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Assessing Risk Perception over Recidivist Traffic Offenders from a Multi-group Approach: How Gendered Could It Be?

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A B S T R A C T

Objective: The core aim of this study was to examine the predictive role of demographic, psychosocial and driving features of Spanish drivers on their risk perception over recidivist traffic offenders, focusing on gender as a key differentiating factor. *Method:* For this cross-sectional study, it was analyzed the data gathered from a nationwide sample of 1,711 licensed drivers from the 17 regions of Spain (49% females, 51% males) with a mean age of 40.07 years, responding to a telephone-based interview on road safety issues. Demographic, driving-related and psychosocial factors were comparatively analyzed through robust tests and a bias-corrected MGSEM (Multi-Group Structural Equation Modeling) approach. *Results:* The findings of this study indicate that drivers' age, driving exposure, traffic law knowledge, their assessment of both enforcement and reeducation, and the number of traffic fines they have received, explain the risk perceived in recidivist traffic offenders. Secondly, and in regard to structural differences, three study variables, i.e., driving exposure, need for enforcement and traffic law knowledge, have shown to exert a differential influence on risk perception according to drivers' gender. *Conclusion:* The findings of this study suggest that both psychosocial and driving-related features differentially predict drivers' risk perception over recidivist traffic offenders between male and female drivers. This research supports the need of fostering the emphasis on gender, in order to strengthen driving education, re-education, and training processes aimed at facing and preventing recidivism in the field of traffic and mobility.

Evaluación de la percepción del riesgo en infractores de tráfico reincidentes desde un enfoque multigrupo y el efecto moderador del género

R E S U M E N

Palabras clave:
Infractores de tráfico reincidentes
Conductores españoles
Percepción del riesgo
Diferencias de género
Seguridad en el tráfico

Objetivo: El objetivo principal de este estudio es analizar el papel predictor que juegan las características demográficas, psicosociales y de conducción de los conductores españoles en la percepción del riesgo en comparación con los infractores reincidentes, centrándose en el género como factor clave diferenciador. *Método:* En este estudio transversal se han analizado datos de una muestra nacional compuesta de 1,711 conductores de las 17 regiones españolas (el 49% mujeres y el 51% hombres), con una media de edad de 40.07 años, que respondieron a una entrevista telefónica sobre temas relacionados con la seguridad vial. Se analizaron comparativamente los factores demográficos, los relativos a la conducción y los psicosociales por medio de pruebas robustas y de modelos multigrupo de ecuaciones estructurales (MGSEM). *Resultados:* Los resultados de este estudio indican que la edad de los conductores, su exposición al riesgo, su conocimiento de las normas de tráfico, su valoración de la aplicación de la ley y de los programas de reeducación vial, así como el número de multas de tráfico que han recibido, explican el riesgo que estos perciben en los infractores de tráfico reincidentes. En segundo lugar, en lo que se refiere a las diferencias estructurales, tres de las variables del estudio (la exposición a la conducción, la necesidad de cumplir las normas y los conocimientos de las normas de tráfico) parecen ejercer una influencia diferencial en la percepción del riesgo de acuerdo con el género de los conductores.

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Conclusión: Los resultados indican que tanto las características psicosociales como las referidas a la conducción predicen la percepción del riesgo de los conductores en relación a los infractores de tráfico reincidentes entre hombres y mujeres conductores. Esta investigación abunda en la necesidad de poner el énfasis en el género para potenciar los procesos de educación en la conducción, reeducación y entrenamiento dirigidos a abordar y prevenir la reincidencia en el campo del tráfico y de la movilidad.

Traffic crashes, understood as a latent threat for both road safety and public health, remain a great concern worldwide. In brief, the latest figures available estimate that 1.35 million people die, while 50 million more result seriously injured each year as a result of road crashes (World Health Organization, 2018). Also, and although some improvements have taken place during the last decade, about 25,600 people lost their lives on European roads during the year 2018, and more than 1.4 million suffered serious injuries in road crashes. More locally, Spain has registered a traffic crash average of 102,000 traffic accidents during the last five years, causing 1,800 deaths and 8,900 serious injuries (Dirección General de Tráfico, 2020). These data suggest that, regardless of where the figures come from, this trend continues to rise, remaining at a worrying level for public authorities, researchers and – of course – the road users themselves.

Precisely, and with the aim of preventing these crashes, governments usually implement road safety actions and measures of different natures and approaches, based on their resources, priorities, and contextual features. In this regard, key issues such as law enforcement and police supervision, substance use-related measures, speeding, vehicle technical inspections and infrastructural road improvements have raised the interest of policymakers during recent years (Staton et al., 2016). However, so far, some topics remain underrepresented in terms of actions and measures taken by public authorities. This is, for instance, the case of recidivist traffic offenders that, despite the great risks they can pose to road safety, do not constitute a crucial focus of action in most countries, even though key preliminary systematic measures and programs (many of them still in a ‘pilot’ phase) are beginning to be developed in some countries, including Spain (Bautista-Ortuño & Miró-Llinares, 2014; Marti-Belda et al., 2019).

