

DRIVING ANGER AND AGGRESSIVE TENDENCY: THE MODERATING ROLE OF EMOTION REGULATION STRATEGY

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Abstract: *The aim of the present study was to examine the moderating role of habitual emotion regulation strategy on the relation between driving anger and aggressive tendency. Three hundred and fourteen Romanian drivers participated in the study. Significant relations between cognitive reappraisal, expressive suppression, experiential avoidance, driving anger, and aggression were obtained. Furthermore, we obtained a moderation effect of expressive suppression on the relation between driving anger and aggressive tendency, suggesting that drivers who habitually suppress their emotions tend to respond in a more aggressive manner when experiencing high driving anger.*

Key words: *driving anger, aggressive tendency, cognitive reappraisal, experiential avoidance, expressive suppression.*

1. Introduction

Aggressive driving behaviour is an alarming phenomenon which jeopardises the safety of both drivers and pedestrians, putting them at risk for various types of road accidents (Krahé, 2005). It consists of any type of behaviour directed to physically or emotionally hurt another individual, either driver or pedestrian (Dula & Geller, 2003). Aggressive driving aims to harm, intimidate, threaten, dominate, retaliate upon, frustrate, or express displeasure with another user of the roadway (Deffenbacher, Richards, & Lynch, 2004). Drivers can display different levels of aggression, varying from mild aggression (e.g. making non-verbal gestures, tailgating, blocking other drivers) to extreme aggression (e.g., physical attacks on other road participants, unsafe lane changing, car ramming) (Özkan, Lajunen, Parker, Sümer, & Summala, 2010). Emotional states, especially anger and anxiety, have been frequently found to increase the risk of traffic accidents. Anger leads to a risky driving style (Deffenbacher, Lynch, Oetting, & Yingling, 2001), aggressions towards other drivers (Deffenbacher, Lynch, Oetting, & Swaim, 2002) and thus to a higher probability of accident involvement, up to the point that road rage – the driving style induced by anger – was described as one of the top three highway threats (Bowles & Overberg, 1998). One of the most studied causes of aggression in recent studies is anger, a significant and dangerous phenomenon that commonly occurs in traffic (Sullman, 2015; Sullman, Stephens, & Kuzu, 2013).

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1.1. Anger and Aggressive Driving

Empirical studies regarding the strength of the relation between anger and aggressive driving have reported mixed findings, some showing a weak relation between aggressive driving and trait anger (Deffenbacher, Alcazar-Olan, Kocur, & Richards, 2014) or driving anger (Sullman et al., 2013), whereas other findings suggested a medium (Herrero-Fernández, 2013) or a strong relation between them (Nesbit, Blankenship, & Murray, 2012). The inter-individual differences in experiencing anger while driving were mostly assessed with the Driving Anger Scale (DAS) (Deffenbacher, 2000), while the manifest expressions of anger were mostly captured with the Driving Anger Expression Inventory (DAX) (Deffenbacher et al., 2002). Trait driving anger represents the extrapolation of the general concept of anger into the specific context of driving and has been conceptualized as the tendency to become angry while driving. Previous findings suggested that drivers with high scores on the DAS engage more frequently in aggressive and risky behaviours compared to those with low scores (Deffenbacher et al., 2001; Deffenbacher, Oetting, & DiGiuseppe, 2002), they are also more frequently involved in road accidents (Deffenbacher et al., 2001; Lajunen & Parker, 2001; Clarke, Ward & Truman, 2002; Krahé, 2005) and respond more quickly to aggressive rather than neutral stimuli (Blankenship & Nesbit, 2013). In addition, drivers with high DAS scores react more intensely in driving situations that have the potential to generate aggressiveness (such as traffic jams, being insulted by another driver, etc.).

Given the fact that driving anger has been consistently shown to have detrimental effects on driving behaviour, it is important to investigate which forms of emotion regulation may be more effective at reducing and minimizing drivers' experience and expression of anger (Harris & Nass, 2011).

