



Exploring Personality Traits and Driving Behavior: Insights from Indian Drivers

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ABSTRACT: The study examines the relationship between personality traits and driving behavior among Indian drivers, validating the Prosocial and Aggressive Driving Inventory (PADI) in the Indian context. Data were collected from 400 licensed drivers including age, gender, income, education, riding frequency, riding exposure, driving behavior, altruism and propensity for aggression. The results confirm the reliability and validity of the Indian version of PADI. Hierarchical regression analysis reveals that altruism positively influences prosocial driving behavior, while propensity for aggression significantly predicts aggressive driving behaviors. Addi-

tionally, riding frequency negatively impacts prosocial behavior, whereas riding exposure and novice driving experience contribute to aggressive behavior. Socio-demographic factors such as gender, age, income, and education also play a role in shaping driving behaviors. These findings provide insights into driver psychology and offer valuable implications for traffic safety interventions, policy development, and behavioral training programs tailored to the Indian context.

KEYWORDS: Prosocial; Aggression; Altruism; Anger; Psychology; driving

1. INTRODUCTION

Road safety is a crucial element for urban well-being, and road users often believe that safe mobility is their need and a fundamental human right. Road crashes are still an emerging issue being the ninth leading cause of death across the world. In this concern, WHO (2018) reported that nearly 1.3 million people die every year due to road crashes, of which 93% of fatalities are observed in middle- and low-income countries. For instance, in the Indian context, about 0.13 million die every year due to road crashes. Besides, 69% of these fatalities are among young adults, with 85% involving males. Interestingly, India has only 1% vehicles worldwide and carries the second-largest road network, but it stands top in road casualties, NCRB (2020). It is escalated by 53 accidents happening every hour in India, as compared with four in the US. A recent behavioral study on Indian drivers has shown that driving behavior is the worst in most Metro cities and a significant cause behind road mishaps (Chatterjee et al., 2020). Hence, analyzing driver behavior is a precursor to traffic safety awareness that will reduce road traffic accidents. However, driving behavior is least understood from the Indian context. Therefore, it is imperative to investigate the cognitive antecedents of driving behavior for improving the psychological integrity of Indian drivers. For the past two decades, studying cognitive processes in driving has been a key focus in transportation psychology. Driving behavior is influenced by both situational facts (e.g. traffic congestion, road design and law enforcement) and individual psychological traits. Among the latter, the Big Five personality traits (extraversion, openness, agreeableness, conscientiousness, and neuroticism) play a crucial role in shaping driving attitudes, and neuroticism play a significant role in shaping driving attitudes and behaviors (Dahlen et al., 2012; Jonah, 1997). Research suggests that conscientiousness and agreeableness are associated with prosocial driving tendencies, while neuroticism and extraversion are linked to higher aggression on the road

(Deffenbacher et al., 2003). Understanding personality-based predispositions is essential for designing effective road safety interventions. Unsafe driving attitudes like speeding, failing to keep minimum headway, drink and drive, and distraction using mobile phones while driving is found to be positively associated with road crashes (Lewin, 1982). Also, research addressing safe driving attitudes like tendency to drive safely, wearing seatbelts/helmets, and patience in traffic queues has shown encouraging results (Najeeb, 2013; Norris et al., 2000; Parker et al., 2002; Deffenbacher et al., 2001). Behavioral studies refer to these unsafe and safe attitudes as aggressive and prosocial driving behavior respectively (Nabi et al., 2005). Prosocial driving behavior is a concept of exhibition of safe driving attitudes. It can be defined as a psychological tendency to benefit others in society (Harris et al., 2014). Besides, aggressive driving behavior defines the tendency of unsafe and rude driving that escalates risk to other road users. Aggressive drivers are less concerned about society and are different from prosocial drivers on dispositional behaviors (Iversen and Rundmo, 2002). Research on the influence of prosocial and aggressive behaviors on driving is found to be relevant and important since they provide a comprehensive assessment of driving behavior.

