examined the role of perceptions in aggressive driving and found that drivers who attributed perceived provocations (such as tailgating or being cut-off) to the internal, stable characteristics of the 'other' driver reported greater anger and subsequent aggressive responses towards that driver. Similarly, recent qualitative research (Lennon & Watson, 2011) and results of driver surveys (AAMI, 2007, 2011) suggest that many drivers consider their own aggressive on-road behaviour to be justified retaliation in response to the deliberate driving acts of others. In contrast to these context-specific findings, research on general human aggression suggests that ambiguous situations are often perceived as threatening and thus may elicit greater levels of aggression in order to reduce the situational ambiguity (Anderson, Anderson, Dill & Deuser, 1998).

The aim of the present study was two-fold: to examine the cognitive and emotional processes behind aggressive driving; and to explore the applicability of the theoretical perspective offered by the GAM. Accordingly, the current study explored participants' perceptions and their behavioural responses to two hypothetical scenarios. These were designed to depict differing levels of aggressive intent from the offending driver. There was also an interest in examining the influence of emotions and cognitions (as per the GAM) in predicting likely behaviour. To allow comparability between this study and previous ones, behavioural response options were drawn from the literature and from previous research in this area by the authors. In addition, these possible behaviours were designed to incorporate the distinction between instrumental and hostile aggression.

2. Method

Participants were presented with two driving scenarios, one of which was designed to depict intentional aggression and the other where intention was unclear (ambiguous) but potentially anger provoking. It was anticipated that drivers would report stronger emotions and more negative cognitions to the intentional scenario than to the ambiguous one, consistent with previous research in aggressive driving. In keeping with previous findings in both driving and general aggression research, age, gender and trait aggression were expected to predict a higher likelihood of adopting an aggressive driving response. Further, in keeping with the stage structure of the GAM, it was expected that greater levels of negative emotion and cognition would predict endorsement of an aggressive behavioural response, over and above socio-demographic variables and trait aggression.

2.2. Participants

A general sample of drivers was recruited from two sources. Firstly, a random sample stratified by age (<25 years, 25-44 years; 45 years and older) was drawn from the Royal Automobile Club of Queensland (RACQ- a state-wide motoring organisation) membership list. A total of 5000 invitations to participate were sent by post to the sample drawn. The invitation included information on the project and a copy of the questionnaire with a reply-paid envelope. A total of 878 responses were received, 25 of which had substantial missing data and were therefore omitted, leaving 853 valid responses (18% response rate). In order to supplement the number of younger drivers (less than 25 years old) participating in the study a second, smaller sample from the Queensland University of Technology (QUT) first year psychology student participant pool was sought. Seventy-four participants were drawn from this source. However one questionnaire was unable to be used, leaving 73 valid responses. Therefore, in all 926 participants completed the questionnaire. Participants from QUT received course credit for participation, while RACQ members were eligible to win a year's free membership of the club.

2.3. Materials and measures

A self-report questionnaire was designed to collect a socio-demographic information (including age, gender, education level) as well as responses to the hypothetical scenarios, and a measure of trait aggression (Aggression Questionnaire).

2.3.1. Aggression Questionnaire (AQ)

To gauge underlying propensity towards aggression, the Aggression Questionnaire (AQ; Buss & Perry, 1992) was utilised. The AQ is a standardised 29-item, four scale measure of trait aggression. Participants are required to rate on a five-point Likert scale (1 = 'extremely characteristic of me', 5 = 'extremely uncharacteristic of me') how characteristic each item is of themselves. The AQ has well-demonstrated reliability and validity, with Cronbach's α of .89 (Buss & Perry, 1992). Responses ratings to all items were summed for each participant and this provided a total trait aggression score.

2.3.2. Driving scenarios

Two scenarios with differing levels of intent were presented to participants. Scenario One (S1) depicted the behaviour of the other driver as intentionally aggressive while in Scenario Two (S2), the intentionality of the other driver's behaviour was designed to be unclear yet potentially anger provoking:

S1: *"You are driving down a two lane road (one lane each way) travelling at the speed limit and you notice that the car behind you is travelling very close to your vehicle. Instead of waiting for an opportunity to overtake you, the driver proceeds to flash his/her lights and beep his/her horn."*

S2: *"You have just had an argument with someone close to you, prior to getting in the car. You then approach an intersection and the light changes to 'red'. You come to a stop behind another car. The light seems to take a long time to change back to 'green'. When the light finally changes the driver in front does not move off, preventing you from moving forward."*

The scenarios were piloted with a small sample of personal contacts prior to finalisation. This process confirmed that S1 was perceived as intentionally anger-provoking, regardless of initial reported

emotional state. However, pilot participants indicated they would not find the situation in S2 anger-provoking if they were not already in a heightened emotional state. Therefore, to ‘standardise’ the mood of participants, the wording was altered to include reference to a prior negative event (which is reflected in the first sentence in S2).