1.2. Emotion Regulation Strategies

Emotion regulation consists of all the conscious and unconscious strategies individuals use in order to reduce, maintain, or increase either positive or negative emotions (Gross, 2001). Even though many frameworks for conceptualizing the different ways individuals regulate their emotions have been proposed (see for example Larsen, 2000; Parkinson & Totterdell, 1999; Koole, 2009) the process model of emotion regulation (Gross, 1998) is the most widely used model. It provides a conceptual framework to organize the forms of emotion regulation that individuals use, explaining how these forms differ in their affective, cognitive, and social consequences (Gross & Thompson, 2007). The model distinguishes between two major forms of emotion regulation (Gross, 2001): (1) *antecedent-focused strategies* - taking place before appraisal give rise to a full-blown emotional response (i.e. situation selection, situation modification, attentional deployment, and cognitive reappraisal) and (2) *response-focused strategies* – occurring after the emotional responses are generated (i.e. response modulation through suppression of the experience or of the expression of emotion).

Cognitive reappraisal is an antecedent-focused strategy that involves changing the appraisal of an emotion-eliciting stimulus in order to diminish its impact (Gross, 2001). Because it occurs early in the emotion generative process, reappraisal is thought to be an adaptive and relatively effortless strategy (Gross & Thompson, 2007). Previous experimental studies showed that the instructed use of reappraisal influences many

aspects of emotional responding, reducing both the experienced and expressed negative emotion (Gross, 1998), as well as its peripheral physiology (Jackson, Malmstadt, Larson, & Davidson, 2000). Moreover, recent research has also shown that individuals that predominantly use reappraisal as an emotion regulation strategy tend to have a more adaptive profile of emotion experience and cardiovascular responding in anger-inducing situations (Mauss, Cook, Cheng, & Gross, 2007)

Among the response focused strategies, suppression (both experiential and expressive) has been the most studied form of emotion regulation. Experiential avoidance, the suppression or avoidance of an array of psychological experiences, including thoughts, emotions, sensations, memories, and urges, can lead to a variety of negative outcomes (Hayes et al., 2004), due to its paradoxical effect of increasing negative thoughts (Wenzlaff & Wegner, 2000). With respect to expressive suppression (i.e., the inhibition of emotionally expressive behaviour), Gross (1988) states that even though it may reduce the outward expression of emotion and possibly the subjective experience of emotion on the short term, it is less efficient in reducing emotion and physiological arousal on the long term (John & Gross, 2004; Gross & Thompson, 2007). Moreover, chronic suppression hinders habituation, resulting in hypersensitivity to depression and anxiety - related thoughts and symptoms (Wenzlaff & Wegner, 2000).

Aldao, Nolen-Hoeksema, and Schweizer's (2010) meta-analysis indicated that individuals' tendency to use avoidance, suppression, and rumination as emotion regulation strategies were found to be positively related to psychopathological symptoms. More recently, a meta-analysis of the efficiency of emotional regulation strategies indicated that cognitive change proved more effective than attentional deployment or response modulation in regulating both positive and negative emotions (Webb, Miles, & Sheeran, 2012). Moreover, whereas suppressing the expression of emotion proved effective, suppressing the experience of emotion or one's thoughts about the emotion-eliciting event did not (Webb et al., 2012).

So far, the topic of emotion regulation in traffic was mostly neglected. Although the importance of regulating driving anger has been acknowledged (Chan & Singhal, 2013), studies on whether emotion regulation strategies are effective at regulating anger while driving are scarce. A recent study showed that self-reported difficulties in emotion regulation were related to dysfunctional driving styles (i.e. anxious, angry, dissociative, and risky driving style) whereas lesser difficulties in regulating emotions were associated with careful driving (Trógolo, Melchior, & Medrano, 2014). Few studies have examined whether the instructed use of emotion regulation strategies are effective at down-regulating drivers' experience of anger, as well as their risky and aggressive driving behaviour (Chan & Singhal, 2013; Wollstadter, Vollrath, & Pfister, 2013). Moreover, at this point, studies on how individuals' habitual style of regulating emotions moderates the relation between induced emotions and their behavioural consequences are scarce.