Aggressive driving is a significant concern for public safety, contributing to traffic conflicts, accidents, and road rage incidents. Studies indicate that aggressive driving behavior, such as speeding, tailgating, honking, and reckless overtaking, are often linked to individual personality traits, particularly impulsivity, hostility, and aggression. Among the Big Five personality traits, neuroticism and extraversion are the most strongly associated with aggressive driving. Neurotic individuals, prone to emotional instability and frustration, exhibit heightened road rage and impulsive driving behaviors, particularly in high-congestion settings (Sullman et al., 2007). Extraverted drivers, characterized by risk-taking tendencies and sensation-seeking, are more likely to speed and overtake dangerously (Jonah, 1997). Conversely, high

conciseness and agreeableness are linked to cautions and prosocial driving behaviors, reducing aggressive tendencies (Dahlen et al., 2012). These insights highlight the need for personality driver road safety policies.

However, aggressive driving is a multifactorial phenomenon, influenced not only by internal psychological characteristics but also by external situational factors that exacerbate stress and frustration on the road. External conditions such as traffic congestion, road infrastructure, time pressure, adverse weather, enforcement policies, and cultural driving norms play a crucial role in triggering aggressive driving behavior. Studies suggest that long commuting hours, frequent stops due to poor road conditions, and perceived violations by other drivers lead to frustration and aggressive responses. Furthermore, lack of law enforcement, lenient penalties for traffic violations, and social acceptance of aggressive driving behavior in certain regions contribute to the persistence of the problem.

While most of the studies on driving behavior have been conducted in Euro-American context, research on Indian driver behavior remains relatively limited. Previous Indian studies indicate that aggressive driving is influenced by infrastructural deficiencies, traffic congestion, and lenient enforcement mechanisms (Chatterjee et al., 2020; Najeeb, 2013). Unlike in Western context, where aggressive driving is often linked to personality traits alone, studies in India suggest that external stressors, including road conditions and urban density, significantly contribute to such behavior. Moreover, prior research on Indian drivers has identified a strong correlation between traffic violations and risk-taking attitudes (Lewin, 1982). A study conducted in major cities found that young drivers, particularly males, exhibit higher levels of aggression due to peer influence and social acceptance of rule-breaking behavior on the road (Parker et al., 2002). This contrasts with findings from European studies, where driver aggression is often attributed to impulsivity and sensation-seeking tendencies rather than socio-cultural factors.

A survey instrument called Prosocial and Aggressive Driving Inventory (PADI) was developed by Harris et al. 2014, to assess prosocial and antisocial driving behavior. The PADI is a questionnaire based on two scales, measuring safe (prosocial) and unsafe (antisocial) attitudes on the assumption that drivers have steady and enduring mannerisms. There are other survey instruments such as Dula Dangerous Driving Index (Castillo-Manzano and Castro-Nuño, 2012). Driving Anger Expression Inventory (Blows et al., 2005), and others (Lajunen and Özkan, 2011) emphasize exclusively on antisocial driving behavior. These instruments lack constructive insights into prosocial attitudes of drivers. Driver Behavior Questionnaire (DBQ), Motorcycle Rider Behavior Questionnaire (MRBQ) has been tested and validated in Indian context, but these instruments do not consider prosocial attitudes of a driver. Since due to the cross-cultural disparity, the American, Chinese or German version of PADI cannot be used as such in the Indian context without being tested and validated. India with higher population, lenient enforcement system, priority rules, road conditions, lack of funds bestows a more complex traffic environment than other developing countries.

Prosocial driving component in the PADI defines the defensive driving characteristics that makes drivers as well as other road users safe and promotes cooperation among road users. The PADI emphasizes both effective norms of driving that can minimize accidents and induce road safety. It consists of 29 items among which 12 items belong to aggressive and 17 items of prosocial driving behavior. PADI addresses unsafe driving behavior aspects like speeding and rude gestures excluding violent behavior. The PADI instrument has been validated using behavioral data from Chinese context (Sanchez-Jimenez, 1967) and German context (Sullivan et al.,

