COMPARISON OF DRIVERS' AGGRESSION FREQUENCY ON AND OFF THE ROAD ACCORDING TO THE PROPENSITY TO EXPERIENCE ANGER WHILE DRIVING

COMPARACIÓN DE LA FRECUENCIA DE AGRESIÓN EN CONDUCTORES GENÉRICAMENTE Y EN LA CONDUCCIÓN EN FUNCIÓN DE SU PROPENSIÓN A EXPERIMENTAR IRA AL VOLANTE

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Abstract

An important question in the study of driving anger is whether drivers express anger the same way on and off the road. With the aim of analyzing the between-group and within-group differences in a heterogeneous sample of 157 drivers divided in high, moderate and low–driving anger, four ways of expressing anger were assessed (verbally, physically, displacedly and adaptatively), both in general and behind the wheel. The between-group results showed that high anger drivers scored higher than low angered in all types of desadaptative expression on the road ($\eta 2$ = .08 – .16) as well as in the physical ($\eta 2$ = .06) and displaced ($\eta 2$ = .10) ways off the road. The within-group comparisons evidenced high equivalence in each of the three groups about the preference of anger expressions on and off the road, concluding the apparent equivalence of the behavior in all the contexts. Clinical and road safety implications are discussed.

Keywords: Driving anger; Driving anger expression; General anger expression; Road safety; Traffic psychology.

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Resumen

Una cuestión importante en el estudio de la ira en la conducción es si los conductores expresan la ira de la misma manera dentro y fuera del vehículo. Con el objetivo de analizar las diferencias tanto intergrupales como intragrupales en una muestra heterogénea de 157 conductores divididos en alta, moderada y escasamente propensos a experimentar ira al volante, cuatro formas homólogas de expresar la ira tanto en general como en la conducción fueron valoradas (verbalmente, físicamente, desplazadamente y adaptativamente). Los resultados de los contrastes intergrupales mostraron que los conductores altamente propensos a experimentar ira puntuaron más alto que los escasamente propensos a esta emoción en todas las maneras de expresión agresiva al volante ($\eta 2$ = .08 – .16), así como en las formas física ($\eta 2$ = .06) y desplazada ($\eta 2$ = .10) fuera del vehículo. Las comparaciones intragrupo evidenciaron una alta equivalencia en cada uno de los tres grupos acerca de la frecuencia de expresión de la ira dentro y fuera del vehículo de cada una de las cuatro maneras valoradas, concluyéndose la aparente equivalencia de comportamiento en todos los contextos. Se discuten las implicaciones clínicas y para la Seguridad Vial.

Palabras clave: Ira en la Conducción; Expresión de la Ira en la Conducción; Expresión Genérica de la Ira; Seguridad Vial; Psicología del Tráfico.

Introduction

One of the specific contexts in which human behavior must be studied is that which includes the driving of a vehicle. Given the complexity of this, the specific study of the cognitive, emotional and behavioral responses that drivers give because of the road contingencies is necessary. One of the principal reasons to justify this analysis is that the human factor explains more variance of the road accidents than the vehicle and environment factors do (Evans, 1991).

One of the variables of the human factor –and more concretely of the emotions– that more relevance seems to have is anger (Dahlen & Ragan, 2004; Deffenbacher, Deffenbacher, Lynch, & Richards, 2003; Deffenbacher, Filetti, Richards, Lynch, & Oetting, 2003; Deffenbacher, Lynch, Filetti, Dahlen, & Oetting, 2003). This is because the experience of this emotion has a negative influence in some cognitive variables, like attention, perception and information processing, which are essential to the exercise of driving (Bone & Mowen, 2006; Deffenbacher, Deffenbacher, et al., 2003; Pinto, 2001), evidencing their implication in road accidents. In the same way, some comparative studies between high anger and low anger drivers have been carried out, showing that high anger drivers commit more traffic infractions than low anger drivers (Underwood, Chapman, Wright, & Crundall, 1999). Besides, in laboratory studies made through simulation tasks, anger experience has been linked to loss of control of the vehicle, loss of concentration and higher probabilities of suffering an accident (Deffenbacher, Lynch, et al., 2003; Deffenbacher, Lynch, Oetting, & Yingling, 2001).