2. Aim of the Present Study

The aim of the present study was to examine whether individuals' specific styles of regulating emotions moderates the relationship between driving anger and aggression. We considered three different types of emotion regulation strategies, which are the most commonly studied in relation to anger and dysfunctional behaviours, namely *cognitive reappraisal*, *expressive suppression* and *experiential avoidance*. So far, studies have

pinpointed mostly situational moderators of drivers' aggressive emotional expressions, such as the anonymity offered by the vehicle (Doob & Gross, 1968; Ellison-Potter, Bell, & Deffenbacher, 2001), high ambient temperature (Kenrick & MacFarlane, 1986), the presence of aggressive cues on the road (Ellison-Potter et al., 2001), longer waiting times (Shinar, 1998), or congestion and being in a hurry (Deffenbacher, 2003). Our study focuses on a psychological moderator, namely drivers' habitual emotion regulation strategy. To our knowledge, this is the first study aimed at identifying how the emotion regulation strategies habitually used by drivers interact with driving anger to determine different degrees of aggressive reactions in traffic. We expect certain emotion regulation habitual strategies, such as reappraisal, to prove more efficient in diminishing drivers' aggressive behaviours when dealing with anger – inducing situations. On the other hand, the studies reviewed above on the detrimental consequences of other strategies, specifically suppression, raise the possibility that drivers who habitually use this emotion regulation strategy would manifest more intense aggressive behaviours when experiencing anger.

3. Method

3.1. Participants

A convenience sample of 314 drivers participated in this study ($N_{\text{men}} = 156$). Their age ranged from 19 to 72 ($M = 35.64$; $SD = 12.56$). Driving experience ranged from 1 to 53 years ($M = 10.33$; $SD = 8.69$), and the average mileage in the last year was 15,286.50 km ($SD = 41,084.71$).

3.2. Instruments

The full version of the *Driver Anger Scale* (DAS – Deffenbacher, Oetting, & Lynch, 1994) consisting of 33 items was used to measure *driving anger*. The instrument was translated from English using the back and forward translation method. Participants responded with self-ratings on the amount of anger probable in response to each brief statements describing anger-provoking situations using a 5-point Likert scale (ranging from “not at all angry” to “very much anger”). Finally, an average score was computed and the instrument has been found to have high internal reliability (in our sample, Cronbach's $\alpha = .94$; in Deffenbacher et al., 2004 – Cronbach's $\alpha = .90$).

The respondents' tendencies to engage in *aggressive behaviours* while driving were assessed using the *Propensity for Angry Driving Scale* (PADS – DePasquale, Geller, Clarke, & Littleton, 2001). The PADS consists of 19 hypothetical scenarios depicting driving situations typically regarded as anger-provoking (e.g. being cut off, another driver making rude gestures). The instrument was translated from English using the back and forward translation method. The participants responded by selecting their most likely behaviour out of four options. The options varied in expressed aggression from mild to extreme reactions (e.g., slowing down and relaxing, making obscene gestures, driving recklessly). The coding schema proposed by DePasquale et al. (2001) was used and an average score was computed. The instrument was found to have good internal reliability, similar to the one obtained by DePasquale et al. (2001) (original Cronbach's $\alpha = .80$ and in our sample, Cronbach's $\alpha = .86$).

In order to assess individuals' tendency to use *expressive suppression* and *cognitive reappraisal* in order to regulate their emotions, we used the *Emotion Regulation Questionnaire* (ERQ - Gross & John, 2003). The instrument was translated from English using the back and forward translation method. The ERQ consists of 10 items indicating in each item a typical example of the emotion regulatory process intended to measure (e.g. "I control my emotions by changing the way I think about the situation I'm in" – for cognitive reappraisal; "I control my emotions by not expressing them" for expressive suppression), the participants rated each item on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Moreover, in addition to the general emotion regulation items, both the reappraisal and the suppression scale included at least one item referring to regulating a negative and a positive emotion. Finally, each participant obtained an average score for both subscales and the instrument was found to have good internal reliability (in our sample, for cognitive reappraisal Cronbach's $\alpha = .71$ and for expressive suppression Cronbach's $\alpha = .64$). Our coefficients were similar to Gross and John's (2003) (Cronbach's $\alpha = .75$ for reappraisal and Cronbach's $\alpha = .68$ for suppression).