2011), which shall be extended through evidence from other contexts. Of that, the Indian version of the PADI or any such survey instruments that inculcate prosocial driving behavior is still sparse. Motorcycle Rider Behavior Questionnaire (MRBQ) has been tested and validated in Indian context, but these instruments do not consider prosocial attitudes of a driver. Notably, the population, driving maneuver, enforcement policies, traffic rules, safety conditions, and logistic constraints in India contribute to a more complex traffic environment than in other developed countries (Bone and Mowen, 2006). Due to this cross-cultural disparity, the American, Chinese or German version of PADI cannot be used as such in Indian context without being tested and validated. Besides, prosocial and aggressive driving behaviors are influenced by both socio-demographic and driving factors of drivers. Each driver has distinct socio-demographic characteristics like age, sex, education, income, and vehicle ownership that play a significant role in influencing their attitudinal behaviors. While driving characteristics like experience, exposure, purpose, and frequency are external factors that can regularly or continuously be associated with driving problems (e.g., noise, lane change, overtaking, and congestion) in all situations. Studies dealing with socio-demographic and driving exposure are valuable yet limited in that most studies typically focus on finding associations between personality traits and aggressive behaviors, they have not explored the interrelationships among all the above factors with prosocial and aggressive driving behaviors.

Several studies have examined the influence of socio-demographic factors such as age, gender, education, and income on driving behavior. However, profession has received relatively less attention in the context of traffic psychology. Research suggests that individuals in different professions exhibit varying levels of risk-taking and self-conscious behavior while driving. For instance, professional drivers (e.g. taxi, truck and delivery drivers) often develop more defensive driving habits due to their frequent exposure to traffic conditions, whereas individuals in high-stress occupations may exhibit more aggressive driving tendencies due to work-related pressures. Propensity of accidents in Indian road conditions are higher with the unexpected presence of pedestrians, bicycles, animals, or animal driven vehicles. Also, there is a huge disparity between Indian drivers and drivers from developed nations. The lack of safe driving skills and the challenges they are likely to encounter on the road are important aspects of defensive driving. Therefore, it is indispensable to have a valid testing of the prosocial and aggressive behavior of Indian drivers.

Previous studies have developed a handful of tools and scales that assess different features of risky driving practices including distracted driving (Clapp et al., 2011), anxious driving (Deffenbacher et al., 2003), angry driving (Wiesenthal et al., 2000), vengeful driving (Wiesenthal et al., 2000; Hennessy and Wiesenthal, 2005). Nevertheless, to date, only few studies have assessed the effect of safe driving behavior. Few literatures have identified that safe driving behavior is negatively associated with driving errors, violations, and aggressive behavior (Harris et al., 2014; Özkan and Lajunen, 2005; Machin and Sankey, 2008; Dahlen et al., 2012). With respect to the behavioral differences within individuals, personality traits hold a prime importance. Defensive and patient driving skills are positively related to prosocial driving behavior and negatively related to aggressive driving behavior. With respect to the behavioral differences within individuals, personality traits hold a prime importance. Defensive and patient driving skills that are relevant to safe driving are positively associated with prosocial driving and negatively associated with angry driving styles (Precht et al., 2017). Many studies have found that aggressive driving behaviours are positively

associated with personality traits such as sensation seeking (Tay et al., 2003; Jonah, 2001; Zukerman, 2007; Lancaster and Ward, 2002; Hemenway and Solnick, 1993), hostility (Deery and Fildes, 1999; Norris et al., 2000; Ulleberg and Rundmo, 2003) and negatively associated with behavioural traits such as altruism (Marengo et al., 2012; Shen et al., 2018) locus of control (Phares, 1976; Matricardi, 2006; Rudin-Brown and Noy, 2002; Cellar et al., 2001) conscientiousness (Guo et al., 2016; Shechtman et al., 2009). Harris et al., (2014) also found a positive relation among prosocial driving behavior and personality traits such as openness, conscientiousness and agreeableness (Harris et al., 2014). Among various behavioral traits, altruism and propensity to aggression has been chosen as positive and negative traits respectively for the present study which can comprehend the driving behavior of Indian drivers.

In 1998, Shinar stated that frustration aggression model is beneficial to understand and predict aggression on the road. Also, he highlighted that the running red lights and honking could be valid measures of aggression (Shinar, 1998). Aghabayk et al., (2022) assessed the contributing factors of pedestrian aggression such as travel habits, demographics, and the big five personality traits. Shinar & Compton, (2004) studied aggressive driving behavior on both situational variables such as congested and non-congested scenarios; as well as individual characteristics such as gender, age etc. This study provided a strong linear connection between congestion and the frequency of aggressive behaviors. Schmitt et al., (2007) studied personality traits in 56 nations and found that the cross-cultural generalizability of the Big five structure. Das & Das, (2022) contributed to the driver's behavior factors and developed an end-to-end Multi-task Learning with Attention (MTLA) based model with Long Short-Term Memory (LSTM) using smartphone sensor recorded data which captured individual personality traits.

A method was developed by Chen et al., (2024) to identify aggressive driving by evaluating vehicle dynamics data including speed, acceleration, and steering angle. Data was collected from simulations in an urban setting using the software SCANer™ Studio. Also, they used Bayesian optimization based on long short-term memory neural network, a pattern recognition model for the detection of driving behavior. Jayakumar & Vinodkumar, (2025) measured the effects of driver characteristics on aberrant and positive driving behaviors among bus drivers and clusters based on drivers' characteristics and driving behaviors. Haritha & Preethi, (2022) evaluated various causes of abnormal driving behavior in Kerala (India) and highlighted the impact of socio-demographic characteristics and socioeconomic status using Confirmatory factor analysis (CFA). Also, study results showed that driving experience and personal traits of road users had a significant influence on offence, fault, and lapse.

With respect to driving behavior, the factors such as age, gender, income, educational qualifications, and driving experience also carry importance. Some studies found out that aged drivers seem to abide by law and take less risk (Golias and Karlaftis, 2001; Lawton et al., 1997). Also, young drivers are more associated with reckless and risky driving behavior (Elander et al., 1993; Dukes et al., 2001). Few studies have found men drivers are more prone to physical injury and aggressive driving (Ma et al., 2021; carvalho et al., 2017). Lajun & Parker (2001) and Jia et al. (2016) found a negative correlation of rude driving behavior with driving experience. Conversely, Li et al., (2004) reported no specific relation between aggressive driving and driving experience. Traffic psychological studies mainly focus on drivers characteristics and are grouped into driver performance and behavior (Machin and Sankey, 2008). Propensity of accidents in Indian road conditions are higher with the unexpected presence of pedestrians, bicycles, animals, or animal driven vehicles. Also,

there is a huge disparity between Indian drivers and drivers from developed nations. The lack of safe driving skills and facing the challenges they are likely to encounter on the road are important aspects of defensive driving. Therefore, it is indispensable to have a valid testing of the prosocial and aggressive behavior of Indian drivers. However, only few studies have investigated the impact of safe and risky driving behavior with respect to the personality traits within the Indian context. Driving exposure of Indian drivers is extremely heterogeneous when compared to developed nations. It increases the complexity that tends drivers to more aggressive and unsafe ways of driving, which further leads to accidents. Thus, studying driving behavior and their relationship with external and internal factors is perhaps the most apt way to prevent increasing crashes in the current context. The main objective of the study is to identify the interrelationships between driving exposures, personality traits of drivers and socio-demographic characteristics based on PADI instruments. Keeping in mind the existing research efforts on driving behavior in various contexts, the study contributes to literature in two ways. Firstly, it validates the PADI instrument from a context that is extremely different from other studies. Secondly, it instigates the less explored, however important relation between personality traits and driving behavior aligning with driving exposure and socio-demographics of Indian drivers.

2. METHOD

2.1 Survey and Respondents

Krejcie and Morgan, (1970) equation was adopted to calculate sample size. The minimum samples required were 384 with 95% confidence interval, 0.5 population proportion and 0.05 degree of accuracy (5% desired margin of error). In total, 460 responses were collected from drivers from different cities of India.

2.2 Participant Selection Method

Initial eligibility for participating in questionnaire survey was based on the following inclusion criteria: (a) owning a valid driver's license, (b) understanding English, (c) minimum driving experience of 1 year, (d) driving two-wheelers or three-wheelers or four-wheelers. Heavy or light vehicle drivers or truck drivers are excluded from the survey. Total participants for the survey were 460 Indian drivers from various cities of India such as Mumbai, Cochin, Thiruvananthapuram, Chennai, Hyderabad, Bangalore, Delhi, Bhubaneswar, Kanpur, Lucknow, Visakhapatnam, Pune, Jaipur, Bhopal, Nagpur, Coimbatore and Ahmedabad. Thus, survey samples represent the Indian population that tends to exhibit aberrant traffic behavior. A web-based survey hosted using Google forms was used to collect data. Snowball sampling (chain-referral sampling) was adopted for the study. The questionnaire survey was floated in India from December 2021-January 2022. Different online approaches were adopted to reach participants which include group mail, personal emails, and social media promotions. Out of the 460 responses, 400 responses were used for the study analysis after removing 60 samples which were incomplete and did not follow the criteria. Since the survey was anonymous, respondents were assured of anonymity and confidentiality and there was no need for ethics approval. Sample proportions among various cities were based on the number of vehicles registered. Table 1 provided sample proportioning among various cities. To ensure the sample adequacy. To confirm the sample adequacy, a post hoc power analysis calculation using the software package G-power was conducted (Faul and Erdfelder, 1992). The results found that the statistical power for this study was greater than 0.99, hence proving the size of the sample was adequate.

City Name	Population	Samples Collected
Delhi	32940000	90
Mumbai	21200000	64
Bangalore	13600000	41
Hyderabad	10800000	33
Chennai	8653000	26
Ahmedabad	8650000	26
Pune	7166000	22
Jaipur	4207000	13
Lucknow	3945000	12
Kochi	3406000	10
Kanpur	3234000	10
Nagpur	3047000	13
Coimbatore	3009000	11
Thiruvananthapuram	2891000	10
Bhopal	2565000	10
Visakhapatnam	2331000	7
Bhubaneswar	1258000	4
Total	132902000	400

Table 1. Samples collected from each cities

2.3 Instruments and Measures

Three instruments were adopted for this study such as Altruistic Personality Scale (APS), Prosocial and Aggressive Driving Inventory (PADI), and Propensity to Aggression Scale (PAS). The details of each instrument are provided below. Prosocial and Aggressive Driving Inventory (PADI). A self-report questionnaire called PADI (Prosocial and Aggressive Driving Inventory) was developed by Harris et al. (2014) to encourage safety for people (Harris et al., 2014). The inventory includes two components such as safe and unsafe driving behavior. PADI has a total of 29 items, among which 17 items are defined under prosocial driving behavior and 12 items are defined under aggressive driving behavior. The respondents rated the statements based on how they are engaged in driving on road and what are the behavioral patterns they exhibit on six-point Likert scale of Never to Always with 1-Never, 2-Almost never, 3- Sometimes, 4-Fairly often, 5-Very often and 6-Always.

- Altruistic Personality Scale (APS). It is one of the most widely used tools for evaluating the level of altruism (Davey et al., 2007), with a 20-item scale by measuring the number of times at which one person shows his/her altruistic nature primarily towards strangers. The instrument was measured on a five-point Likert scale from Never to Very Often with 1- Never, 2- Once, 3- More than once, 4-Often and 5-Very Often. For instance, participants were asked to rate questions like “I have given directions to a stranger”, “I have made change for a stranger”, etc.
- Propensity to Aggression Scale (PAS). In this study, aggression scale by Watson et al., (2007) is adopted to assess propensity of aggression in drivers. This instrument consists of 6 items measured on a seven-point Likert scale from Never to Always with 1-Never, 2-Very rarely, 3-Rarely, 4-Not Known 5-Occasionally, 6-Very Frequently and 7- Always. Respondents are asked how often they experience each statement while driving. For example, respondents are asked “How they felt frustrated by other road users”. PAS adopted in the Indian context has exhibited excellent reliability and validity with Cronbach’s alpha as 0.72 (Bryman and Cramer, 1999). Socio-demographic Characteristics. The participant’s socio demographic (age, gender, education, profession) and driving related information (Years

of experience in driving, driving exposure per week) were obtained. