

# A CITY-LEVEL STUDY OF DRIVER ANGER AND AGGRESSION IN SOUTH AFRICA

A SUKHAI<sup>a\*</sup>, M SEEDAT<sup>ab</sup> and E JORDAAN<sup>c</sup>

<sup>a</sup>MRC-UNISA Crime, Violence and Injury Lead Programme, South Africa

<sup>b</sup>Institute for Social and Health Sciences, University of South Africa

<sup>c</sup>Biostatistics Unit, Medical Research Council, Cape Town, South Africa

\*Corresponding author: Medical Research Council, PO Box 19070, Tygerberg, 7505 South Africa, E-mail: [anesh.sukhai@mrc.ac.za](mailto:anesh.sukhai@mrc.ac.za)

## ABSTRACT

Driver anger is strongly related with aggressive road behaviours and adverse injury outcomes. This paper seeks to explore the nature and extent of driver anger in the South African east-coast city of Durban. Findings revealed that over a one-year period, most motorists (96%) reported experiencing anger at consistently high intensity levels when being a victim to the different dimensions of aggressive road behaviours. With general self-reported anger-provoking events, behaviours relating to impeding one's progress were reported most often, by more than one-third of participants. Additionally, multiple linear regression modelling was used to identify several significant relationships with anger, including associations with the different types of anger coping strategies used by motorists. This study has yielded valuable preliminary findings on anger and its expressions in this setting, and are important considerations towards comprehensive road safety intervention strategies.

## 1. INTRODUCTION

### 1.1 Extent and associations between driver anger and aggression

Following increasing public visibility, anger and aggression in the traffic environment have emerged as a significant multidisciplinary subject of enquiry. According to the National Highway Traffic Safety Administration (NHTSA) 66% of all annual traffic fatalities in the United States of America (USA) may be attributed to driver aggression (Martinez, 1997). In Britain, a survey by the Automobile Association established that 90% of motorists there reported at least one 'road rage' encounter over a one-year period (Joint, 1995). The experience of anger in the traffic environment is also reported to be widespread. In Britain, while Joint (1995) reported that 60% of motorists admitted to losing their temper while driving during a one-year period, Underwood, Chapman, Wright and Crundall (1999) reported that 85% of the 100 drivers in their diary study experienced anger while driving during a two-week period.

South African data on driver aggression also resonates with international findings. A recent study among motorists in the east-coast city of Durban revealed that over a one-year period, 95% of those surveyed reported experiencing threatening and intimidating behaviours such as fellow-motorists 'tailgating' them or attempting to cut them off the road. At least 45% of motorists reported perpetrating at least one of these behaviours (Sukhai, 2003). Furthermore, one-quarter reported experiencing and one-tenth reported perpetrating at least one form of extreme rage and direct confrontational behaviour, such

as arguing with or assaulting another motorist, over a one-year period. In a related South African study both victimisation and perpetration of the extreme forms of aggressive road behaviour showed associations with driving under the influence of alcohol, carrying a weapon while driving, driving above posted speed limits and/or receiving regular traffic fines (Sukhai, Seedat, Jordaan & Jackson, 2005).

Anger is generally regarded as a significant emotional or affective precursor to aggressive behavior in the traffic environment. For example, Deffenbacher and colleagues have shown significant associations between both trait and state driving anger, and aggressive expressions of this anger on the roads where high anger drivers were shown to experience up to four times more aggression compared to low anger drivers (Deffenbacher, Huff, Lynch, Oeting & Salvatore, 2000; Deffenbacher, Lynch, Oeting & Yingling, 2001). In elucidating the relationship between anger and driver aggression, Parker, Lajunen and Summala (2002), in a study across three European countries used a range of potentially anger-provoking situations to correlate respondent's levels of anger experienced with their propensity to react aggressively to those situations. It was shown that in all three countries, the behaviours that were most likely to provoke anger were also those that were most likely to give rise to an aggressive reaction. The three behaviours that generated the highest levels of anger were: having one's parking spot taken (74% claimed they would react), being followed with bright lights switched on (77% claimed they would react) and being approached with bright lights on (85% claimed they would react). Further to the intensity of anger experienced, Ramirez, Santisteban, Fujihara & Van Goozen (2002) also found that in general, those who experienced anger more frequently were also more likely to express their anger. The study used the 'Anger Situation Questionnaire' to compare the subjective feelings of the experience of anger with the proneness toward an angry action among Spanish and Japanese university cohorts.