Experiential avoidance was measured through the short form of *Acceptance and Action Questionnaire* (AAQ-II – Hayes et al., 2004). The instrument was translated from English using the back and forward translation method. The AAQ-II has 7 items and they are designed to tap different aspects of experiential avoidance (e.g., the ability to act effectively when experiencing negatively evaluated private events, negative evaluations of private events and painful experiences, the ability to distance oneself from the literal content of negative evaluations, negative comparison as to how others handle their lives). The respondents rated the degree to which items apply to them on a 7-point scale ranging from 1 ("*never true*") to 7 ("*always true*"). Finally, each participant obtained an average score on experiential suppression; the instrument was found to have high internal reliability, similar to the one obtained by Hayes et al. (2004) (in our sample, Cronbach's $\alpha = .85$).

4. Results

4.1. Preliminary Analysis

First we tested the normality of the distribution for each of the variables in the study and noticed that only driving anger and suppression scores were normally distributed. For the other variables, we applied the optimal transformations in order to obtain a normal distribution: the aggressive tendency score and avoidance score were transformed using natural logarithm, whereas the reappraisal score was transformed by subtracting the reflected score.

Secondly, given the aim of the study to test the moderating role of the emotion regulation strategies on the relation between anger and aggressive tendencies, the scores of the emotional regulation instruments were first standardized. In order to assess each specific emotion regulation strategy by differentiating it from the others, its *z*-score difference from the mean of the other two strategies was computed; for instance, the individual tendency in using a reappraisal was assessed through the difference between the *z*-score of reappraisal and the mean *z*-score of experiential avoidance and expressive suppression. The same transformation was used in order to obtain the tendency to use experiential avoidance and expressive suppression, respectively.

4.2. Correlational Analysis

The correlation coefficients for all scales are reported in Table 1. Aggressive tendency while driving is positively correlated with driving anger ($r = .453$, $p < .001$) and avoidance tendency ($r = .168$, $p = .003$) and is negatively associated with reappraisal tendency ($r = -.196$, $p < .001$). Moreover, driving anger is negatively related to reappraisal ($r = -.182$, $p < .001$) and suppression ($r = -.090$; $p = .06$) and positively associated with avoidance ($r = .255$, $p < .001$).

Table 1

Correlation coefficients between aggressive tendency, driving anger, and emotion regulation strategy (cognitive reappraisal, expressive suppression, experiential avoidance)

	(1)	(2)	(3)	(4)	(5)
(1) Aggressive tendency	-	.453**	-.196**	.030	.168**
(2) Driving anger		-	-.182**	-.090†	.255**
(3) Cognitive reappraisal			-	-.433**	-.593**
(4) Expressive suppression				-	-.469**
(5) Experiential avoidance					-

* $p < .05$; ** $p < .001$; † $p < .06$.

4.3. Testing for Moderation

In order to examine the degree to which each of the emotion regulation strategies moderates the influence anger on drivers' aggressive tendencies, we conducted three hierarchical regression analyses for aggressive tendencies while driving as an outcome, one for each of the emotion regulation strategies. Anger was included as predictor in the first step in each regression model; participants' scores on one emotion regulation strategy were added in the second step, and the interaction between the two variables was added in the final step. The main and interaction effect were centred to minimize multicollinearity.

The results showed that the relation between driving anger and aggressive tendency was not moderated by reappraisal, as the interaction between reappraisal and anger failed to yield statistical significance ($b = -.01$; $t(308) = -1.25$; $p = .21$). Similar results were obtained in case of avoidance; anger did not interact with avoidance in predicting the aggressive tendency ($b = -.01$; $t(308) = -1.02$; $p = .31$). In the case of suppression, the results showed that anger interacted with suppression tendency in predicting aggressive tendencies while driving (see Table 2).

Table 2

Hierarchical regression models of driving anger, emotion regulation strategies (suppression) on aggressive tendencies while driving

	Aggressive tendency			
	β	t	ΔR^2	ΔF
<i>Step 1</i>			.205	79.89**
Driving anger	.453**	8.94		
<i>Step 2</i>			.004	1.65
Suppression	.013	1.29		
<i>Step 3</i>			.010	3.75*
Suppression x driving anger	.025*	1.94		

* $p < .05$; ** $p < .001$.

Drivers with high levels of suppression and a high level of driving anger reported the highest levels of aggressive tendencies (see Figure 1).

