Differences in Driving Behavior Between Professional and Nonprofessional Drivers

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Abstract

Research has been highlighting possible behavioral differences between professional and nonprofessional drivers, beyond their distinct involvement in accidents. This study explores these differences in a sample of 560 professional and nonprofessional Portuguese drivers, using a self-reported survey on driving behaviors and accident history. Results showed i) that nonprofessional drivers presented more aggressive driving behaviors; ii) the existence of a positive association between aggressive driving behaviors and road accidents only in the nonprofessional drivers; iii) no group differences regarding prosocial driving behaviors, although professional drivers reported significantly more prosocial driving behaviors than aggressive. The study's results, and limitations are discussed.

Keywords: Aggressive and prosocial driving behaviors; Professionals drivers; Nonprofessional drivers.

Diferenças no Comportamento de Condução entre Condutores Profissionais e Não Profissionais

Resumo

Têm sido destacadas possíveis diferenças comportamentais entre condutores profissionais e não profissionais. O estudo explorou as referidas diferenças entre estes grupos numa amostra

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de 560 condutores portugueses, através de um questionário de autorrelato sobre comportamentos de condução e histórico de acidentes. Os resultados indicaram: i) que os condutores não profissionais apresentavam mais comportamentos agressivos, e que a relação entre esta variável e envolvimento em acidentes apenas era significativa neste grupo; ii) a ausência de diferenças nos comportamentos pró-sociais, embora os condutores profissionais reportassem significativamente mais comportamentos pró-sociais do que agressivos. Os resultados e as limitações do estudo são discutidas.

Palavras-chave: Comportamentos de condução agressivos e pró-sociais; Condutores profissionais; Condutores não profissionais.

Différences dans le Comportement de Conduite entre les Conducteurs Professionnels et Non Professionnels

Résumé

Des différences comportementales possibles entre conducteurs professionnels et non professionnels ont été mises en évidence. Cette étude a exploré ces différences au sein d'un échantillon de 560 conducteurs portugais, à l'aide d'un questionnaire d'autoévaluation sur les comportements de conduite et l'historique d'accidents. Les résultats ont montré: i) que les conducteurs non professionnels manifestaient davantage de comportements agressifs, la relation entre cette variable et l'implication dans des accidents n'étant significative que pour ce groupe; ii) l'absence de différences dans les comportements prosociaux, bien que les conducteurs professionnels en rapportent davantage que de comportements agressifs. Les résultats et limites sont discutés.

Mots-clés: Comportements de conduite agressifs et prosociaux; Conducteurs professionnels; Conducteurs non professionnels.

Diferencias en el Comportamiento de Conducción entre Conductores Profesionales y No Profesionales

Resumen

Se han señalado posibles diferencias de comportamiento entre conductores profesionales y no profesionales. El estudio exploró dichas diferencias en una muestra de 560 conductores portugueses, mediante un cuestionario de autoinforme sobre comportamientos de conducción e historial de accidentes. Los resultados indicaron: i) que los conductores no profesionales mostraban más comportamientos agresivos, y que la relación entre esta variable y la implicación en accidentes solo era significativa en este grupo; ii) la ausencia de diferencias en los comportamientos prosociales, aunque los conductores profesionales reportaron significativamente más comportamientos prosociales que agresivos. Se discuten los resultados y las limitaciones del estudio.

Palabras clave: Comportamientos de conducción agresivos y prosociales; Conductores profesionales; Conductores no profesionales.

1. Introduction

The literature has been highlighting the possibility of differences between professional drivers (i.e., individuals whose profession is driving) and nonprofessional drivers concerning the behaviors adopted in the context of driving. Indeed, one cannot overlook the existence of differences related to the task of driving between these two groups of drivers, such as exposure to driving, the consequences of their actions, and motivations for driving (Caird & Kline, 2004; Maslać *et al.*, 2018; Sullman *et al.*, 2002).

However, despite the prevalence of professional drivers on the roads, only some studies have focused explicitly on professional drivers or the differences between them and nonprofessional drivers (e.g., Almallah *et al.*, 2025; Davey *et al.*, 2007; Dias *et al.*, 2022; Sullman *et al.*, 2002), and the existing studies tend to focus on the differential involvement of professional and nonprofessional drivers in road accidents. In this scope it is postulated that professionals - given the high number of annual kilometers they drive and their continuous exposure to traffic - are at greater risk of being involved in road accidents, once they are more prone to stress, and frustration (Davey *et al.*, 2007; Öz *et al.*, 2010).

Taking this into account, the present study aims to investigate potential differences between professional and nonprofessional drivers in what concerns their driving behaviors, as well as the associations between these behaviors and road accidents, through a quantitative study in a Portuguese convenience sample.