To assess emotional responses, participants were asked to rate on a 5-point Likert scale (1 = ‘not at all’ to 5 = ‘very much’) the extent to which they would experience three negative emotions—angry, annoyed, agitated in response to each scenario. A mean emotional response score was calculated from ratings across the three emotions for each scenario. This variable was labelled ‘negative emotions’. Participants were also asked to rate on a 5-point Likert scale how much threat they perceived in response to each event. To measure negative attributions and cognitive responses, participants were asked to indicate on a 5-point Likert scale (1 = ‘extremely unlikely’ to 5 = ‘extremely likely’) the likelihood of having three negative thoughts (i.e., attributions) about the ‘other’ driver in each scenario. These thoughts were: “What an idiot!”, “How did that fool get a licence!”, and “That idiot shouldn’t be allowed on the road!” A composite negative attributions score for each scenario was formed using the mean ratings for the three statements combined. Finally, self-reported behavioural responses were measured by asking participants to indicate the likelihood of adopting each of the behavioural responses listed in Table 1 in response to each scenario. Response options were on the same 5-point Likert scale.

In order to ensure that the behavioural measures were tapping different types of aggression, exploratory factor analysis was conducted on participant’s endorsements of the 11 response options detailed in Table 1. As items 3 and 7 did not involve the adoption of an aggressive behavioural response, they were excluded from the analysis. This analysis revealed two factors with an internal reliability Cronbach’s alpha of .77 and .74 (respectively). The first factor included items 1, 2, 4, 5, 6 and 10. Each of the behaviours depicted in these items involves lesser acts of reactive aggression that may be adopted in order to vent anger or remove the source of on-road frustration. These behaviours are consistent with previous conceptualisations of ‘instrumental aggressive driving’ (Shinar, 1998) and this factor was labelled accordingly. The second factor consisted of items 8, 9 and 11, which depicted more extreme behaviours with the potential to involve interpersonal violence and a preparedness to put one’s immediate goals aside. Consistent with Shinar’s (1998; 2004) conceptualisation, this factor was labelled ‘hostile aggression’. Participants’ mean response for the items on each of these factors was computed and formed the behavioural response scores.

Table 1: Behavioural response set for driving scenarios

1.	Swear or mutter to yourself or others in your car (<i>Instrumental</i>)
2.	Give a blast of your horn and/or flash lights (<i>Instrumental</i>)
3.	Carry on driving normally (<i>Non-Aggressive Response</i>)
4.	Gesture at the other driver (<i>Instrumental</i>)
5.	Swear at and/or verbally abuse the other driver (<i>Instrumental</i>)
6.	Drive close to/follow the other vehicle (<i>Instrumental</i>)
7.	Ignore the incident as if nothing happened (<i>Non-Aggressive Response</i>)
8.	Stop the vehicle and get out of your vehicle, ready to argue (<i>Hostile</i>)
9.	Stop the vehicle and get out prepared to engage physically with the other driver (<i>Hostile</i>)
10.	Shout or scream out loud but not at the offending driver (<i>Instrumental</i>)
11.	Use your vehicle to physically damage the other driver’s vehicle (<i>Hostile</i>)

2.4. Analyses

Hierarchical regression was used to examine the influence of cognitions and emotions in the prediction of aggressive responses to each scenario. To control for the influence of socio-demographic and trait aggression variables, which have consistently been found to be associated with greater aggressive driving tendencies (and in keeping with the stages of the GAM), these variables were entered at Blocks 1 and 2 respectively.

To facilitate parametric analysis, data from the Likert scale scored items were treated as continuous. Similarly, participant age, originally an age-group and thus categorical variable, was recoded to allow inclusion in the regression analysis. For this, participant age was given the value of the mid-point of the reported age bracket, and the resulting variable was also treated as continuous.

Educational attainment was recoded into a dichotomous variable, with values 0 = “grade 10 education or less”, and 1 = “greater than grade 10 education”.

3. Results

3.1. Socio-demographic Variables:

A total of 564 (60.9%) women and 362 (39.9%) men completed the questionnaire. Almost one quarter (24.4%) of participants were aged between 18-24 years, 12.5% between 25-39 years, 13.8% aged 40-59 years and 10.1% were 60 and older.

3.2. Trait measures

A 2x4 Analysis of Variance was conducted to detect age and gender differences on the AQ. The results revealed a significant gender difference such that men had significantly higher scores than women ($M = 43.8$) ($F(1, 918) = 24.25, p < .001, \eta^2 = .03$). Men were also found to report significantly higher scores for the physical ($M = 11.7, M = 9.2, p < .05$), verbal ($M = 11.7, M = 10.5, p < .05$) and hostile aggression ($M = 16, M = 15, p < .05$) subscales. No gender differences in scores were detected on the angry aggression subscale. The analysis also revealed age difference in AQ scores such that drivers aged 17-24 years old had significantly higher total aggression scores ($M = 55.92, p < .05$) as well as significantly higher scores for each of the AQ subscales.

3.3. Emotional, cognitive and behavioural responses to hypothetical on-road incidents

The results of pairwise t-tests comparing drivers' emotional, cognitive and behavioural responses to the two different scenarios, along with the mean (SD) responses are displayed in Table 2. Participants were more likely to report significantly stronger negative emotion, greater levels of perceived threat and more negative attributions in response to the intentionally aggressive situation (S1) than the ambiguous situation (S2). Additionally, participants reported significantly greater likelihood of responding with instrumental or hostile aggression in response to S1. It was also noteworthy that mean level of instrumental aggressive response was higher for the intentionally provocative situation (S1) than the ambiguous one (S2).

Table 2: Pairwise t-tests of mean emotional, cognitive and behavioural responses to Scenarios One and Two (S1, S2).

Emotional, cognitive and behavioural responses by Scenario	M (SD)
Emotional & Cognitive Response	
<i>Negative Emotion</i>	
S1 (intentionally aggressive)	2.97*** (1.04)
S2 (ambiguous intent)	2.50 (1.09)
<i>Threat</i>	
S1 (intentionally aggressive)	2.53***(1.31)
S2 (ambiguous intent)	1.18 (.52)
<i>Negative Attributions</i>	
S1 (intentionally aggressive)	3.36*** (1.15)
S2 (ambiguous intent)	2.14 (1.12)
Behavioural Response	
<i>Instrumental Behavioural Response</i>	
S1 (intentionally aggressive)	1.96*** (.75)
S2 (ambiguous intent)	1.87 (.73)
<i>Hostile Behavioural Response</i>	
S1 (intentionally aggressive)	1.07** (.35)
S2 (ambiguous intent)	1.05 (.29)

** $p < .025$, *** $p < .001$

3.4. Likelihood of an instrumental behavioural response.

Results for the hierarchical regression of the socio-demographic, trait aggression and emotional and cognitive response variables on an instrumental behavioural response to S1 and S2 are

detailed in Tables 3 and 4 respectively. The overall regression analyses were significant. At the first block, entry of socio-demographic variables was found to significantly predict endorsement of instrumental aggressive driving in both scenarios. In the second step, trait aggression was also found to contribute a significant proportion of the variance in response to each scenario. Finally, negative emotions and negative attributions added a significant proportion of explained variance in response to each scenario.

Five individually significant predictors for the intentionally aggressive situation (S1) were found including: age, total AQ, negative emotions, perceived threat, and negative attributions. These results suggest that those drivers who were more likely to adopt an instrumental aggressive response to S1 were likely to be younger, had higher AQ scores, reported greater negative emotion and negative attributions, but reported lower levels of perceived threat.

Similarly, for the ambiguous situation (S2) five individually significant predictor variables were identified: age, education level, total AQ, negative emotions and negative attributions. Thus for S2, higher AQ scores, negative emotions and negative attributions significantly predicted an instrumental aggressive response.

Table 3: Hierarchical regression of socio-demographic, trait aggression and emotional and cognitive response variables on participant instrumental response to Scenario One.

Variables	M	B	β	sr ²	Adj R ²	ΔR^2
Block One						
Age	40	-.004*	-.087	.00		
Gender		-.081	-.053			
Education Level		.048	.024			
					.185***	
Block Two						
Total AQ	47	.017***	.349	.06		
					.352***	.167***
Block Three						
Negative Emotions	3	.250***	.349	.05		
Perceived Threat	2.5	-.058***	-.101	.00		
Negative Attributions	3.4	.078***	.120	.03		
					.470***	.118***

*** $p < .001$ ** $p < .01$ * $p < .05$

Table 4: Hierarchical regression of socio-demographic, trait aggression and emotional and cognitive response variables on participant instrumental response to Scenario Two.