## 1.2 Rationale and scope of study

Following the high prevalence and significant contribution of driver anger to aggressive road behaviours and injury outcomes, it is crucial that the mechanisms related to these extreme emotional states are better understood, and that they are considered towards holistic traffic safety intervention strategies. This study is exploratory in nature and seeks to examine the nature and extent of anger in relation to self-reported instances of aggressive road behaviours among motorists in the South African east-coast city of Durban.

## 1.3 Aims and objectives

The specific objectives of this paper are to:

- 1) Explore anger-provoking events in the South African traffic environment by examining motorists' self-reported intensity of anger in relation to experiencing the different dimensions of aggressive road behaviours, as well as by examining motorists' open-ended responses of general triggers to their anger in the traffic environment;
- 2) Statistically examine associations between motorists' self-reported anger and demographic profiles, general driving characteristics and 'other hazardous driving behaviours'; and
- 3) Explore motorists' anger coping strategies and their associations with the intensity of anger experienced in relation to the different dimensions of aggressive road behaviours.

## 1.4 Definitions

The following definitions relating to driver anger, driver aggression and 'other high-risk driving behaviours' were operationalised for this study.

**Anger** may be regarded as "an emotional state that consists of subjective feelings that vary in intensity, from mild irritation or annoyance to intense fury and rage" (Spielberger et al., 1983, p16). In the traffic environment, this definition encapsulates anger generated by situation-specific driving events and this transient emotional-physiological condition is generally referred to as 'state' anger. On the other hand, 'trait' anger refers to the general dispositional propensity to experience more frequent or intense anger across a wide range of situations (Deffenbacher, Lynch, Filetti, Dahlen & Oetting, 2003).

For the purposes of this paper as elsewhere (see Sukhai et al., 2005) we operationalise and locate **aggressive road behaviours** on a continuum consisting of four levels including:

- (a) *Expressions of annoyance (or level 1 aggressive behaviour)* refers to mild, verbal and non-threatening expressions of annoyance or self-irritability such as complaining and/or yelling to one's self and/or fellow passengers in response to another driver's behaviour;
- (b) *Aggressive driving (or level 2 aggressive behaviour)* refers to mild, verbal or gestural expressions of anger on the road such as the use of insensitive or obscene gestures and inappropriate and/or excessive use of the horn and lights.
- (c) *Direct threatening and/or intimidating behaviour (level 3 aggressive behaviour)*, includes trying to cut another motorist off the road or following or chasing another motorist in anger; and
- (d) *Direct confrontational behaviour (level 4 aggressive behaviour)*, may include arguing with or assaulting another motorist.

**Road rage** refers to a display of uncontrolled anger, which may be manifested as level 3 or level 4 aggressive road behaviour. The expression of anger may, at a behavioural level, be directed at the perceived offending driver, vehicle, road signage or other objects in the traffic environment. The term, '**other high-risk or hazardous driving behaviour**', refers to those instrumental behaviours that constitute deliberate and dangerous driving but do not involve an intentional aggressive interaction and may include the running of red lights, weaving in traffic and driving above the speed limit or above the legal blood alcohol limit.

## 2. **METHODS**

### 2.1 Study design

The study design, formalized as a cross-sectional descriptive survey, included an interviewer-administered semi-structured questionnaire to collect both quantitative and qualitative data. Data were obtained using self-reports by motorists.