Facing Offending (and Reoffending) Drivers

Many of the interventions and measures for offending drivers are based on reeducation and rehabilitation programs consisting of systematic measures for preventing further road offences – typically among drunk drivers and speed offenders – aiming at fostering positive behavioral modifications through their participation in these actions, as a condition to keep, or to recover, their driving status (Bartl et al., 2002; Turner & Mitra 2021). For instance, a recent macro-study analyzing thoroughly the data of almost 60,000 convicted drivers in Canada concluded that it seems possible to reduce recidivism risk through well-structured programs, even though this remains a substantially difficult task, given the many constraints involved in facing a widespread problem on the basis of considerably little empirical evidence and serious technical and institutional flaws (Wickens et al., 2016).

Further, it is worth remarking that the effectiveness of most programs developed for facing traffic-related problems is relative, and that – in many cases – actions developed to prevent risky road behaviors are not followed up over time (Ouimet et al., 2013), as well as commonly lack systematicity and sufficient contextual knowledge to efficiently face specific challenges, including the troublesome case of recidivist drivers (Baltruschat et al., 2021; Bamford et al., 2007; Clark et al., 2015; McKnight & Tippetts, 1997; Michael, 2004; Senserrick & Watson 2021; Struckman-Johnson et al., 1989). In this regard, most of the available interventions follow “Demerit Point Systems” (DPSs), grounded on behavioral “token economies”, as developed by Ayllon and Azrin (1986), and point recovery systems.

Depending on the severity, infractions are associated with a series of points, being the most dangerous and the ones that produce the greatest damage those penalizing the most. In this way, it is expected that recidivist traffic offenders will be the ones getting penalized and unable to keep (at least legally) driving a motor vehicle in the shortest term (Goldenbeld et al., 2012).

So far, 21 European countries have incorporated Demerit Point Systems (DPSs). However, there are certain differences among them. For instance, in most of these countries drivers start with a balance of 0 points and every sanctioned traffic violation adds some points, while in other cases (including the Spanish) drivers get between 12-15 points that can be withdrawn as a consequence of such road misbehaviors. In both cases, anyway, the recurrence of offending behaviors causes the total loss of their points and undergo both economic sanctions and license withdrawal. Once this happens, it is necessary to undergo reeducation programs and/or driving qualification tests to regain a driving license (Bestpoint, 2012). However, understanding the relationship between recidivism and drivers’ faculty to legally drive a vehicle (or the absence of it), at least in a population level, makes it necessary to approach the concept from both its theoretical and legal roots.

“Recidivism” as a Concept: Insights and Constraints from Literature

Perhaps, the most commonly accepted definition of the concept of “recidivism” from a legal approach is the one proposed by Maltz (1984), according to which it can be understood as “the reversion of an individual to criminal behaviour after he or she has been convicted of a prior offense, sentenced, and (presumably) corrected”, despite the fact that, of course, the ways of controlling recidivism in traffic are often limited to conducts sanctioned through fines or “tickets”, or the occurrence of (generally severe) crashes making them manifest (Hunt & Dumville, 2016; King & Elderbroon, 2014).

However, and although there exists a relative consensus for understanding “recidivism” in the field of traffic, there are no homogeneous criteria over the type of behaviors to be punished and, e.g., their severity, frequency, aggravating, and mitigating circumstances (Lijarcio et al., 2015; Payne, 2007). This implies that the legal approach to recidivist drivers may vary depending on the legislation or regulatory framework of each country, and their ability to detect offenders’ law bypassing through traffic control actions. In fact, many decades ago Blumstein and Larson (1971) already elaborated about the several difficulties to establish “true” recidivism rates, as – same as with many other law bypassing behaviors – they remain largely dependent on criminal records commonly prone to data underreporting and multiple other biases, especially when the behavior does not involve administrative sanctions, arrests, and/or police recording procedures (DeMichele & Payne, 2013; Loinaz & Sousa, 2019; Ruggero et al., 2015).

In addition to the pointed above, there are different authors using concepts such as ‘multi-recidivism’, in cases in which the frequency of the offending behavior is repeated twice or more, especially in offenses related to alcohol or substance use, which are the ones detected and sanctioned several times over time in most cases (Beck et al., 1999; McMillen et al., 1992; Reis, 1982). In this regard, and beyond the already troublesome low effectiveness of recidivism

detection systems, some of the biggest shortcomings to address the problem of 'multi-recidivism' among drivers are: (i) the excessive ambiguity and implicitly poor operationalization of the term across diverse legal contexts, (ii) their often-differential understanding of the concept, and (iii) its fluctuating legal configurations worldwide.