Variables	M	B	β	sr ²	Adj R ²	ΔR^2
Block One						
Age	40	-.003*	-.065	.01		
Gender		-.022	-.015			
Education Level		.098*	.050	.01		
					.198***	
Block Two						
Total AQ	47	.015***	.314	.06		
					.382***	.185***
Block Three						
Negative Emotions	2.5	.208***	.311	.05		
Perceived Threat	1.9	-.003	-.00			
Negative Attributions	2.1	.153***	.234	.03		
					.559***	.177***

*** $p < .001$ ** $p < .01$ * $p < .05$

3.5. Likelihood of a Hostile Behavioural Response.

As shown in Tables 5 and 6, the overall hierarchical regression analyses on the likelihood of a hostile behavioural response were significant. As can be seen, the pattern for the predictors was different for each scenario.

For the intentionally aggressive scenario (S1), entering socio-demographic variables in the first block significantly predicted a hostile response. Adding AQ scores in Block 2 significantly added

to the prediction of a hostile response. After controlling for the effects of socio-demographic variables and trait aggression, adding the emotional and cognitive variables at Block 3 did not significantly contribute any further variance. Thus, higher levels of trait aggression (and none of the other cognitive or emotional variables) were significantly associated with hostile aggression in response to an anger-provoking on-road situation.

For S2, as well as significant contributions from socio-demographic variables at Block 1, three other significant predictor variables were found: total AQ; negative emotions; and perceived threat. Higher AQ scores and greater reported perceived threat were associated with an increased likelihood of endorsement of hostile aggression in response to S2. However, for S2 lower levels of negative emotion were associated with an increased likelihood of hostile aggression.

Examination of the unique variance, sr^2 , contributed by the predictors suggests that total trait aggression scores (AQ) accounted for a larger proportion of the unique variance in the dependent variable, especially for S1. However, perceived threat accounted for a larger proportion of the variance in the dependent variable in response to S2.

Table 5. Hierarchical regression of socio-demographic, trait aggression and emotional and cognitive response variables on participant hostile response to Scenario One.

Variables	M	B	β	sr^2	Adj R^2	ΔR^2
Block One						
Age	40	.001	.063			
Gender		-.051*	-.071	.00		
Education Level		-.013	-.014			
					.022***	
Block Two						
Total AQ	47	.008***	.363	.09		
					.117***	.095***
Block Three						
Negative Emotions	3	-.014	-.043			
Perceived Threat	2.5	.004	.014			
Negative Attributions	3.4	.005	.016			
					.118***	.001

*** $p < .001$ ** $p < .01$ * $p < .05$

Table 6. Hierarchical regression of socio-demographic, trait aggression and emotional and cognitive response variables on participant hostile response to Scenario Two.

Variables	M	B	β	sr^2	Adj R^2	ΔR^2
Block One						
Age	40	.001	.030			
Gender		-.019	-.031			
Education Level		-.004	-.005			
					.005***	
Block Two						
Total AQ	47	.004***	.195	.03		
					.040***	.035***
Block Three						
Negative Emotions	2.5	-.046***	-.169	.01		
Perceived Threat	1.9	.183***	.320	.09		
Negative Attributions	2.1	.016	.059			
					.138***	.098***

*** $p < .001$ ** $p < .01$ * $p < .05$

4. Discussion

The current study aimed to examine the cognitive and emotional processes underlying aggressive driving by exploring responses to two hypothetical scenarios designed to depict differing levels of intent. It was anticipated that drivers would report stronger negative emotions and more negative cognitions in response to an intentionally anger-provoking incident than to an ambiguous one. The results of pair-wise t-tests were supportive of this expectation. Drivers reported stronger

negative emotions, greater levels of perceived threat and more negative attributions when faced with a clearly anger provoking on-road event than one where the intent was unclear. Further, drivers were significantly more likely to report a greater likelihood of responding aggressively to an intentionally anger provoking situation than one where intent was ambiguous. These results are consistent with earlier aggressive driving research, which has found that on-road events that are perceived as intentional or deliberate on the part of the 'other' driver provoke greater levels of negative emotions and increased subsequent aggression (Lajunen, Parker, & Summala, 1999; O'Brien, et al., 2004; Shinar, 1998).