### 2.2 Measuring instrument

The questionnaire focused on respondents' demographic characteristics, general motoring characteristics and adverse driving behaviours, which included indicators for annoyance (level 1), aggressive driving (level 2), road rage (levels 3 and 4) and 'other general high-risk driving behaviours'. A Likert-type scale ranging from 0 (never) to 10 (often) was used to measure the frequency of experiencing and perpetrating each of the aggressive road

behaviours, the level of anger for each of the aggressive road behaviours experienced and the frequency of engaging in 'other high-risk driving behaviours'. For analysis, the 10-point scale was also interpreted in a categorical manner. Additionally, for 'other high-risk driving behaviours', binary responses were sought for receiving at least one traffic fine over the past year and for carrying a weapon while driving. Following the definitional framework for aggressive road behaviours, four sub-scales were delineated and all corresponding behaviours were grouped under these sub-scales.

## 2.3 Sample

### *Study population*

The study focused only on urban motorists in the Durban Metropolitan Area (DMA) and is consistent with international findings suggesting that driver aggression is more prominent in urban areas or areas of high congestion (Parkinson, 2001; Rathbone & Huckabee, 1999; Shinar, 1998).

The sample of motorists was drawn from users of petrol stations in the DMA as this was considered an accessible site that almost all drivers were expected to visit. Hence, using this approach, the population validity of the study was enhanced by ensuring that all motorists had a possibility of being included in the sampling frame.

A listing of all suburbs in the DMA, obtained from the Durban Metropolitan Council, constituted the clusters for the cluster sampling strategy and all petrol stations in these clusters were identified through information obtained from the Durban Traffic and Transportation Department. Individual petrol stations were selected using simple random sampling.

Closer to completion of data collection, participants were purposefully selected on the basis of vehicle type in order to weight the final sample to be proportionally representative of the vehicle distribution pattern of the DMA. The following proportions, obtained from the National Department of Transport, were applied to the data: 86.5% for cars and light delivery vehicles, 4.0% each for minibus taxis and heavy commercial vehicles, 0.5% for buses and 5.0% for other self-propelled vehicles (NDoT, 2002).

### *Sample size and distribution*

Using a listing of 60 suburb clusters, 12 suburbs followed by three petrol stations per suburb were randomly selected. Twenty-eight participants were then randomly selected at each petrol station as follows: ten participants were chosen during the day on a weekday (to accommodate workers whose work involves driving, and the non-worker), ten in the evening on a weekday (to accommodate the worker who works normal office hours and at a time when one would be relatively more inclined to participate) and a further eight participants were selected over the weekend (four during the day and four in the evening). According to the above scheme, each interviewer approached sequential drivers from the time of arrival at each petrol station until the desired number for that visit was obtained.

### *Nature of selected sample*

A total of 1081 motorists were approached in order to yield the final sample size of 1006 respondents. This satisfactory response level may be attributed to the experience and commitment of the interviewers, the use of an incentive for participation (a car air-freshener that depicted an anti-road rage message) and an outreach media campaign sensitizing motorists to the study. That motorists found the study topical, and identified with the subject as an area of public concern may have also contributed to the good response rate.

## 2.4 Data analysis

Level 1 behaviours relating to mild, verbal and non-threatening expressions of annoyance and self irritability were not relevant to investigating anger and aggression relationships and thus, were excluded from the analysis. To answer the question “How many drivers in the Durban Metropolitan Area experience anger as a result of the various forms of aggressive driving acts on the roads?” the prevalence for the twelve individual acts measuring aggressive behaviours was calculated. For this purpose, the denominator was the number of drivers experiencing each act and a positive response was any level of anger. An indication of the level at which drivers experienced the anger was given as the arithmetic mean for each of the twelve individual acts, indicated for those drivers with a positive response for the specific aggressive driving act.

The individual measures for the three sub-scales were aggregated into three summated scores to reflect the three levels of aggressive driving behaviours. Distributions of the scores were all skewed, with a long “tail” of high values. The logarithmic transformation was used to achieve approximate normality (Table 1). Geometric means are used in Tables 1 and 3 to reflect the logarithmic scale of the scores.

**Table 1: Distribution of summated group measures for experiencing anger as a victim to level 2 to level 4 aggressive road behaviours**

Group variable	Geometric mean	Lower confidence level	Upper confidence level	Cronbach Alpha (n=998)
Level 2	5.47	5.07	5.89	0.689
Level 3	10.02	9.44	10.64	0.623
Level 4	0.43	0.36	0.50	0.380

Multiple linear regression modeling was used to assess the association between the experience of anger and demographic characteristics, driving characteristics and ‘other high-risk driving behaviours’. Univariate analysis was first performed on all independent variables and those that were significant ( $p < 0.05$ ) were considered for selection in the multiple modeling. No interactions with age, race or gender were found in the models, and therefore, no stratified analyses were deemed necessary.

Responses to anger coping strategies were grouped based on three broad and mutually exclusive categories: (1) ‘simply ignore’ the offending motorist, (2) make efforts to avoid offending motorist and (3) retaliate aggressively. The relationship between the method a driver used to manage anger and the level of anger experienced, was assessed by comparing the mean levels of anger experienced between the control group (no management) and the specific anger coping strategy (simply ignore, or efforts to avoid, or retaliate aggressively). The same control group was used for the three comparisons of anger coping ( $n=81$ ).

Clustering of petrol stations due to the design was dealt with by analyzing the data using generalized estimating equations, with independent working correlation structure.

The appropriateness of the measurement scales for this population was assessed, using the internal consistency as measured by the coefficient alpha (Cronbach, 1951).

### 3. RESULTS

#### 3.1 Demography and general driving characteristics

The mean age was 40 years and males constituted the majority of the sample (83%). The mean education level was 12 years (counting all years from Grade 1). Most participants were married (66%), and the majority were employed (60% were in formal employment and 27% were either self-employed or worked in the informal economic sector).

Most motorists (94%) drove a vehicle 'almost every day' for a median distance of 70 kilometers per day. Most drove self-owned vehicles (73%). Cars (73%) and light delivery vehicles (16%) were the types of vehicles driven most often.

#### 3.2 Anger by type of aggressive driving behaviours

Overall, 95.6% of the 1006 participants reported experiencing anger while driving over a one-year period. Table 2 shows the level of anger experienced (on a scale from 1-10) for the level 2 to level 4 aggressive road behaviours.

**Table 2: Frequency and levels of anger for experiencing anger as a victim to level 2 to level 4 behaviours\***

	Frequency** n (%)	Level
		Arithmetic mean (S.D)
<b>Level 2 behaviours</b>		
2.1 Give another driver 'dirty looks'	522 (69.7)	4.9 (2.9)
2.2 Hoot/yell at another driver	665 (81.3)	5.0 (2.7)
2.3 Make obscene gestures at another driver	485 (77.0)	5.8 (2.9)
<b>Level 3 behaviours</b>		
3.1 Prevent another driver from entering lane	683 (86.6)	5.6 (2.8)
3.2 Prevent another driver from passing	610 (88.8)	5.8 (2.7)
3.3 Tailgate another driver	676 (87.0)	6.1 (2.6)
3.4 Try to cut another driver off the road	270 (81.8)	6.8 (2.5)
3.5 Follow/chase another driver	71 (79.8)	5.5 (3.0)
<b>Level 4 behaviours</b>		
4.1 Get out of car and argue with another driver	148 (85.1)	7.6 (3.1)
4.2 Get out of car to hurt another driver	33 (67.3)	4.2 (3.8)
4.3 Deliberately collide with or damage another car	60 (66.7)	6.3 (3.8)
4.4 Point a gun or shoot at another car	34 (59.6)	5.2 (4.1)

\* Level 1 behaviours not relevant to anger and aggression relationships and excluded.

\*\* The frequency gives the number and percentage of drivers experiencing anger as a result of the various forms of aggressive driving acts where the denominator is the number of drivers experiencing each act and a positive response is any level of anger.

For experiencing *level 2 behaviours* (aggressive driving behaviours – verbal or other expressions of anger directed at the offending motorist), self-reported anger ranged from 70% to 77% at a level ranging from 4.9 to 5.8. Anger was most frequently reported for the experience of being hooted or yelled at.

For experiencing *level 3 behaviours* (direct threatening and/or intimidating behaviours), self-reported anger ranged from 80% to 89% at a level ranging from 5.5 to 6.8. Anger was most commonly reported for being prevented from entering a lane and being 'tailgated' while being cut/forced off the road generated the highest level of anger.

For experiencing *level 4 behaviours* (direct confrontational behaviours) self-reported anger ranged from 60% to 85% and the level ranged from 4.2 to 7.6. Being subjected to verbal, confrontational assault by fellow-motorists resulted in the experience of anger most often and also, at the highest intensity level.

### 3.3 Other self-reported contributors to driver anger

When asked an open-ended question about a single behaviour of other motorists that angered them the most in the traffic environment, only 16.3% of the 1006 participants made reference to aggressive road behaviours and these consisted of only level 2 and level 3 behaviours. Behaviours relating to impeding one's progress was reported most often (37.7%) followed by behaviours associated with dangerous/inappropriate lane changing/overtaking (29.4%). Under one-tenth (7.5%) of motorists reported other's excessive speed as a behaviour that angered them.

### 3.4 Anger associations with demography, driving characteristics and 'other high risk driving behaviours'

Table 3 shows the statistically significant variables together with the parameter estimates from the multiple regression model for being angered by the level 2 to level 4 behaviours.

**Table 3: Parameter estimates (on a log scale) of statistically significant variables associated with experiencing anger for level 2 to level 4 behaviours for multiple regression model**

	Level 2	Level 3	Level 4
Age	0.006		
Rush through yellow or run red lights	0.064		
Drive above posted speed limits		0.038	
Received at least one traffic fine over past year*	0.209		0.372
Drive while under the influence of alcohol			0.056
Carry weapon while driving*		-0.494	

\* Categorical variables

Driver anger when experiencing *level 2 behaviours* was positively related with age (older drivers were more angered than younger drivers) and with red light running and receiving traffic fines. For *level 3 behaviours*, driver anger was associated with driving above posted speed limits but was negatively related with carrying a weapon while driving (most often a firearm). This is an interesting result suggesting that drivers' anger when experiencing these behaviours is lower when carrying a weapon than for those drivers who do not carry a weapon. For the extreme *level 4 behaviours*, driver anger was positively related with receiving traffic fines and with consuming alcohol while driving. None of the general driving characteristics were significantly related to the experience of anger.

### 3.5 Anger coping by motorists and relationships with experiencing anger

In response to the open-ended question on coping strategies that motorists' used when angered, most of the 1006 motorists reported that they 'simply ignored' the offending motorist (59.8%). One-quarter (25.8%) reported that they made efforts to avoid engaging in a conflicting situation, which included using some form of calming measure. Listening to music was the most commonly reported measure (10.0% of all motorists). Of concern though is that about one-tenth (8.0%) of the motorists reported that they retaliated aggressively to the offending motorist in order to 'calm' themselves. Aggressive retaliation was most often through gesturing, hooting or swearing.

Table 4 shows the association between anger coping and the experience of anger for level 2 and level 4 behaviours.

**Table 4: Association between anger coping and experience of anger\***

	n	Least Square Means	Lower Confidence Level	Upper Confidence Level	p	p overall (from F test)
<b>Level 2</b>						
No management*	81	5.693	4.118	7.753		
Simply ignore	590	4.844	3.956	5.893	0.280	
Efforts to avoid	255	7.370	5.946	9.088	0.084	
Retaliate aggressively	80	4.501	2.976	6.611	0.094	0.004
<b>Level 4</b>						
No management	81	0.744	0.410	1.158		
Simply ignore	590	0.342	0.189	0.514	0.027	
Efforts to avoid	255	0.766	0.507	1.069	0.912	
Retaliate aggressively	80	0.524	0.236	0.881	0.341	0.025

\* Level 1 behaviours were not relevant to anger and aggression relationships and excluded. The overall F test was not significant for level 3 behaviours ( $p=0.266$ ) and excluded. All estimates have been adjusted for gender, race and age

\*\* Four mutually exclusive categories are used for the management of anger. The control group/reference category is defined as those drivers not following any of the three management techniques

While level 1 behaviours were not relevant to investigating anger and aggression relationships, the global F-test was not significant for level 3 behaviours ( $p=0.266$ ) and this dimension was excluded. For experiencing level 2 behaviours, efforts made to avoid an offending motorist was related to about one-third more anger compared with the control group (no management) but was only significant at the 10% level ( $p=0.08$ ). Interestingly, retaliating aggressively was associated with slightly lower anger than the control group and was also significant at the 10% level ( $p=0.09$ ). When experiencing level 4 behaviours, only ignoring the offending motorist was found to be significant ( $p=0.03$ ) with an anger score of about half that of the control group.

## 4. SUMMARY AND DISCUSSION

### 4.1 Extent and levels of driver anger for experiencing aggressive road behaviours

That 96% of the sample experienced anger while driving over a one-year period shows that anger is extremely prevalent in this particular South African setting and is higher than that found in studies elsewhere (Joint, 1995; Underwood, Chapman, Wright & Crundall, 1999). Together with the generally high intensity levels reported, this finding is of concern considering the strong relationships that have been documented for the anger-aggression-injury relationships introduced earlier. As a victim to all types of aggressive road behaviours, at least two-thirds of the motorists experienced anger, with exception for being threatened with a gun or shot at. Even though being aggressively exposed to a gun may represent the most extreme behavior in this study, findings suggest that motorists tend to assign anger more often and at a higher intensity to frequently and less serious perpetrations (level 2 and 3 behaviours) and less often and at a lower intensity to the less frequent but most extreme behaviours (level 4 behaviours). This finding is consistent with the adaptational value of appraisal where faced with such a dangerous situation, a cognitive and rational response ensues to prevent the situation from becoming maladaptive. In this instance, terror may be the predominant emotion (rather than anger) where safety and self-preservation would be considered fundamental.



## 4.2 Other self-reported contributors to driver anger

In general, only 16% of motorists attributed their driver anger to aggressive road behaviours and thus, these behaviours may be less significant to anger generation in the South African traffic environment than expected. Similarly, in the study by Parker, Lajunen and Summala (2002), the leading anger-provoking behaviours among European drivers were also shown to be instrumental in nature.

In this study setting, motorists attributed their anger most often (38%) to situations when their progress in traffic was impeded such as slow moving vehicles. The dominant component in these situations is frustration as a result of other road users thwarting one's goal-directed behaviour or attempt to maintain progress in the traffic environment (Lajunen, Parker & Stradling, 1998). In the study by Knee et al. (2001), experiencing anger as a result of other drivers' slow driving was significantly and positively related to having a controlled orientation. Hence, anger as a result of other's slow driving may also be symptomatic of the high pressure and demands placed on individuals in modern society.

Behaviours relating to dangerous lane changing and overtaking was the next highest contributor to reported driving anger (29%). But, it could also mean that, in their haste (with concomitant high speeds and 'other high-risk driving behaviours'), normal lane changing or overtaking by relatively slower drivers may be perceived as dangerous. This is accentuated by findings from an earlier paper (Sukhai et al., 2005) showing that just more than half of all motorists acknowledged to driving above posted speed limits and at a frequency of half the time that they would get an opportunity to do so.