1.1. The task of driving: professional versus nonprofessional

Driving as a professional activity has different demands, as the tasks of professional drivers are mainly predetermined, unlike those of nonprofessional drivers. Driving for professional drivers becomes a less self-regulated task, as various factors, such as schedules, increase the demands of their tasks. Furthermore, professional drivers are exposed to organizational factors (e.g., company culture, safety practices) that largely determine the safety with which they drive (Caird & Kline, 2004; Öz *et al.*, 2010). Conversely, for nonprofessional drivers, driving is a more individualized task, allowing them to determine the degree of difficulty and

risk taken, travel time, and driving speed (Caird & Kline, 2004; Öz *et al.*, 2010). All these differences may influence the behaviors adopted by these two groups of drivers and the way they interact with the other road users.

Additionally, the daily, prolonged, and continuous frequency of driving by professional drivers may lead to increased fatigue (Adavikottu & Velaga, 2021; ERSO, 2023), which can affect their attention capacity and self-control, important aspects for the adoption of aggressive behaviors (Liu *et al.*, 2022), given that is considered an integral part of the processing of information, which also plays a critical a role in the implementation of behaviors (Deffenbacher *et al.*, 1994; Machado *et al.*, 2024).

It should be noted that only some nonprofessional drivers use the vehicle for the same purposes. Different motivations make people drive, such as leisure or going to work or college: driving as an end by itself and a means to reach an end, respectively. Considering this, it is crucial to understand if these groups of nonprofessional drivers are also different. In this line, Agra and Queirós (2004) identified three distinct groups of nonprofessional drivers, namely: i) drivers for fun (i.e., those who use the vehicle for participating in competitions, competing with friends, tuning); ii) regular drivers (i.e., those who use the vehicle as a means of transportation for fixed-schedule activities, such as commuting to work, attending classes, or transporting family members); and iii) leisure drivers (i.e., those who use the vehicle for off-road driving, orientation circuits outside the city). According to the authors (Agra & Queirós, 2004), these different groups exhibit distinct characteristics, with drivers for fun presenting higher indices of severe traffic violations compared to the remaining two groups.

1.2. Driving behaviors: aggressive and prosocial

Traffic violations and road accidents represent significant social problems (with human, social, and economical costs), resulting from the interaction between cognitive and emotional processes, as well as situational and personal variables (Donário & Santos, 2012; van den Berg *et al.*, 2020; Yagil, 2001). The research has highlighted that the human factor plays a crucial role in road accidents, with drivers' behaviors, a form of social behavior (van den Berg *et al.*, 2020), and specifically their aggressive behaviors, being a risk factor for their occurrence (e.g.,

Galovski & Blanchard, 2004; Zinzow & Jeffirs, 2018). Therefore, given their detrimental consequences to the "offender," "victim," and society, this type of act has been a topic of interest in different fields of research. As noted by Factor (2008), contrary to other types of delinquent, antisocial, criminal, and transgressive behaviors that generally involve only a small group of offenders, in the driving context this group is composed of most of the drivers. Moreover, the manifestations of these behaviors are widespread, and it is expected that any country with cars, roads, and drivers will present rates of aggressive driving behaviors (Miles & Johnson, 2003). In this context, it is noteworthy that Portuguese drivers are often described as *risk takers*, due to the aggressive maneuvers frequently recorded by surveillance equipment (Tavares *et al.*, 2008).

A varied range of acts expressed in different forms, from making rude gestures, running red lights, honking, and driving too fast (e.g., Galovski & Blanchard, 2004; Houston *et al.*, 2003; Shinar, 1998) are typically classified as aggressive driving behaviors. In this study, the adopted conceptualization aligns with those of Houston *et al.* (2003) and Tasca (2000). According to the authors', aggressive driving behavior is a pattern of deliberate, insecure, and risky behaviors that compromise the safety of drivers and/or others, probably increasing the risk of road accidents. These behaviors are driven by different motives – ranging from hostility to an attempt to save time. With this definition, we only focus on observable behaviors, not considering cognitions or emotions that may arise during driving (e.g., anger and frustration), recognizing that not all aggressive behaviors arise from anger and aim to hurt another person.

Nevertheless, in the daily day of driving, both aggressive, hostile, insecure, and prosocial, positive, and secure behaviors are present (Guého *et al.*, 2014; Özkan & Lajunen, 2005) – they are not mutually exclusive (Yu *et al.*, 2023). While the prosocial behaviors in driving have received little attention, there are reasons to explore them (Harris *et al.*, 2014; Shen *et al.*, 2018). In fact, understanding both types of behaviors will allow a better and more holistic view of driving behavior and driving dynamics, which, in turn, will help promote and improve a safer driving environment (Shen *et al.*, 2018; Yu *et al.*, 2023).