Driving anger has been conceptualized as a personality trait, being defined as the degree in which this emotion is experienced in specific contexts related to driving (Deffenbacher, Oetting, & Lynch, 1994). In this way, some studies about the relationship between on-the-road and off-the-road anger have been conducted, with the aim of shedding some light on the old debate of whether "people are transformed behind the wheel" or if "we drive as we live" (Tillmann & Hobbs, 1949). Different results about this question have been obtained. On the one hand, there are researches that propose an stability of anger through the different situations (Spielberger, Krasner, & Solomon, 1988), being therefore conceptualized as a relatively stable syndrome of physiological reactions, feelings and cognitions, (Berkowitz & Harmon-Jones, 2004), which implies that aggression in the specific context of driving would be one more part of a most generalized behavior pattern (MacMillan, 1975).

However, another reseach line has evidenced that driving anger is a specific personality trait, different but related to general anger trait, according to the moderate-strengh correlation coefficients found between the two traits (Deffenbacher, Deffenbacher, et al., 2003; Deffenbacher, Filetti, et al., 2003; Deffenbacher, Lynch, Oetting, & Swaim, 2002; Deffenbacher, White, & Lynch, 2004; Esiyok, Yasak, & Korkusuz, 2007; Lajunen & Parker, 2001). In other research, more statistically sophisticated and developed through structural equation modeling, it was discovered that the observable variables (measurements of general anger and driving anger) fitted signiticantly better in two latent variables than in only one, although these two were strongly correlated (van Rooy, Rotton, & Burns, 2006). In the same way, it has been showed that persons that score high in trait driving anger have also high scores in risk, general anger, impulsivity, general aggression and anxiety (Deffenbacher, Deffenbacher, et al., 2003; Deffenbacher, Filetti, et al., 2003; Deffenbacher, Huff, Lynch, Oetting, & Salvatore, 2000).

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The experience of anger behind the wheel has been associated in several studies with aggressive behaviors in this environment, having identified five ways of expression: verbally, physically, through the own vehicle, displacedly and adaptatively (Deffenbacher, et al., 2002; Esiyok, et al., 2007; Herrero-Fernández, 2011a). The importance of studying the way of anger expression lies in the fact that two drivers with the same amount of anger can express this emotion by very different ways. Therefore, verbal expression includes the emission of yells, calling names, slight threats, etc.; physical expression includes more serious threats, physical violence, fights, etc.; using the vehicle to express anger involves driving closely to the precedent vehicle, driving in parallel to another vehicle, etc.; displaced expression consists in directing aggression against a different target that provoked the anger, and adaptative expression consists of expressing constructively the anger, like through the assertiveness or the self control (Deffenbacher, Lynch, Deffenbacher, & Oetting, 2001; Deffenbacher, et al., 2002; Herrero-Fernández, 2011a).

Therefore, although it seems to be a relationship between behavior on and off the road, there is no research comparing specifically drivers based on the propensity to experience anger behind the wheel, in the different identified ways of expressing this emotion (verbally, physically, displacedly and adaptatively), common to the two contexts (general and on the road), and, at the same time, analyzing the possible within-group differences in the more and less preferred ways of expression in each of the two contexts. Therefore, the aims of this research are four, divided in four parts. In regards to the first part, the first aim is to analyze whether the frequency of the expression of the aggressive behaviors in the on-the-road context is higher in drivers who score high in trait driving anger with regards to those who score moderate or low; and the second aim is to verify whether the self-reported frequency of aggressive behaviors of different types, in the driving context, is the same in the three established groups based on the propensity to experience anger behind the wheel. Regarding to the second part, firstly, the aim is to verify whether the frequency of the expression of aggressive behaviors off the road is higher among drivers who score high in trait driving anger than the other two groups; and secondly, to analyze whether the self-reported frequency of aggressive behaviors of different types, in off-the-road context, is the same based on the amount of anger experienced behind the wheel.