Of note is that the top two behaviours reported to anger motorists in this study setting did not feature prominently among European drivers in the study by Parker, Lajunen and Summala (2002). This may relate to differences in the general conceptualization and perceptions of the driving experience by motorists between these settings.

## 4.3 Anger associations

Results indicated that older motorists were more likely to be angered when experiencing level 2 aggressive road behaviours. This age effect with aggressive driving behaviours however, is contrary to that found in international studies where younger drivers have been shown to be more likely to be angered by 'direct hostility' (Lajunen et al., 1998; Parker et al., 2002). Behaviours considered under direct hostility were generally consistent with the conceptualisation of level 2 aggressive road behaviours in this study. However, of note is that although older motorists are more likely to be angered by these aggressive behaviours, in an earlier analysis (Sukhai et al., 2005), it was shown that younger motorists were more likely to engage in aggressive road behaviours. Our findings suggest the possibility that although older motorists are less tolerable of aggressive road behaviours (possibly due to greater lifetime exposure to these behaviours), they may be better placed to manage their anger, having the benefit of greater experience and emotional maturity. The greater reporting of anger by older motorists when experiencing these behaviours may also relate to them comparing present day traffic situations with less congested and less frustrating traffic patterns that they have experienced during their earlier years of driving.

With exception of consuming alcohol and carrying a firearm while driving, anger when experiencing all groups of behaviours was related to them engaging in at least one high-risk driving behaviour, which included red light running, driving above posted speed limits

and receiving traffic fines. This finding may be interpreted from both an 'at-fault' and a 'not at-fault' perspective. These motorists could possibly be instigating aggressive responses through their high-risk driving behaviours or alternatively that when being a victim to aggression, a 'compensatory' competitive element is unleashed as reflected in their high-risk driving behaviours.

When experiencing level 3 road rage behaviours, motorists who carried a weapon while driving (most often a firearm) were less likely to experience anger than motorists who did not carry a weapon. It is likely that carrying of a firearm may serve as a mental restraint with the awareness of a possible violent and harmful reaction if one were to become angered. Of interest is that although anger from experiencing level 4 behaviours was not related to carrying a firearm, earlier analysis showed that both the experience and perpetration of these behaviours were significantly related to motorists carrying a weapon while driving.

#### 4.4 Anger coping

While it is encouraging to note that most motorists are capable of 'simply ignoring' an offending motorist, one-tenth of them engaged in aggressive measures for the purpose of calming themselves. The latter, together with the finding of relatively low anger scores for retaliating aggressively, may relate to poor control of hostile impulses and hence an increased susceptibility to provocation (Novaco, 1991) or may even relate to an instance where aggression is used as a social problem-solving strategy or as an instrument for reaching one's goals (Baron & Richardson, 1994).

With anger management, only 'simply ignoring' the offending motorist was related to lower levels of anger and was applicable for the extreme level 4 direct confrontational behaviours. This finding is consistent with that found by Deffenbacher et al., (2002) where adaptive/constructive expressions of anger were found to be negatively correlated with both trait and state anger.

### **5. LIMITATIONS AND FUTURE RESEARCH**

Like other studies where measurements are difficult or not possible to obtain through direct observation, this study, based on indirect self-reports, is affected by response bias. While the response rate was satisfactory (aided by using interviewer-administered techniques, incentives and publicity), social desirability bias is an important consideration. There is a possibility that there may have been some empathic motorists who, being sensitive to the social implications of expressing anger and not displaying hostile tendencies in public, would have reported experiencing greater anger than others who displayed their anger.

Future research would benefit from a more focused approach with due consideration of the above and from employing stronger analytical designs such as case control or cohort studies as well as qualitative methods to help elucidate the sequence of events that leads to driver anger and aggression. Future driver anger research will also benefit from examining anger expression and coping in traffic compared with other environments.

Finally however, despite these limitations, the study has yielded a valuable preliminary perspective on some of the relationships between anger and its expressions in the South African traffic environment and thus provides an initial platform for further research in this setting.

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