According to Harris *et al.* (2014, p.4), prosocial driving behaviors are a "pattern of safe driving behaviors that potentially protect the well-being of passengers, other drivers, and

pedestrians, and that promotes effective cooperation with others in the driving environment", being effective forms of driving behavior that can diminish/avoid road accidents. Here, we can include the altruistic actions that the drivers take to cooperate reasonably with other drivers, such as giving way to other vehicles, but also with pedestrians, for instance, driving with special care near them (Harris *et al.*, 2014; Shen *et al.*, 2018). This definition of prosocial driving behaviors is consistent with the broader definitions of prosocial behaviors, such as those presented by Batson (2012) and Eisenberg *et al.* (2010), with the authors stating that prosocial behaviors include a large spectrum of behaviors realized to benefit or help one or more people. According to the literature (e.g., Eisenberg *et al.*, 2010), these behaviors can be motivated by four factors: selfishness, altruism, collectivism, and principle. Making the parallel to driving context, Harris *et al.* (2014) states that prosocial driving behaviors can emerge from the desire to help others or themselves; to conform to the group's norms regarding safe driving; and because their principles involve obedience to the rules of driving.

Regarding the different involvement of professionals and nonprofessionals in these two driving behaviors, scientific research is still scarce and nonconsensual. To the best of our knowledge, no research has focused on the differences between prosocial driving behaviors in professional and nonprofessional drivers. Concerning aggressive driving behavior, for example, in the study of Öz *et al.* (2010), conducted with a sample of 234 male drivers, the results showed that the nonprofessional drivers (n = 38) drove significantly more above the speed limit than the professional's drivers, namely: taxi drivers (n = 69), truck drivers (n= 64), and minibus drivers (n = 63). Also, taking into consideration the subscale of "Aggressive driving violations" [(i.e., Conflict behaviors towards other road users that represent a type of aggressive traffic violation – Lawton *et al.*, 1997)] of the Driving Behavior Questionnaire, the results obtained by Maslać *et al.* (2018) indicate that professional drivers committed fewer violations of this type, compared to nonprofessional drivers. In contrast, Wu *et al.* (2016), measuring another type of aggressive driving behavior, concretely red light running (RLR), found that the RLR rate of taxi drivers was statistically higher than that of nonprofessional drivers. In the same line, Dias *et al.* (2022), using observational data, indicated that professional drivers in Qatar drove more aggressively than nonprofessional drivers.

1.3. Road accidents: association with driving behaviors, and groups of drivers

As previously referred, road accidents represent critical social problems with various costs, from human to economic, being a product of different processes and variables (van den Berg *et al.*, 2020; Yagil, 2001). Only in Portugal, between 2019 and 2023, there were more than 157 thousand road accidents with victims, including 2.751 fatalities (ANSR, 2019, 2020, 2021, 2022, 2023).

Regarding the relationship between driving behaviors and road accidents, the literature has focused on the association between aggressive and risky driving and crash involvement. For example, the study of Adavikottu and Velaga (2021) reported that "aggressive" drivers were 2.79 and 1.81 times more prone to be involved in a road accident than "cautious" and "normal" drivers, respectively. Also, the authors concluded that professional drivers were 0.564 times more likely to be involved in road accidents than nonprofessional drivers.

As noted earlier, the investigation into the scope of prosocial driving behaviors still needs to be conducted. Nevertheless, the existing results showed that safe and prosocial driving behaviors were negatively associated with road accidents, driving violations, and driving fines (e.g., Harris *et al.*, 2014; Karras *et al.*, 2022, 2024; Shen *et al.*, 2018).

1.4. Present Study

The present study aims to extend and consolidate existing evidence by examining differences in driving behaviors among three groups of drivers in the Portuguese context: professional (e.g., taxi drivers), regular (i.e., those who use the car for fixed-schedule activities), and leisure drivers (i.e., those who use the car for recreational purposes). Specifically, this study intends to examine i) differences in the practice of aggressive and prosocial driving behaviors, and ii) the differences in the involvement and number of road accidents in the last three years between and within the three groups of drivers. Moreover, it attempts to analyze the association between aggressive and prosocial driving behaviors and road accidents among the three groups of drivers and distinguish and compare the strength of these associations between the three groups.

2. Material and methods

2.1. Participants

The study sample consisted of 560 participants (*n* = 328, 58.57% female) taken by convenience from the population of Portuguese drivers. Of the total, 56 (10%) reported being professional drivers, and the remaining reported being nonprofessional drivers (*n* = 504, 90%), using the car to perform regular activities, such as going to work (*n* = 391, 77.58%), and for leisure activities (*n* = 113, 22.42%) (Table 1). The sample age ranged from 18 to 67 years old (*M* = 32.25, *SD* = 12.73), and their driving experience varied from 1 month to 49 years (*M* = 12.62, *SD* = 11.92). Moreover, predominantly, the participants reported driving daily (*n* = 233, 41.60%).