Method

Participants

The convenience sample consisted of 157 participants, taken from the University of Deusto. The most of them were students (82.6%), but some others (17.4% were employers). Of them, 54 were males (34.4%) and 103, females (65.6%). The age ranged from 19 to 70 years (M = 28.39, SD = 10.52). The only requirement to take part in the research was to have a driving license and drive, at least, once a week. Participants were not remunerated.

Instruments

The internal consistence indices reported (Cronbach´s alpha) correspond to the data of the present research.

Driving Anger Scale (DAS): The DAS questionnaire is a five-point Likert scale (1 = Not at all to 5 = Very much) that assesses trait driving anger measuring the level of anger experienced when the driver is under the situation described by each item. The DAS is associated with aggressive tendencies behind the wheel. The 14-item short form of the DAS (Deffenbacher, et al., 1994) was adapted with a Spanish sample (Herrero-Fernández, 2011b), through a confirmatory factor analysis, showing a good fit in three factors, called Impeded Progress by Others (α = .80), Reckless Driving (α = .78) and Direct Hostility (α = .85). These three factors can be summed into a global score (α = .87), that is the index used in the analyses.

Driving Anger Expression Inventory (DAX): The original version of the DAX (Deffenbacher, et al., 2002) has been adapted with a Spanish sample (Herrero-Fernández, 2011a). This is a four-point Likert scale (1 = Almost Never to 4 = Almost Always), composed of 50 items that assess the way of expressing anger behind the wheel: Verbally (α = .92), Physically (α = .80), Displacedly (3 items, α = .81) and Adaptatively (α = .93). There are also another assessed way, which entails the expression of anger through the own vehicle. However, in this research this last factor was not considered, because it is focused on a specific way of anger expression on the road, and has no equivalence in the general context.

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State Trait Anger Expression Inventory (STAXI-2): A part of the Spanish version of the STAXI-2 was applied (Miguel-Tobal, Casado, Cano-Vindel, & Spielberger, 2001). Only the control of expression, both Internal and External expression scales were applied, being computed as a whole (α = .87). The response style is a four-point Likert scale (1 = Almost Never to 4 = Almost Always).

Aggression Questionnaire (AQ): A part of an interculturally reformulated version of the Aggression Questionnaire (Vigil-Colet, Lorenzo-Seva, Codorniu-Raga, & Morales, 2005) was applied, including the Verbal Aggression scale (α = .75) and the Physical Aggression scale (α = .84). It is a five-point Likert scale (1 = Completely False to Me, to 5 = Completely True to Me). These scales assess the general verbal and physical anger expression. This version, which is a statistically congruent compilation of the English, Japanese and Spanish language versions, was chosen rather than the specific Spanish version with the aim of being able to be used in further research in other countries in reply to the present results.

Displaced Aggression Questionnaire (DA): The 10-item behavioural displaced aggression scale of the Displaced Aggression Questionnaire (Denson, Pedersen & Miller, 2006) was adapted with a Spanish sample (Herrero-Fernández, 2013), and it was applied in isolation. It is a seven-point Likert scale (1 = Never to 7 = Always) that assesses aggression targeted against a person or object other than the trigger that caused the anger. Its internal consistence is high (α = .80).

Procedure

A Three counterbalanced models were prepared in order to avoid being influenced to answer the following questionnaires. Each model was completed, randomly, by approximately one third of the participants. The questionnaires were answered in groups of no more than five persons. Anonymity was guaranteed to all the participants.