The Legal Framework of Recidivism in Spain

In legal terms, recidivism is classified, specifically in the Spanish context, as an aggravation of a previous criminal responsibility. According to the Spanish Organic Act 10/1995 (*Ley Orgánica 10/1995*), it is considered that there is recidivism when an offender has been enforceable for a crime of the same nature. In the context of road safety, however, the case of recidivist traffic offenders is only mentioned in the Article 81 of the Royal Legislative Decree 6/2015 (*Real Decreto Legislativo 6/2015*), stating that the penalties for recidivist offenders must be higher, in view of (i) the seriousness and significance of the event, (ii) the offender's criminal background, (iii) the potential danger created for both himself and other road users, and (iv) the 'criterion of proportionality', i.e., a correct balance between the corrective measure and the severity of the offense. In this regard, recidivism acquires a criterion of temporality on the basis of a one-year term (*Ley 40/2015*).

Finally, in Act 17/2005 (*Ley 17/2005*), the concept of multi-recidivism is briefly developed, although vaguely, and lacking from a fairly operational definition. Notwithstanding, it should be noted that this is the first time that the concept of multi-recidivism has been used in legislation in reference to traffic and safety. Given this excessive ambiguity for differentiating recidivism from multi-recidivism, in most cases the literature interchangeably uses them, rather referring to repeat traffic offenders in a broader context (*Lijarcio et al., 2015; Payne, 2007*).

Psychosocial Correlates of Recidivism: The Need of Public Awareness

Once we have contextualized the legal framework of recidivism, it is important to highlight that, with the aim of enhancing the development of preventive and rehabilitative measures, some studies have claimed about the need to know what the most usually associated variables (or 'correlates') of the repetition of the offending behavior in the field of traffic (*DeMichele & Payne, 2013; Nagin & Pogarsky, 2001*) are. Although the evidence is still scarce in this regard, it seems clear that sanctions and other enforcement-related measures keep a certain efficacy, but psychosocial issues (such as law knowledge, risk perception, and attitudes towards road safety) may also play a relevant role in explaining a greater or lesser involvement in certain risky driving behaviors commonly performed by recidivist offenders (*Goncalves & Mello, 2017; Wiczorek, 2013*).

In addition, and according to different international studies on crime in the field of traffic, it is common to find how the criminal population performs more offending and criminal behaviors (*Broughton, 2007; Ross, 1992*), even with a three or four times higher frequency than the general population (*Middendorff, 1981*), leaving many serious or fatal injuries among different groups of road users as a result (*Brace et al., 2009*). *Broughton (2007)* also identified that male drivers having committed crimes other than those in the sphere of traffic were more likely to commit alcohol-related offenses than non-criminals. In the same way, *Bautista-Ortuño and Miró-Llinares (2014)* established a 'generic' profile for road offenders in the Mediterranean region of Spain (specifically in the Valencian Region), finding that traffic recidivists were typically men in their 30s, frequently having a prior crime on their personal record.

Notwithstanding, and even though these few existing studies already provide some good insights about recidivist drivers, their

public perception remains considerably understudied. For instance, there are really few studies assessing road users' awareness of recidivism, the prevalence of recidivism in traffic, or (even more specifically) to what extent these recidivists are considered as risky for road safety, and how much these perceptions could vary as a function of road users' demographic features, such as age or gender.

Study Aim and Hypotheses

Bearing in mind the aforementioned considerations, the aim of this study was to assess the predictive role of demographic, psychosocial, and driving-related features of Spanish drivers in their risk perception over recidivist traffic offenders, focusing on gender as a key differentiating factor. In this regard, it was hypothesized that: (i) demographic and psychosocial variables would significantly explain the risk perceived in recidivist drivers and (ii) these variables would have a differential influence on risk perception when considering gender as an analytical category, i.e., there are structural differences in the explanation of risk perception between females and males.

Method

Sample

This study analyzed the data obtained from a nationwide sample of $n = 1,711$ Spanish drivers from all the 17 Regions of the country, with a mean age of 40.07 ($SD = 14.17$) years. From the study sample group, 48.7% of the drivers surveyed were females and 51.3% were males. *Table 1* presents some further demographic characteristics of the study's participants.

Table 1. Sociodemographic Information and Basic Driving Features of the Partakers

Feature	Category	Frequency	Percentage
Gender	Female	834	48.7%
	Male	877	51.3%
	< 25	396	23.0%
Age Group	25-34	309	18.1%
	35-44	273	16.0%
	45-54	451	26.4%
	>54	282	16.5%
Educational level	Primary studies or lower	8	0.5%
	Secondary-high school	832	48.6%
	University studies	734	42.9%
Type of vehicle (most driven)	Post-graduate studies	137	8.0%
	Car	1601	93.6%
	Motorcycle	51	3.0%
	Van	34	2.0%
	Bus	16	0.9%
Driving frequency (weekly basis)	Truck	9	0.5%
	Daily	751	43.9%
	5-6 days a week	345	20.2%
	3-4 days a week	288	16.8%
	1-2 days a week	221	12.9%
	Occasionally	106	6.2%

Study Setting

This empirical research was based on a phone-conducted interview that was applied following a random dialing method, sampling that constitutes a pseudo-probabilistic method, given that it allows researchers to quickly access the population of interest under a fixed selection criteria, even though potential partakers

remain limited to those using phone services (Hoffmeyer-Zlotnik, 2003). Participants were first involved in the study during the data-collection stage, getting contacted by a member of the research staff in order to invite them to partake in the research, and being informed about the research purposes and ethical issues related.