4.1. Prediction of Instrumental Aggression.

The study also sought to determine whether negative emotions and cognitions were useful predictors of behavioural responses to each scenario over and above the prediction offered by socio-demographic characteristics and trait aggression. It was expected that greater levels of negative emotion and negative cognitions would significantly predict the likelihood of both instrumental and hostile responses. The results support these expectations in relation to the endorsement of instrumental aggression. In both scenarios, higher AQ scores significantly predicted a greater likelihood of endorsing an instrumental aggressive driving response. Consistent with expectation, greater negative emotions and cognitions also significantly added to the prediction of endorsing an instrumental aggressive response, over and above that from trait aggression. Interestingly, in response to the deliberately aggressive scenario, drivers endorsing instrumental aggression were likely to perceive lower rather than higher levels of threat. Taken across the two scenarios, and consistent with the GAM, the results suggest that negative emotions and negative attributions are useful in understanding and predicting drivers' instrumental aggression in response to on-road events, regardless of the perceptions of the other driver's intent.

4.2. Prediction of Hostile Aggression

It should be noted that mean values for hostile aggressive responses were low for each of the scenarios, suggesting that participants regarded it as unlikely that they would respond with hostile aggression. Notwithstanding this, the results regarding the prediction of a hostile behavioural response did not follow the same pattern as those described above. For hostile aggressive responses, trait aggression was an important predictor, regardless of the 'other' driver's apparent intent. However, where the 'other' driver's intentions were ambiguous, the level of perceived threat added to the prediction of endorsed aggression, over and above trait aggression. Interestingly, lower levels of negative emotion also significantly predicted hostile aggression in the ambiguous scenario. Nevertheless, these results should be interpreted with caution because for all variables across all scenarios, the unique contribution was very low. Thus a substantial amount of unexplained variance still exists. Additionally, it needs to be acknowledged that the mean score for the likelihood of adopting hostile aggression responses to the scenarios was very low.

4.3 Implications

The results suggest that in the driving context, there may be different underlying mechanisms motivating an instrumental aggressive response from those that motivate a hostile one. Specifically, it appears that instrumentally aggressive responses may be common amongst drivers even where trait aggression is not high. Further, these responses may be as much motivated by cognitive and emotional responses generated as a result of the driving behaviour of others (such as an individual's perceptions of, and attributions about, the cause of the event), as by tendencies to aggression, particularly when the other's actions are perceived as intentional. This is consistent with what is known about aggression in general and highlights the broader individual-level influences on aggressive driving.

From a road safety perspective this suggests that interventions to reduce instrumentally aggressive behaviour should focus on drivers' emotional and cognitive responses to the driving of others, regardless of whether the other's behaviour is deliberate or not. While the behavioural options that fell under instrumentally aggressive responses were generally not dangerous, tailgating has the potential to be so, and horn blasts or gestures have the potential to be distracting to other drivers (including the 'offending' driver). Moreover, although instrumental aggressive driving behaviours are

often not dangerous in isolation, their danger lies in the potential for these acts to be responded to in a 'tit-for-tat' manner and to escalate into more serious and potentially violent forms of aggression (Hennessy & Wiesenthal, 1999; Novaco, 1991; Tasca, 2000). Safety would arguably be improved by reducing these behaviours. Potential approaches would be to attempt to raise drivers' awareness of the dangers inherent in responding to on-road events by retaliatory or intimidating behaviours, particularly tailgating the other to vent frustration or to attempt to force others to behave differently.

4.4. Limitations

Firstly, the study relies on self-reported responses to hypothetical scenarios and thus may not be an accurate reflection of how drivers might behave in real situations. However, although presenting participants with on-road written 'scenarios' may lack realism, it is arguable that most drivers are able to relate to this topical issue and are thus able to accurately imagine their behavioural responses.

Secondly, responses may be subjected to social desirability biases, and as participants normally wish to present themselves in a favourable manner, there is the possibility they may underreport tendencies such as aggression.

Additionally, as outlined above, the results of piloting prompted the inclusion of a sense of 'off-road' stress in Scenario Two, which may have introduced a potentially confounding factor that unintentionally added another layer of complexity to Scenario Two. Consequently, the results should be interpreted with caution. Finally, it is acknowledged that there are a number of additional factors that due to space and time limitations could not be considered that have the potential to trigger an aggressive behavioural reaction on the road.

4.5 Conclusions

Overall these results suggest that instrumental aggression is a more likely response to driving events than is a hostile aggressive response. Moreover, instrumentally aggressive responses are more likely where the 'other' driver's behaviour is clearly intentionally provocative than where it is ambiguous. Similarly, drivers are more likely to feel higher levels of negative emotion and negative attribution where the other's behaviour is clearly intentional, and they are more likely to endorse an instrumentally aggressive response under this circumstance.

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