Participants were divided in three groups, according to their score in the DAS. Therefore, those with a score equal or higher than percentile 75 were in the High Anger group; those with a percentile score from 25 to 75 were in the Medium Anger group; and those with a score equal or lower than percentile 25 were in the Low Anger group.

Data Analyses

The analyses included between-group and within-group comparisons. Initially, the scores from all the questionnaires were transformed into a scale from zero to one hundred, in order that comparisons among them were established. Afterwards, two multivariate analyses of variance (MANOVA) and another two-repeated measure ANOVAs were carried out. In repeated measure ANOVAs the Greenhouse-Geisser correction of degrees of freedom was applied, because the principle of sphericity was violated in all the cases. In all the statistical contrasts signification and effect size (η^2) were calculated. This last index was interpreted according to the Cohen´s criterion, being considered low the effects from .01 to .04, those between .05 and .14 moderate, and those higher than .14 high (Cohen, 1988). Finally, in the between-group comparisons, the Gabriel´s Post Hoc test was applied, because it is the most robust when sample sizes are slightly different. However, in the within-group comparisons the Bonferroni´s Post Hoc test was applied, because it is the most robust when the principle of sphericity is violated (Field, 2005).

Table 1

Univariate comparisons in the measurements of on-the-road anger expressions

	H. Anger		M. Anger		L. Anger		F	η^2
	n = 36		n = 62		n = 59			
	M	*SD*	*M*	*SD*	*M*	*SD*		
Verbal E.	45.60^{c}	28.16	39.03^{c}	20.88	21.98^{ab}	20.80	14.24**	.16
Physical E.	9.44^{c}	13.15	5.17	10.09	1.44^{a}	3.70	8.47**	.10
Displaced E.	19.14^{bc}	24.72	7.96	14.62	6.32^{a}	14.13	6.72*	.08
Adaptative E.	48.08	22.85	52.10	15.93	56.57	16.83	2.53	.03

Note: H. Anger, M. Anger and L. Anger: High Anger, Medium Anger and Low Anger drivers. “a”, “b”, “c”: Significant differences among the groups, being High Anger (a), Medium Anger (b) and Low Anger (c), according to the Gabriel´s Post-Hoc test. *p < .01; **p < .001.

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Table 2

Comparison of the ways of the on-the-road anger expression

	Ways of Expression								F	η^2
	Verbally		Physically		Displacedly		Adaptatively			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
High Anger	45.60^{bc}	28.16	9.44^{ad}	13.15	19.14^{ad}	24.72	48.08^{bc}	22.85	27.57*	.44
Medium Anger	39.03^{bcd}	20.88	5.17^{ad}	10.09	7.96^{ad}	14.62	52.10^{abc}	15.93	129.40*	.69
Low Anger	21.98^{bcd}	20.80	1.44^{acd}	3.70	6.32^{abd}	14.13	56.57^{abc}	16.83	167.44*	.75

Note. Differences among the ways of expression, being Verbally (a), Physically (b), Displacedly (c) and Adaptatively (d), according to the Bonferroni´s Post Hoc test. *p < .001.

Results

Analysis of the Anger Expression behind the Wheel

First, a multivariate analysis of variance (MANOVA) was conducted, introducing the amount of driving anger experienced as an independent variable (high anger, medium anger and low anger), and the four ways of anger expression behind the wheel as dependent variables. A multivariate significant effect was observed, $F(8, 298) = 4.98$, $p = .001$, $\eta^2 = .12$. In the Table 1 the univariate analyses are detailed. High–anger drivers showed more frequency of aggressive expression in the three ways of desadaptative expression with regard to low–anger drivers, with effect sizes from moderate to high. However, there was no difference in the adaptative way of expression. In the case of moderate anger drivers, they scored higher than low angered in verbal expression, and lower than the high angered drivers in displaced aggression.