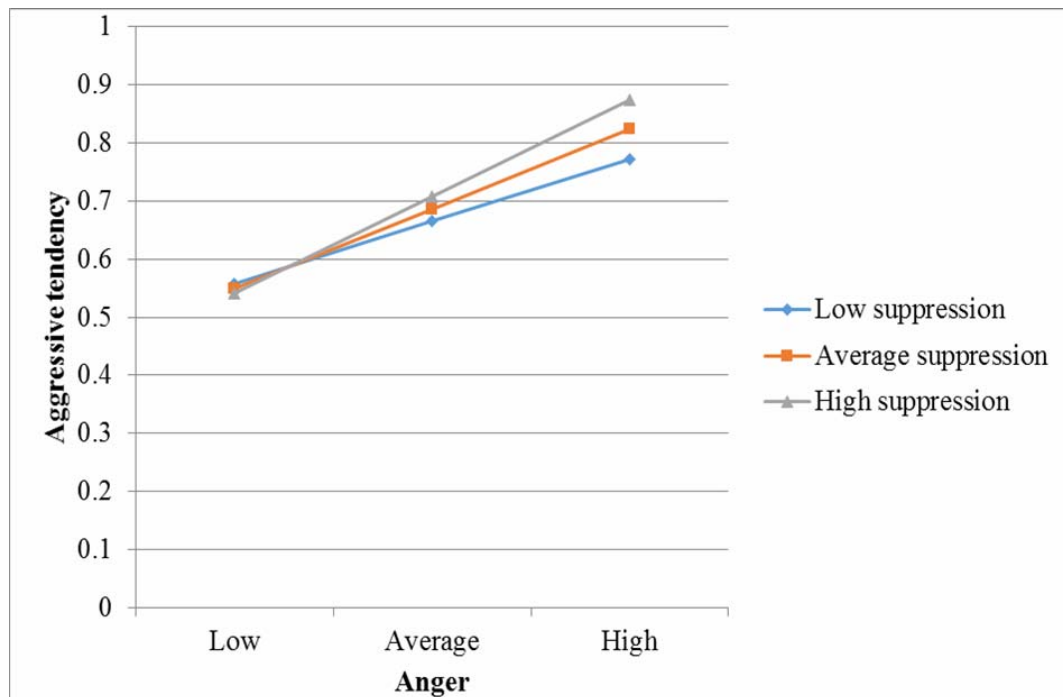


Fig 1. *Aggressive tendency while driving as a function of driving anger and suppression strategy. Simple effects were represented with driving anger and suppression levels defined as at least +1 and -1 standard deviations from the mean, respectively.*

5. Conclusions and Discussion

This study aimed to identify the moderating role of emotion regulation strategies in managing strong emotions in traffic, namely driving anger, and its relation to aggressive driving. Given the fact that previous findings suggested that cognitive reappraisal, experiential avoidance, and expressive suppression influenced the expression and intensity of negative emotions, including anger (Aldao et al., 2010; Webb et al., 2012) we chose them as moderators of the influence of this emotions on aggressive tendencies while driving. Previous findings have shown clear differences in the consequences of these different emotion regulation strategies in various psychological areas. The most frequent effect is the decrease of the intensity of the experienced emotion as compared to the situation where none of the emotion regulating strategies are applied, cognitive reappraisal being more efficient than experiential and expressive suppression (Bebko, Franconeri, Ochsner, & Chiao, 2011).

First, we tested the associations between driving anger, aggressive tendencies and emotion regulation strategies. Driving anger and aggressive tendencies were negatively related with habitual cognitive reappraisal. Drivers with a habitual way of reappraising emotions tend to be less angered while driving and express milder to no aggressive behaviours. As previously stated before, cognitive reappraisal is considered to be one of

the most efficient ways to downregulate anger (Webb et al., 2012) and is negatively related to psychopathological symptoms (Aldao et al., 2010). Moreover, the instructed use of reappraisal influences emotional responding by reducing both the experienced and expressed negative emotions (Gross, 1988), as well as peripheral physiology (Jackson et al., 2000). It is therefore understandable why drivers who habitually reappraise emotions manifested less aggressive tendencies while driving. As a previous study showed, in anger-inducing situations, high reappraisers tend to have a more adaptive profile of emotional experience and cardiovascular responding (Mauss et al., 2007).

Driving anger and aggressive tendencies were positively related to experiential avoidance, suggesting that drivers who habitually deal with anger by avoiding any thoughts, emotions, sensations, or memories of it tend to be more angered while driving and behave more aggressively on the road. As previous findings suggested, response focused emotion regulating strategies are less efficient in reducing emotion and physiological arousal (Gross & Thompson, 2007; John & Gross, 2004). Furthermore, a recent study showed that suppression does not downregulate negative emotions (Kalokerinos, Greenaway, & Denson, 2015) and that drivers who have difficulties in managing emotions tend to have dysfunctional driving styles (i.e., angry or risky driving style (Trógolo et al., 2014).

Secondly, we tested the moderation effect of each emotion regulation strategies on aggressive tendency. We obtained an interaction between expressive suppression tendency and driving anger on aggressive tendency, suggesting that the aggressiveness – inducing effect of driving anger is significantly amplified in participants who habitually suppress outward signs of their feelings. In other words, anger leads drivers characterized by expressive suppression in particular to display the most extreme aggressive reactions. As previously stated, expressive suppression has been proved to be an inefficient emotion regulation strategy and its habitual use may lead to dysfunctional behaviours (Wenzlaff & Wegner, 2000). Furthermore, due to its paradoxical effect to increase negative arousal (Wenzlaff & Wegner, 2000) it can lead to a variety of negative outcomes (Hayes et al., 2004). More specifically, it has been suggested that experiencing a negative emotion is likely to bias the perception of certain events, increasing the possibility of an aggressive response (Crick & Dodge, 1996). Moreover, the over-regulating of negative emotions through suppression predisposes individuals to engage in dysfunctional behaviours (Robertson, Daffern, & Bucks, 2012). On the other hand, dysregulated emotions can be transformed into destructive aggression (Novaco, 2007) because unresolved negative emotions may need a way to burst out in order for the individual to avoid psychological discomfort (Bushman, Baumeister, & Stack, 1999). More conclusive, maladaptive emotion regulation may have as a result a decrease in self-control and an increase in aggression (Denson, DeWall, & Finkel, 2012). Norstrom and Pape's (2010) study confirmed that when individuals had a high level of suppressed anger they got involved more frequently in violent behaviours and, even when controlling for trait anger, suppression was able to predict aggressive behaviour (Tull, Jakupcak, Paulson, & Gratz, 2007).

Moreover, the ability to flexibly adapt one's emotions to fluctuating situational demands is a major component of psychological health (Hollenstein, Lichtwarck-Aschoff, & Potworowski, 2013; Kashdan & Rottenberg, 2010) and a lack of such flexibility may result in emotions that are overly predicted in time (i.e., emotional inertia) (Butler, 2011). A recent study showed that expressive suppression is related to higher inertia of negative emotional behaviours (Koval, Butler, Hollenstein, Lanteigne, & Kuppens, 2015). Thus,

suppression may increase aggression by exaggerating negative affect, reducing inhibition of aggressive tendencies, increasing physical arousal and hindering the resolution of difficult situations.

Although promising, and bearing great importance in understanding anger driving, the results of the presented study should be cautiously taken into consideration, given the inherent limitations of the study. The research was conducted on a relative low number of drivers and all the variables were measured with self-report tools. Future studies should attempt more accurate measurements of drivers' emotion regulation strategies (e.g., using a functional magnetic resonance imaging - fMRI), of their affective states and driving behaviours (e.g., using a simulator). Moreover, the experimental investigation of the influence of emotion regulation strategies on both affective states and driving behaviour is mandatory in order to obtain a comprehensive understanding on the relation between anger and aggression in traffic. Our findings suggest that changing the habitual way in which individuals construe angering events could be an effective treatment in anger regulation interventions and future studies should begin to investigate whether it is possible to alter individuals' habitual emotion regulation strategies.

To our knowledge, this is the first study aiming to test the moderation effect of emotion regulation strategies on the relation of driving anger and aggressive tendencies. Besides the novelty of the topic in traffic psychology, a better understanding of the role of emotion regulation strategies in drivers' emotional and behavioural dynamic may advance the prevention of driving anger and contribute to the mitigation of daily aggressive behaviours.

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