The professional drivers were primarily male (*n* = 42, 75%), aged between 19 and 63 years old (*M* = 43.02, *SD* = 11.65), with a mean driving experience of 22.41 years (*SD* = 11.64), and reported driving every day (*n*= 46, 82.10%). The group of regular drivers was primarily female (*n* = 247, 63.30%), aged between 18 and 67 years old (*M* = 32.78, *SD* = 12.68), with a mean driving experience of 13.14 years (*SD* = 11.92), and 47.30% (*n* = 185) of the drivers reported driving every day. Lastly, the leisure drivers were primarily female (*n* = 67, 59.30%), aged between 18 and 55 years old (*M* = 25.27, *SD* = 8.67), with a mean driving experience of 6.19 years (*SD* = 7.57), and mostly drove only a few times a month (*n* = 40, 35.40%) or during the weekends (*n* = 38, 33.60%).

Finally, it should be noted that the group of professional drivers was significantly older [*H* (2) = 81.51, $p < .001$; Mean order professional drivers= 412.51, Mean order leisure drivers = 181.11, Mean order regular drivers = 290.00] and drove for more time [*H* (2) = 76.56, $p < .001$, Mean order professional drivers = 406.51, Mean order leisure drivers = 183.99, Mean order regular drivers = 289.13] than the other two groups of drivers.

Table 1 - Characterization of driver groups according to their sociodemographic characteristics and driving experience.

Variables	n	%	M	SD
Professional drivers (N = 56)				
Sex				
Female	14	25.00		
Male	42	75.00		
Age			43.02	11.65
Driving regularity				
Several times per month	1	1.80		
Weekends only	1	1.80		
Almost every day	8	14.30		
Every day	46	82.10		
Driving experience (years)	-	-	22.41	11.64
Involvement in road accidents (yes)	11	19.60		
Driving license apprehension (yes)	4	7.10		
Regular drivers (N = 391)				
Sex				
Female	247	63.30		
Male	143	36.70		
Age			32.78	12.68
Driving regularity				
Several times per month	19	4.90		
Weekends only	11	2.80		
Weekdays only	22	5.60		
Almost every day	154	39.40		
Every day	185	47.30		
Driving experience (years)	-	-	13.14	11.92
Involvement in road accidents (yes)	58	14.80		
Driving license apprehension (yes)	19	4.90		
Leisure drivers (N = 113)				
Sex				
Female	67			59.80
Male	45			40.20
Age			25.27	8.67
Driving regularity				
Several times per year	10	8.80		
Several times per month	40	35.40		
Weekends only	38	33.60		
Weekdays only	1	.90		
Almost every day	22	19.50		
Every day	2	1.80		
Driving experience (years)	-	-	6.19	7.57
Involvement in road accidents (yes)	11	9.70		
Driving license apprehension (yes)	2	1.80		

Source: The authors.

2.2. Measures

Aggressive driving behavior was assessed through the Aggressive Driving Behavior Scale (Houston *et al.*, 2003). ADBS is an 11-item self-report questionnaire, where aggressive driving behaviors, representing unsafe driving behaviors that show hostility or can hurt the driver, other drivers, and pedestrians (Harris *et al.*, 2014), are presented. Participants were asked to indicate the frequency of adopting these behaviors over the past six months on a six-point Likert scale (from 1 = Never to 6 = Always). Besides the general index of aggressive driving behavior (α = .75), the ADBS includes two subscales: conflict behavior (7 items, e.g., *Intentionally tap my brakes when another car follows too closely*; α = .67) and acceleration (4 items, e.g., *Drive 20 miles per hour faster than the posted speed limit*; α = .62). The conflict behavior subscale addresses direct social interactions with other drivers, highlighting inconsistent actions that provoke conflict (Houston *et al.*, 2003). On the other hand, the acceleration subscale pertains to behaviors involving unsafe driving practices that may occur independently of other drivers (Houston *et al.*, 2003). The three scores are derived by summing the scores of the items within each scale. The general index of aggressive driving behavior ranges from 11 to 66, the conflict behavior score from 7 to 42, and the acceleration score from 4 to 28. In every instance, higher values indicate more aggressive driving behaviors.

Prosocial driving behavior was assessed using the subscale of the Prosocial and Aggressive Driving Inventory (Harris *et al.*, 2014). PADI pro social subscale is composed of 17 items referring to prosocial behaviors performed in the context of driving (e.g., "*Driving with special care near pedestrians*"; α = .87). Participants are asked to report, on a six-point Likert scale (from 1 – "Never" to 6 – "Always"), the frequency with which they have engaged in each described behavior over the past six months. The score ranges from 17 to 102, with higher values indicating more prosocial driving behaviors.