In order to achieve an acceptable degree of representativeness, an a priori number of about 680 subjects proportionally distributed by sex and age was determined as minimum sample, considering a confidence interval of 95% and a margin of error of 5%, at the least favorable case as $p = q = 50\%$. Notwithstanding, and as partakers were quite responsive, the sample size reached more than 1,700 responses.

The interview took an average time of about 12 minutes. In order to avoid potentially biased responses, before starting the process it was emphasized that the data would be exclusively used for statistical research purposes and their participation was anonymous. All partakers verbally agreed with an informed consent (agreement read by the surveying researcher) containing information on the research purpose and anonymization of personal data. No economic rewards and/or incentives were offered to participants. The response rate (i.e., accepted and responded interviews) was about 60%.

Description of the Questionnaire

The research questionnaire was composed of three main parts or sections:

- The first section of the interview inquired about demographic data, including gender (male/female/other; “other” was never chosen as a response, so the variable was dichotomized), educational level, city of residence, and driving status (having/not having a driving license).
- The second part comprised general driving features and outcomes of participants, such as type of vehicle usually driven, driving frequency (number of days driving in an average week), and hourly intensity (number of hours most commonly spent at the wheel in a driving day) used to calculate the driving exposure.

The number of traffic fines received in the last 2 years was used as a “traffic offense index” among participants in order to assess the number of times they had been sanctioned for committing traffic violations. It results accurate, given that – uniformly with recidivists’ assessment criteria – they correspond to actually sanctioned traffic violations (instead of behaviors that could be remembered, or not, at the moment of responding to the question; Montoro et al., 2018), thus resulting pertinent for the purpose of this study.

Finally, the third part of the interview addressed road safety issues: self-reported knowledge of traffic laws and risk perceived in recidivists were measured through an adapted version of the RPRS (Risk Perception and Regulation Scale; Useche et al., 2021), in which the degree of perceived risk (7 items, $\alpha = .820$) and general knowledge – some of the most universal road regulations (5 items, $\alpha = .813$) – are assessed in a 1-5 scale, i.e., from 1 (*no knowledge/risk perceived*) to 5 (*highest knowledge/risk perceived*). Both the assessment (or ‘valuation’) of driving reeducation programs and the perceived need for enforcement of traffic laws were assessed through single items using the same 1-5 scale in order to make them descriptively comparable to the aforementioned latent factors (i.e., law knowledge and risk perception in recidivists).

Ethics

To perform this study, the Ethics Committee of the Spanish Foundation for Road Safety was consulted, certifying that it complies with the general ethical principles applicable to research involving human subjects and the Declaration of Helsinki (IRB 0120201129HR). Since personal data were not used, the participation was anonymous, and it did not asked about sensitive/confidential information, the risk level for partakers was determined as “minimum”. Moreover, an informed consent statement containing ethical principles and data treatment details was read to participants (and agreed by them) before responding to the interview.

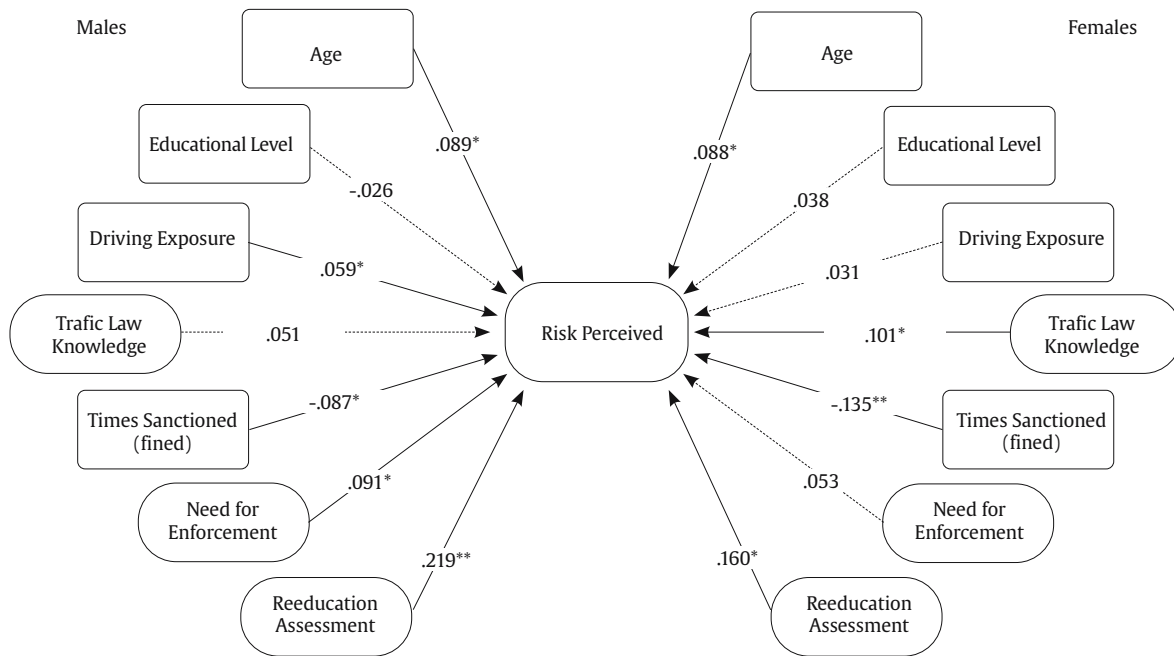


Figure 1. Two-group Structural Model Showing Standardized Path Coefficients for Risk Perception in Recidivists: Men (left) and Women (right).