Afterwards a repeated-measures analysis was carried out, analyzing for each one of the groups the preferred order of anger expression, according to the scores in the frequency of expression in each of the four ways of expression. The results are detailed in the Table 2. Two patterns were identified with regard to the hierarchy of the ways of expression: On the one hand, high anger drivers express their anger preferably verbally and adaptatively, followed by the displaced and physical ways. On the contrary, moderate and low angered drivers behave behind the wheel adaptatively, followed by the verbal way and finally, by the displaced and physical ways of expression.

Analysis of the General Anger Expression

First, a multivariate analysis of variance (MANOVA) was conducted, introducing the amount of driving anger experienced as an independent variable (high anger, moderate anger and low anger), and the four identified ways of general anger expressions as dependent variables. A multivariate significant effect was observed, $F(8, 304) = 3.47$, $p = .001$, $\eta^2 = .08$. In the Table 3 the univariate analyses are detailed. Significant differences were observed in physical expression, scoring high anger drivers higher than moderate and low angered, and in displaced expression, scoring high and moderate angered drivers higher than low anger ones. In the two cases the effect sizes were moderate.

Later, a repeated-measures analysis was conducted, analyzing for each of the groups the preferred order of expressing general anger. The results are showed in Table 4. High anger drivers evidenced a preference for the verbal and adaptative ways of expression, followed by the dis-

Table 3

Univariate comparisons in the measurements of the off-the-road anger expressions

	H. Anger		M. Anger		L. Anger		F	η^2
	n = 36		n = 62		n = 59			
	M	*SD*	*M*	*SD*	*M*	*SD*		
Verbal E.	46.53	22.33	45.16	21.81	41.31	19.97	0.82	.01
Physical E.	27.47^{bc}	22.86	18.77^{a}	16.88	16.16^{a}	14.57	4.76*	.06
Displaced E.	27.82^{c}	15.58	25.00^{c}	12.37	16.50^{ab}	12.56	8.90**	.10
Adaptative E.	54.71	20.74	63.53	17.13	62.57	17.74	2.95	.04

Note. H. Anger, M. Anger and L. Anger: High Anger, Medium Anger and Low Anger drivers. “a”, “b”, “c”: Significant differences among the groups, being High Anger (a), Medium Anger (b) and Low Anger (c), according to the Gabriel´s Post-Hoc test. *p < .01; **p < .001.

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Table 4

Comparison of the ways of the off-the road anger expression

	Ways of Expression								F	η^2
	Verbally		Physically		Displacedly		Adaptatively			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
High Anger	46.53^{bc}	22.33	27.47^{ad}	22.86	27.82^{ad}	18.58	54.71^{bc}	20.74	13.77*	.28
Medium Anger	45.16^{bcd}	21.81	18.77^{acd}	16.88	25.00^{abd}	12.37	63.53^{abc}	17.13	85.89*	.59
Low Anger	41.31^{bcd}	19.97	16.16^{ad}	14.57	16.50^{ad}	12.56	62.57^{abc}	17.74	115.06*	.67

Note. Differences among the ways of expression, being Verbally (a), Physically (b), Displacedly (c) and Adaptatively (d), according to the Bonferroni´s Post Hoc test. *p < .001.

placed and physical ways. In the case of the other two groups, the differences among the ways of expression are clearer, being the adaptative the preferred way of expression, followed by the verbal, the displaced and finally the physical way. In all the cases the effect sizes were high.

Discussion

The aims of the present research consisted of between-group and within-group comparisons of the drivers who scored high, moderate and low in trait driving anger, through the four identified ways of expressing anger (verbally, physically, displacedly and adaptatively), both behind the wheel and in general.