Demographic information and the participants' driving experience were collected: sex (0 = female), age, years of driving, involvement (yes/no), and number of road accidents in the last three years. Finally, it was asked the participants to report which function of driving mainly represents them, namely: i) "*I am a professional driver, e.g., taxi and TVDE driver / I use the*

car as an essential transport to practice my profession, e.g., transporter"; ii) "*I use the car as a means of carrying out a regular activity, e.g., go to work;* iii) "*I use the car as a means of transport for leisure;* and iv) "*I use the car to participate in a competition, to compete with friends, to perform tuning*". Taking into consideration the participants' responses, three groups of drivers were created, namely: i) the professional drivers (those who identify their function of driving as i), ii) the regular drivers (those who choose option ii), and iii) the leisure drivers (those who choose option iii). Only two participants chose option iv) and, therefore, no group of drivers for fun was created and analyzed.

2.3. Procedure

The questionnaire was developed using the LymeSurvey and distributed online through universities and driving associations across all 20 regions of Portugal. The only mandatory criteria for participation were having a valid driver's license and active driving.

The questionnaire started with an information sheet that detailed the study's objectives and the mandatory requirements for participation. The sheet also outlined the participation requested, emphasizing the anonymity and voluntary nature of the participation.

A total of 2075 individuals accessed the survey. Of these, 374 (17.54%) progressed until the informed consent, and 174 (8.39%) only responded to the socio-demographic questions. Therefore, these individuals were excluded from the final database. Additionally, 975 participants (46.99%) only completed part of the survey and were not considered for the present study. Lastly, 2 (.10%) individuals identify themselves as drivers for fun, and given the small number of elements of the group, they were not considered for analysis. Given that, the final sample comprised 560 Portuguese drivers.

3. Results

Given the study's objectives, statistical analyses based on both correlational and group differences approaches were performed. Since all variables were non-normally distributed, non-parametric tests (i.e., Spearman's and Point Bi-serial correlation coefficients, Krustal-

Wallis, chi-square tests, Wilcoxon Signed-Ranks, and Fisher's Z test) were employed. Kruskal-Wallis's test does not indicate which specific groups have significantly different distributions. Therefore, it was necessary to use multiple comparisons of mean ranks (Marôco, 2011), namely Dunn's post-hoc test to identify which groups were statistically different (Dinno, 2015).

3.1. Aggressive and prosocial driving behaviors associations and differences: within groups

Negative associations between aggressive driving behaviors and prosocial driving behaviors were found across the three groups of drivers (*r* ranging from -.21 to -.64) (Table 2). To assess whether the strength of the associations differed significantly between groups, the correlation values between Aggressive driving behavior and Prosocial driving behavior were compared across groups. Fisher's Z test results showed no significant differences between the "Professional" and "Regular" drivers (Z = -1.10, p > .05), "Professional" and "Leisure" drivers (Z = -1.39, p > .05), or "Regular" and "Leisure" drivers (Z = -0.67, p > .05).

Table 2 - Associations between aggressive driving behavior and prosocial driving behavior – within groups.

	1	2	3	4
	Professional drivers (N = 56)			
1. Aggressive driving behavior	-	**.87*** **	**.88*** **	**-.56*** **
2. Conflict behavior		-	**.55*** **	**-.38** **
3. Acceleration			-	**-.64*** **
4. Prosocial driving behavior				-
	Regular drivers (N = 391)			
1. Aggressive driving behavior	-	**.87*** **	**.78*** **	**-.44*** **
2. Conflict behavior		-	**.41*** **	**-.28*** **
3. Acceleration			-	**-.51*** **
4. Prosocial driving behavior				-
	Leisure drivers (N = 113)			
1. Aggressive driving behavior	-	**.88*** **	**.85*** **	**-.38*** **
2. Conflict behavior		-	**.54*** **	**-.21***
3. Acceleration			-	**-.44*** **
4. Prosocial driving behavior				-

Note. * p< .05; * p< .01; *** p <.001.

Source: The authors.

Subsequently, Wilcoxon Signed-Ranks tests were conducted to determine whether these behavioral measures, in addition to being associated, differed significantly within each group of drivers. Given that the variables resulted from the sum of a different number of items and were evaluated using distinct Likert scales, the variables were previously standardized, and the aggressive and prosocial driving behavior levels were compared. Significant differences were found in the professional group (Z = -2.02, p < .05, r = .09), and leisure drivers (Z = -2.40, p < .05, r = .10) (Table 3).

In the group of professional drivers, considering the values of the negative (23.96) and positive (31.67) ranks, the individuals had higher levels of prosocial driving behaviors than aggressive driving behaviors. Conversely, leisure drivers showed higher levels of aggressive than prosocial driving behaviors (Negative ranks = 58.15, Positive ranks = 56.35). It should be noted that the effect sizes were considered insignificant and small, respectively, taking into consideration Cohen's (1988) systematization.

Table 3 - Differences between aggressive driving behavior and prosocial driving behavior – within groups.

	Negative ranks		Positive ranks		Ties	*Z*	*r*
	N	Mean rank	N	Mean rank			
Professional drivers (N = 56)	23[a]	23.96	33[b]	31.67	0[c]	**-2.02***	**.09**
Regular drivers (N = 391)	208[a]	192.19	183[b]	200.33	0[c]	-.74	
Leisure drivers (N = 113)	41[a]	58.15	72[b]	56.35	0[c]	**-2.40 ***	**.10**

Note. [a:] Prosocial driving behavior < Aggressive driving behavior. [b]: Prosocial driving behavior > Aggressive driving behavior. [c]: Prosocial driving behavior = Aggressive driving behavior; * p< .05.
Source: The authors.

3.2. Behavioral differences among drivers' groups

The results indicated significant differences in all analyzed variables regarding aggressive driving behaviors (Table 4). Considering the total index of ADBS, the Krustal-Wallis test was significant [H (2) = 17.53, p < .001, r= .52], showing that the three groups differed from each other. The comparisons through the method of pairwise showed that the group of regular drivers and leisure drivers differed between them (p = .000, r = .13). Considering the mean

orders of each group (Leisure drivers = 228.04, Regular drivers = 298.43), the data showed that the regular drivers had higher levels of aggressive driving behaviors.

In the same line, the results indicate the existence of differences in the variable Conflict behaviors [H (2) = 12.44, p < .01, r= .37], with the post hoc test of Dunn showing that the regular drivers and the leisure drivers were differed between them (p = .002, r = .15). Considering the mean orders of each group (Leisure drivers = 237.34, Regular drivers = 295.77), the data indicated that the regular drivers had higher levels of conflict behaviors.

The same pattern of results was found in what concerns the variable Acceleration [H (2) = 13.56, p < .001, r = .41], with the test of Dunn showing that the regular drivers and the leisure drivers differed between them (p = .001, r = .16). In line with the previous results, the data indicated that the regular drivers had higher levels in the variable of acceleration, compared to the leisure drivers (Mean order $_{\text{leisure drivers}}$ = 233.57, Mean order $_{\text{regular drivers}}$ = 295.94).

Table 4 - Differences between groups of drivers: aggressive driving behavior and prosocial driving behavior.

Variables	Professional drivers (N = 56)				Regular drivers (N = 391)				Leisure drivers (N = 113)				*H*	*r*
	Q1	Mdn	Q3	Mean order	Q1	Mdn	Q3	Mean order	Q1	Mdn	Q3	Mean order		
Aggressive Driving behavior	17	20.50	25	261.15	18	23	26	298.43	15	19	24	228.04	**17.53*** **	**.52**
Conflict behaviors	9	11	14	260.94	10	12	15	295.77	9	11	13	237.34	**12.44** **	**.37**
Acceleration	6	9	11.75	267.39	8	10	12	295.94	6	8	10.50	233.57	**13.56*** **	**.41**
Prosocial Driving behavior	85.50	92	97.50	323.16	83	90	95	274.09	83	90	95	281.53	4.52	

Note. Q1: First quartile; Mdn: Median; Q3: Third quartile; N: Number of subjects; H: Value of Krustal-Wallis; r: effect size ** p< .01; *** p <.001.
Source: The authors.

3.3. Road accidents: differences between groups of drivers

Table 5 presents the descriptive statistics of the variables regarding the involvement in road accidents in the last three years. The results indicated that, although regular drivers showed

higher levels and frequencies in all variables under study, there were not significant differences between groups.

Table 5 - Descriptive statistics of road accidents for each group of drivers, and differences between them.

Variables	Professional drivers (N = 56)			Regular drivers (N = 391)			Leisure drivers (N = 113)			
	M(SD)	Mdn	n	M(SD)	Mdn	n	M(SD)	Mdn	n	
Road accidents_prevalence										
Yes	-	-	11	-	-	58	-	-	11	x^2 (2) = 3.32
No	-	-	45	-	-	333	-	-	102	*p*=.190
Road accidents_incidence (number of accidents)	1.18(.41)	1	-	1.14(.35)	1	-	1.00(.00)	1	-	*H* = 1.96, *p*=.375

Note. M (SD): Mean (Standard-deviation); Mdn: Median; N: number of subjects in each group; n: absolute frequency; x2 = chi-square value; H = Krustall Wallis value; p = p value.
Source: The authors.