* $p < .05$, ** $p < .01$.

Data Analysis

After performing basic statistical procedures, i.e., descriptive statistics, bivariate Spearman's rho correlations, and mean comparisons (robust tests, as basic normality and homoscedasticity-related assumptions were not met), a gender-based multi-group structural equation model (MGSEM) was built up. For this purpose, bootstrap-based robust maximum likelihood estimations (i.e., 10,000 bootstrap samples and 95% confidence intervals) were used in order to handle non-normality issues, as most of study variables did not meet the basic assumption of univariate normality and multivariate normality was not met either, as usually happens in self-report-based studies (Byrne, 2010). The model fit was evaluated by using chi-square (χ^2), minimum discrepancy ratio (CMIN/df), normed fit index (NFI), Tucker-Lewis index (TLI), incremental fit index (IFI), and root mean square error of approximation (RMSEA).

Estimators were calculated controlling for age, education, and driving exposure. According to the specialized literature led by Hu and Bentler (1999), it is commonly accepted, as rules of thumb, that a set of CFI/NFI/TLI/IFI coefficients greater than .900 and a root mean square error of approximation lower than .080 (better if < .060), plus the coherence of the model data with its theoretical assumptions, constitute insights of an acceptable model fit to the data. When possible, the model's fit was improved taking into account the largest and more theoretically parsimonious modification indexes.

As for the punctual features of the model used to test the hypothesized structural relationships among measured variables, the multivariate relationships between female and male drivers' demographic/psychosocial factors and risk perceptions over recidivist traffic offenders, it was composed of the seven exogenous variables (educational level was excluded due to its collinearity with age, and type of vehicle was not considered given its nominal nature) and one endogenous factor (i.e., risk perceived in recidivists) shown in Figure 1. This is statistically more accurate than separately testing genders as separate populations, since it considers the full sample parameters for fitting the models. The direct effects of the model, their confidence intervals (at the level 95%), and significance levels were calculated following the bootstrap method, specifically through a Monte Carlo (parametric) procedure, favoring that (e.g.) the results of the estimates can be bias-corrected, do not present problems of normality, and type I errors (*false positives*) in regression paths can be avoided, and constitutes a reasonable alternative to other estimation methods such as Satorra-Bentler or weighted least square mean and variance adjusted (WLSMV), that cannot be performed with AMOS software (Version 26.0; IBM Corp.), as done in this research for SEM modeling tasks.

Results

Table 2 shows the mean values and bivariate correlations of the variables measured in the study, divided in three groups: demographic data, driving factors and outcomes, and road safety-related perceptions. Overall, demographic variables, and especially age, have shown certain associations with road safety-related perceptions. For instance, drivers' age has been found positively and significantly associated with the assessment given to driver reeducation programs, as well as with a greater risk perception towards recidivist traffic offenders over road safety.

Also, driving-related factors, especially drivers' self-reported knowledge of traffic laws and the number of fines they have received in two years, have been found significantly associated with road safety perceptions, as follows: drivers' knowledge of traffic laws is positively associated to both (i) their perceived need for enforcement and (ii) their risk perception in relation to recidivist traffic offenders. On the other hand, the more drivers commit (sanctioned) road risky behaviors, the least they perceive that recidivist drivers constitute a risk for road safety.

Finally, risk perception in recidivists was positively and significantly correlated to both participants' assessment of driver reeducation strategies and their perceived need for enforcing traffic laws.

Gender Differences

After assessing the bivariate correlations (Spearman's rhos) between these three groups of variables, gender differences were explored through mean comparison tests. Given that the assumption of normality was not met in the case of most variables used in the study, especially as for those having an ordinal nature, and variances were rather heteroscedastic, robust (Brown-Forsythe) tests were used for this purpose. Unlike traditional ANOVA tests, this technique uses a different denominator for the 'F' equation, adjusting the mean square through the observed variances of each group, instead of dividing by the mean square of the error. The results of mean comparison tests are fully available in Table 3, being readable and interpretable in the same way than one-way analysis of variance tests.

Overall, not many significant differences could be established between both genders in regard to most of the study variables. For instance, the average self-reported traffic law knowledge, the assessment of reeducation programs for drivers, and the level of risk perceived in recidivist traffic offenders did not report significant differences, being rather almost invariable between males and females. On the other hand, this analysis suggests two relevant figures related to female drivers: firstly, they had a greater driving exposure than

Table 2. Descriptive Data and Bivariate (Spearman rho) Correlations between Study Variables

Variable	Mean / %	SD ³	1	2	3	4	5	6	7	8
Demographic data										
1 Gender ¹	51.3%	--	--							
2 Age (years)	40.07	14.17	.422**	--						
3 Educational level	--	--	-.130**	-.092**	--					
Driving factors and outcomes										
4 Driving exposure	2.17	1.29	-.122**	-.082**	.078**	--				
5 Traffic law knowledge ²	4.66	1.88	.032	-.116**	.059*	-.045	--			
6 Times sanctioned (fined)	0.12	0.40	.066**	.011	.010	-.071**	.008	--		
Road safety perceptions										
7 Need for enforcement ²	2.01	0.40	-.070**	-.010	-.016	.029	.110**	-.072**	--	
8 Driver reeducation assessment ²	3.89	0.75	-.028	.075**	-.008	-.039	.029	-.051*	.037	--
9 Risk perceived in recidivists ²	3.74	0.55	.007	.083**	.007	.039	.052*	-.102**	.091**	.171**

Note. ¹Categorical variable (ref = male); ²variable measured in a 1-5 scale; ³SD = standard deviation. * $p < .05$ (2-tailed), ** $p < .01$ (2-tailed).

Table 3. Descriptive Statistics and Mean Comparisons between Genders

Variable	Group	Descriptives		Statistic ¹	Brown-Forsythe test		
		Mean	SD		df1	df2	p
Driving exposure	Males	2.01	1.19	30.591	1	1651.373	< .001
	Females	2.35	1.36				
Traffic law knowledge	Males	4.71	1.97	1.103	1	1704.784	.294
	Females	4.61	1.78				
Times sanctioned (fined)	Males	0.14	0.41	3.425	1	1708.808	.064
	Females	0.10	0.39				
Need for enforcement	Males	1.97	0.41	8.334	1	1708.972	.004
	Females	2.02	0.39				
Reeducation assessment	Males	3.86	0.77	1.738	1	1708.994	.188
	Females	3.91	0.73				
Risk perceived in recidivists	Males	3.74	0.55	0.009	1	1705.459	.923
	Females	3.73	0.54				

Note. ¹Asymptotically *F* distributed.

males, with $F(1, 1651.373) = 30.591, p < .001$ (highlighting the need of controlling for this variable for structural analyses) and secondly, they were also the ones attributing a larger importance to enforcement to prevent overall risky behaviors of road users, with $F(1, 1708.972) = 8.334, p = .004$.

The Structural Model

Based on the aforementioned theoretical assumptions of the study, the effect of gender over the extent to which Spanish drivers consider recidivist drivers constitute a risk for road safety was examined through a MGSEM (multi-group structural equation modeling) approach that differs from using gender as a dummy category within a structural model encompassing other predictive variables, whose effects can be hypothesized to differ in nature according to drivers' gender. Instead, it allows differentially assessing the effect of the exogenous factors on the dependent variable for each group, making it possible to compare the "mechanisms" by which these relations can be explained for the case of each gender.

In this sense, data were split into two gender-based groups (i.e., reference categories): a group of 834 (48.7%) female and a group of

877 (51.3%) male drivers, both of them with acceptable sample size and proportionality for the comparative exploration. Using the SPSS AMOS multi-group (MGSEM) analysis, the hypothesized structural model was adjusted to control for demographic and driving-related differences and to fit the data according to gender, at the same time considering the parameters of the full sample.

The resulting structural equation model, simultaneously fitted for both gender groups or categories, $\chi^2(18) = 44.547, p < .001$; CMIN/df = 1.485; NFI = .942; CFI = .935; TLI = .909; IFI = .942; RMSEA = .017, IC 90% [.003, .017], is presented through two merged graphical models in Figure 1. Qualitatively, the magnitude and significance levels of paths from exogenous variables to risk perception rates show differential trends between male and female individuals. The standardized path coefficients (see Table 4 and values next to solid lines in Figure 1) of the bias-corrected MGSEM suggest that there are significant structural similarities, but also key differences, as follows:

In regard to structural similarities, it was found that:

(i) Age exerts a positive effect on the risk perception for the case of both genders, showing magnitudes and significance levels alike.

(ii) The number of traffic fines received in the last 2 years had a similar negative effect among all study participants, i.e., the greater

Table 4. Multi-group SEM Model to Predict Risk Perceived in Recidivist Traffic Offenders

		Group 1: Males							
Path		SPC ¹	SE ²	CR ³	p	Bootstrap Bias-corrected Coefficients ⁴			
						SE ²	95% CI ⁵	p	
Age	→	.089	.001	2.583	.009	.002	.002	.007	.046
Educational level	→	-.026	.026	-0.781	.435	.022	-.056	.013	.318
Driving exposure	→	.059	.015	2.113	.041	.013	.003	.050	.046
Traffic law knowledge	→	.051	.009	1.497	.134	.009	-.001	.031	.127
Times sanctioned (fined)	→ Risk perceived	-.087	.043	-2.695	.007	.053	-.218	-.030	.030
Need for enforcement	→	.091	.044	2.774	.006	.056	.023	.204	.043
Reeducation assessment	→	.219	.023	6.715	< .001	.03	.111	.210	.007
		Group 2: Females							
Path		SPC ¹	SE ²	CR ³	p	Bootstrap Bias-corrected Coefficients ⁴			
						SE ²	95% CI ⁵	p	
Age	→	.088	.002	2.576	.009	.001	.001	.006	.048
Educational level	→	.038	.030	1.132	.258	.037	-.024	.091	.406
Driving exposure	→	.031	.013	0.929	.353	.013	-.013	.034	.416
Traffic law knowledge	→	.101	.010	2.956	.003	.012	.009	.050	.012
Times sanctioned (fined)	→ Risk perceived	-.135	.046	-4.023	< .001	.069	-.295	-.075	.008
Need for enforcement	→	.053	.047	1.572	.116	.060	-.043	.167	.197
Reeducation assessment	→	.160	.025	4.762	< .001	.031	.066	.167	.019

Note. ¹SPC = standardized path coefficients (can be interpreted as b-linear regression weights); ²SE = standard error; ³CR = critical ratio; ⁴bootstrapped (bias-corrected) model; ⁵confidence interval at the level 95% (lower bound – left; upper bound – right).

the number of sanctioned risky behaviors they commit, the least their risk perception in recidivist traffic offending.

(iii) Also, the assessment given to reeducation programs for drivers has, in both cases, a positive effect, whose magnitude is slightly larger for males when compared to females. In other words, it can be assumed that reeducation assessment influences risk perception among male and female drivers, but this effect is greater for the first.

(iv) Finally, the educational level had a non-significant effect on risk perception among both males and females.

As for structural differences, it was found that: (i) driving exposure has a significant effect on risk perception only for the case of male drivers; in other words, the greater the exposure, the more risks they perceive in regard to recidivist traffic offending; (ii) also, only among males, the need for enforcement has a significant path to the endogenous variable, i.e., the fact of perceiving law enforcement as a more/less important matter seems to affect only the risk perception of male drivers; (iii) on the other hand, traffic law knowledge only had a significant effect over risk perception among female drivers, being this relationship positive and significant, as graphically shown in Figure 1. Additional information on the model's statistical parameters is presented in Table 4.

Discussion

Based on the data gathered from a nationwide sample of $n = 1,711$ Spanish drivers, this paper examined the relationships among demographic, psychosocial, and driving features of Spanish drivers, and their risk perceptions over recidivist traffic offenders, focusing on gender as a key factor possibly influencing them. Through the multi-group structural equation modeling approach, we found empirical evidence supporting the hypothesis that there are key gender-related differences in the explanation of recidivist-related risk perceptions, i.e., finding how demographic, driving-related, and perceptual factors may differentially influence this outcome between genders.

In this regard, and although this technique had never been applied to the study of recidivist traffic offenders, previous studies have already analyzed the role of gender as a key potential mediator between, on the one hand, demographic and psychosocial factors and, on the other hand, perceptual and behavioral outcomes of road users. Furthermore, gender differences have also been studied in diverse fields addressing both risk-related perceptions and law-related issues.

However, evidences in these regards remain very limited. Actually, pioneer studies such as Gustaffson's (1998) offer good highlights in regard to gender differences in risk perceptions, arguing that, apart from being of different kinds, they may require both quantitative, qualitative, and innovative approaches to be holistically depicted. This is, precisely, one of the strengths of this study: although in a first moment no significant differences were found through mean comparison tests, structural analyses allowed to determine that (beyond mean values) risk perception-related mechanisms and dynamics might substantially vary between male and female drivers, serving as a starting point for further research.

Also, other recent studies addressing risk perceptions in regards to both traditional and emerging issues for public health such as COVID-19, chronic diseases and natural disasters (McDowell et al., 2020) have concluded that, beyond the average outcomes potentially observable between genders, the way that males and females develop risk-related appraisals of certain circumstances and individuals can largely vary in terms of nature, structure, and dynamics (Rhodes & Pivik, 2011; Useche et al., 2021). Indeed, various studies performed from the perspective of legal psychology in relation to other risk-related issues, such as violence and aggression, do not only show how (from the earliest stages of development) gender may explain key behavioral differences, but how these discrepancies also apply to their attitudes and perceptions in regard to these risk-related

behaviors (Del Hoyo-Bilbao et al., 2020; Loínaz & Sousa, 2019).

Overall, the aforementioned theoretical and empirical considerations, in addition to the study findings, suggest – in accordance to the study hypotheses – that: (i) demographic and psychosocial variables, as measured in the present study (except for the case of educational level), would significantly explain the risk perceived in recidivist traffic offenders, and that (ii) three of these variables have a differential influence on risk perception when considering gender as an analytical category, as described in detail in the next subsection.

Summary: Gender-based Structural Differences and Similarities in the Risk Perceived in Recidivist Traffic Offenders

The core analysis factor addressed in this study, as a split category, was gender. In this regard, our research aimed to study the structural differences (and similarities) between 877 male and 837 female Spanish drivers in many factors, theoretically influencing their risk perceptions over recidivist drivers. The two multi-group SEM models allowed us to determine that specifically for each independent variable:

- Age. This demographic variable significantly explains recidivist-related risk perception among both male and female drivers. In these two cases, the relationship is positive and similar in terms of magnitude. Therefore, no gender differences were found in the case of age, which appeared to have a similar influence in both cases. In other words, it can be assumed that the greater the driver's age, the higher the extent to which recidivist traffic offenders are perceived as risky road users, regardless of their gender.

- Educational level. This ordinal factor has shown to have a non-significant effect on risk perception amongst the two genders of participants addressed by this research. In other words, after controlling for demographics (especially as for the correlation between age and education), risk perception seems to be, rather, explained by the six other features used as independent variables.

- Driving exposure. One of the most interesting findings of this set of structural comparisons is that unlike females the weekly time spent at the wheel does significantly explain risk perception over recidivist drivers among male participants. In other words, the more a male driver is exposed to driving scenarios in terms of frequency and intensity, the greater his perception of recidivist traffic offenders as potentially risky for road safety.

- Traffic law knowledge. The self-reported degree of knowledge on traffic norms has shown to have a significant effect on risk perception of female drivers, but not in the case of males. In other words, and given the positive direction of the path, recidivist-related risk perception among women could be influenced by the extent to which they are actually familiarized with traffic norms and regulations, while it does not seem to influence male drivers significantly.

- Traffic fines. This indicator has been used as a "traffic offense index" among participants in order to assess the number of times they have been sanctioned for performing traffic violations. MGSEM results show how, apart from having a significant effect across genders, it keeps a negative relationship with risk perception, i.e., the greater the number of (sanctioned) traffic offenses performed by Spanish drivers, the lesser the extent to which they perceive recidivist traffic offenders as risky for road safety.

- Need for enforcement. The extent to which male individuals consider that actions related to law enforcement are needed for improving road safety significantly (and positively) predicts the degree of risk perceived in recidivist drivers. However, this association is not significant among female drivers.

- Reeducation assessment. Finally, the valuation given to drivers' reeducation actions and programs has shown to positively predict risk perception over recidivist drivers. In other words, both males and females tend to perceive greater risks in recidivist traffic offenders

when their assessment of the effectiveness and importance of drivers' reeducation tends to be higher.

Limitations of the Study and Further Research

Although this research analyzed the data from a sample that can be considered as representative of the Spanish driving population in terms of age and gender, and the essential theoretical assumptions, analytic parameters and goodness-of-fit criteria were met, it is important to state some essential limitations and technical shortcomings that could have biased the study outcomes, so that they should be interpreted in consideration of them.

First of all, an anonymous interview does not fully deter common method biases (CMBs) in responses, especially if there are addressed topics related to their own behavior and other common socially stigmatized issues (Af Wählberg & Dorn, 2015). Secondly, and although based on a literature review, the set of variables measured by this study is partial, given that many further factors potentially affecting drivers' risk perception in regard to recidivist traffic offenders is more extensive and may cover many other spheres. However, and same as in most cross-sectional-based studies, the extension of the surveys and time spent by participants are limited, making it necessary to use relatively short sets of questions.

Likewise, and as previously suggested by Gustafsson (1998), it might be advisable to complementarily acquire further insights on this interesting issue by means of (e.g.) in-depth interviews and mixed research methods, with the aim to maximize the explanation of gender-based differences in regard to legal issues affecting traffic safety.

Conclusions

The findings of this study suggest that both psychosocial and driving-related features differentially predict drivers' risk perception over recidivist traffic offenders according to gender. In other words, the mechanisms by which these factors (i.e., driving exposure, traffic law knowledge, and perceived need for enforcement) affect risk perception seem to differ between male and female drivers.

Secondly, this research supports the influence of gender on risk perception of key safety issues such as recidivist traffic offenders, thus depicting the differential role of demographic and psychosocial factors on safety-related perceptions according to drivers' gender.

Finally, and as for the practical implications of this study, this research stands as the first approximation made so far to the matter from a gender-based MGSEM approach, these results being of potential interest for many stakeholders, even though in different ways. For instance:

- Road safety researchers can get from this study relevant insights about factors influencing drivers' risk perceptions, whose value for crash prevention is widely supported in the specialized literature.

- Policymakers might find it useful to count on: (i) a detailed problematization about the need to unify criteria to understand, face, and prevent recidivism in the field of traffic and mobility and (ii) recent and contextually specific empirical evidences endorsing the relevance of the problem and its state of the art in Spain.

- Practitioners' actions aimed at intervening in road safety problems related to human factors (including recidivism) might get benefitted from the described evidences and differences in order to enhance driving education, re-education, and training processes.

Conflict of Interest

The authors of this article declare no conflict of interest.

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