Firstly, the three groups were compared in the aggressive ways of expression on the road. The results evidenced statistically significant differences in the three desadaptative ways of expression, with effect sizes from moderate to high, finding no differences in the adaptative way of expression. In all the cases high anger drivers scored the highest, being the position of the moderate angered different in all the cases. These results are coherent with most of the researches. On the one hand, it has been proposed that the expressed desire of expressing anger is one of the best predictors of this emotion, both in general and on the road (Parkinson, 2001). On the other hand, in other correlational methodology based studies, positive correlations among trait driving anger and different ways of aggressive expression in this environment have been found, while negative correlations between trait driving anger and the adaptative way of expression have been obtained (Dahlen & Ragan, 2004; Deffenbacher, Kemper, & Richards, 2007; Deffenbacher, Lynch, Deffenbacher, & Oetting, 2001; Deffenbacher, et al., 2002; Deffenbacher et al., 2004; Herrero-Fernández, 2011a; Lajunen & Parker, 2001). However, contrarily to these results, it has been also proposed that anger experience behind the wheel does not always provoke an aggressive response, for this can be inhibited (Baron & Richardson, 1994).

Subsequently, it was analyzed the order of frequency in which anger is expressed through each of the four identified ways of expression behind the wheel. The aim was to verify whether the propensity to experience anger has the same influence in the way this emotion is expressed. The results showed high differences in each of the three groups, with high effect sizes. In the moderate and low anger driver groups more specificity responses were evidenced, given that three of the four responses were significantly differenced in frequency on expression. Besides, the effect size of the differences was higher the lower the propensity to anger. Therefore, the drivers who scored high in trait driving anger will show a bigger pattern of aggressive behaviors than the drivers who scored lower in this trait. Finally, similar studies have not been found.

In the second part, the three established groups were compared in the frequency of emission of aggressive behaviors in general. The results evidenced the existence of significant differences in the displaced and physical ways of expression only, with moderate effect sizes in the two cases. Similarly to the comparison carried out based on the aggressive expression in the vehicle, in this case high anger drivers scored higher than low angered in all the cases, being the difference in the moderate angered group. These results are in line with other similar studies in which high anger drivers are concluded to score higher than low angered ones in variables associated with the general aggression, such as impulsivity, risk behaviors and general anger (Deffenbacher, Deffenbacher, et al., 2003; Deffenbacher, Filetti, et al., 2003; Deffenbacher, et al., 2000). Analyzing the results here along with those obtained in the comparison of the aggressive ways of expression behind the wheel, it seems to be a similitude among the ways of behavior on and off the road, at least with regards to the aggressive responses and their nature.

Finally, the order of frequency in which anger is expressed through each of the four identified ways of expression in general was analyzed. The results evidence an equivalence with regards to the hierarchy showed behind the wheel. Therefore, it seems to support the theory that

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when anger is experienced, it is expressed by the same way as well on as off the road. Thus, it can be hypothesized for future research that the way of response to stimuli which provoke anger is based on an operant conditioning, so one person would have a baggage of learned behaviors to carry out when the threshold of the anger experience has been overcome, probably following a generalization process from the general context to the particular driving environment. It would be according to the social learning processes (Bandura, 1983).

With regards to the implications of these results, first clinical implications can be emphasized. The homogeneity and probable generality of the pattern of aggressive behaviors in all the contexts can be useful for the clinical psychologist to plan the intervention to suppress desadaptative aggressive behaviors and to teach adaptative patterns. Training in an only general context and not in each one in which aggressive behaviors appear could be enough, given the apparent generalization process. On the other hand, related to the road safety area, these results suggest that road education must deal with the training to manage negative emotions behind the wheel –among other aspects–, but it should also collaborate with a more generalized education which teaches to express emotions adaptatively, given the homogeneity of the behavior on and off-the-road.

Finally, this study has three important limitations. The first one is that the sample is of convenience, and could be no representative of the Spanish driver population. The second one is that this research is based on self-informed questionnaires only. Therefore, in future research these results should be verified by measuring the variables not only through questionnaires, but also through more objective ways, like laboratory studies, experimental analysis of behavior, etc. Finally, the third one is that there can be relevant variables that have not been considered, like years of driving experience or distance (kilometers or miles) droven per year, and the level of studies attained by the participants.

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