3.4. Associations between driving behaviors and driving incidents: within groups

Regarding the association with aggressive driving behavior, no significant associations were found in the group of professional drivers (Table 6). In the group of regular drivers, a positive correlation was observed between the variables Accident Prevalence, Aggressive Driving Behavior (r = .15, p = .01), and Acceleration (r = .16, p = .05), indicating that those who had been involved in road accidents in the past three years exhibited higher levels of aggressive driving behaviors, particularly those related to speeding. For the group of leisure drivers, the results showed that those who had been involved in road accidents in the past three years demonstrated a higher frequency of aggressive driving behaviors (r = .26, p = .01), specifically speeding behaviors (r = .33, p = .01).

In both the "Professional Drivers" and "Leisure Drivers" groups, the strength of the relationships between the variables Acceleration and Accident Prevalence was stronger than those observed between the total ADBS score and Accident Prevalence. The Fisher's Z test revealed that the associations between these two pairs of variables did not differ significantly between the two groups [(Aggressive Driving Behavior x Accident Prevalence, Z = -1.06, p > .05; Acceleration x Accident Prevalence, Z = -1.68, p > .05)].

Finally, no significant associations between prosocial driving behavior and road accidents (frequency and incidence) were found among the three groups.

Table 6 - Associations between driving behaviors and road accidents – within groups.

	Aggressive driving behavior	Conflict behavior	Acceleration	Prosocial driving behavior
		Professional drivers (N = 56)		
Road accidents_prevelance (yes/no)[1]	.05	.09	-.07	.12
Road accidents_incidence (number of accidents)[2]	.53	.46	.38	.08
		Regular drivers (N = 391)		
Road accidents_prevelance (yes/no)[1]	**.15****	.09	**.16****	-.08
Road accidents_incidence (number of accidents)[2]	.12	.13	.14	-.20
		Leisure drivers (N = 113)		
Road accidents_prevelance (yes/no)[1]	**.26****	.13	**.33****	-17
Road accidents_incidence (number of accidents)[2]	-	-	-	-

Note.[1]: Point-Biserial coefficients; [2]: Spearman coefficients.
Source: The authors.

4. Discussion

The primary objective of this study was to examine the possible differences between professional and nonprofessional drivers in terms of their aggressive and prosocial driving behavior levels. Moreover, the present study also explored the association between aggressive and prosocial driving behaviors and road accidents within different groups of drivers, addressing the implications for road safety and policy.

Firstly, our results demonstrated the existence of negative associations between aggressive driving behaviors and prosocial driving behaviors in the three groups of drivers analyzed (i.e., professional, regular, and leisure drivers). These findings indicate that those who display more aggressive behaviors behind the wheel show less prosocial driving behaviors, supporting previous research, such as Harris *et al.* (2014) and Kerwin and Bushman (2020), that reported a negative association between prosocial and aggressive driving behavior. Moreover, and in

line with our results, the study of Kerwin and Bushman (2020) provides experimental evidence supporting this pattern. The authors asked the participants to rate the aggressiveness of the driving behaviors displayed in various short videos, with the results showing that higher levels of prosocial driving behaviors (measured through PADI) were associated with lower perceived aggressiveness in the speeding driving scenarios [i.e., showing the driven car or a third person car overtaking at 50 MPH (86 KPH) a line of cars going 35 MPH (56 KPH) (Kerwin & Bushman, 2020, p.3)].

Also, despite aggressive and prosocial driving behaviors being negatively associated, the Wilcoxon Signed-Ranks test showed that the levels of aggressive and prosocial driving behaviors were statistically different in the professional and leisure drivers' groups. Concretely, the group of professional drivers had higher levels of prosocial than aggressive driving behaviors, and the leisure drivers presented higher levels of aggressive driving behaviors than prosocial. These results reinforce the idea that professional drivers develop safer and more regulated driving behaviors due to their occupational exposure and increased accountability (Maslać *et al.*, 2018). Also, our results demonstrated that the group of nonprofessional drivers, specifically the regular ones, had higher levels of aggressive driving behaviors (conflict and acceleration) than the remaining distinguished groups. The obtained results align with those reported by Maslać *et al.* (2018), which demonstrated that professional drivers committed fewer aggressive driving violations. According to the authors, this type of result can be due to two main reasons, namely: i) professional drivers are more prone to be visible taking these types of behaviors, given the physical characteristics of the vehicles, and ii) the consequences of doing such actions are more severe for professional drivers than for nonprofessional drivers. Considering these two factors, professional drivers can inhibit themselves from engaging in aggressive driving behaviors (Maslać *et al.*, 2018). Therefore, the "capable guardian" (Cohen & Felson, 1979) seems more present for professionals than nonprofessional drivers. Moreover, the hypothesis of Maslać (2018) highlights that for this group of drivers that have the task of driving as a profession, the deterrence from committing these types of acts is more significant, given that the losses from them are bigger than the gains. For example, they can have monetary losses and labor penalties.

Regarding road accidents, our results demonstrated the nonexistence of differences between groups, neither in the frequency nor incidence of road accidents in the last three years. Also, positive associations between aggressive driving behaviors and road accidents emerged only in the two groups of nonprofessional drivers. The results indicated that regular and leisure drivers with higher levels of aggressive driving behaviors, concretely acceleration ones, had a higher frequency of road accidents. These results concord with the scientific evidence that speeding is one of the factors that most contributes to the probability and severity of road accidents (e.g., Elvik, 2012). According to the scientific literature, the decision to speed is influenced by demographic characteristics, such as sex and age (with women and older people having less of these behaviors), and psychological factors, such as risk perception and driving habits (e.g., Alonso *et al.*, 2015; Zhang *et al.*, 2013). Moreover, the fact that professional drivers had more responsibility while driving, given that is their profession, may explain not only the fact of them having more prosocial than aggressive driving behaviors – as referred above – but also the absence of association between their levels of aggressive driving behaviors and frequency of road accidents.

Despite the contributions of the current study, the same is not absent of limitations. Firstly, the current study is cross-sectional, which limits the inference of causal relations. Secondly, the use of self-report measures. Besides the advantages of questionnaires and the fact that research has proven that this data collection method is reliable and valid, the results obtained should be confirmed through behavioral measures. With regard to driving, individuals may not be the best to judge their performance, and self-reporting may be vulnerable to social desirability (e.g., Lajunen & Summala, 2003). Given that, future studies could use virtual reality and simulators to immerse individuals in realistic scenarios, potentially enhancing the data's validity and enabling real-time measurement of behavioral responses (Zinzow & Jeffirs, 2018). Moreover, despite the study's relatively large total sample, the participants were drawn from the general population, with the majority being college students or staff. In fact, concerning professional drivers, the number of subjects was highly diminutive (n=56), which can diminish the generalizability of the findings and the possible absence of statistical differences between this group and the remaining. Nonetheless, according to Hill & Hill (2000), in the specific case of comparing three groups, each should consist of a minimum of

27 cases – which was ensured in this study. Even so, future research should attempt to sample more professional drivers and more diverse professionals' drivers in what concerns sex, as most of the participants of this group were male. Also, and as referred to above, the continuous frequency of driving by professional drivers may lead to fatigue, affecting their capacity for attention and, consequentially, their perception of the driving situations and actions of other drivers (Deffenbacher *et al.*, 1994). Therefore, future studies should explore differences between professional and nonprofessional drivers concerning their perception of driving interactions with other road users and their possible behavioral responses to those situations. It should be noted that studies that adopt mixed methods approaches have a greater depth of knowledge of the subjective experiences of professional drivers, which can provide a richer understanding of driving behavior. Still regarding the study sample, the fact that only data from individuals who totally completed the questionnaire were considered for analysis may have led to the "loss" of more impatient and impulsive individuals—traits that are associated with a higher likelihood of engaging in aggressive driving behaviors (e.g., Miles & Johnson, 2003). Finally, given that professional drivers were significantly older and drove for more time than the remaining two groups of drivers analyzed, future studies should explore the influence of these variables on the obtained results, as these aspects may have influenced the results obtained. As referred above, scientific research has been consistent in reporting the existence of a negative association between age and aggressive driving behaviors, highlighting that older drivers are generally safer drivers, while younger drivers are more prone to engaging in aggressive and risky driving behaviors (e.g., Liu *et al.*, 2022; Wells-Parker *et al.*, 2002). Concerning driving experience, despite some exceptions, most of the studies demonstrate a negative association between driving experience and aggressive driving behavior and driving violations (e.g., Cardoso *et al.*, 2024).

4.1. Final conclusions and practical implications

Overall, the current results have implications for road security interventions. First, our results suggest that professional drivers may benefit from occupational contexts that promote supervision and deterrence, which foster more regulated and prosocial driving behaviors. This highlights the possibility of extending similar mechanisms to nonprofessional drivers, such as

increased enforcement or educational campaigns that emphasize social responsibility and the negative consequences of aggressive driving behaviors. Moreover, given that aggressive driving behaviors were associated with road accidents exclusively among nonprofessional drivers, targeted prevention strategies should focus particularly on this group. Third, and related to the previous point, the study emphasizes the importance of incorporating prosocial driving behaviors into road safety policies and driver education programs. Promoting such behaviors, in cognitive behavioral programs, may not only reduce aggressive driving but also contribute to a safer overall traffic environment. In this sense, road safety campaigns and training programs could shift from an exclusive focus on the negative aspects of driving toward a broader emphasis on positive driving behaviors.

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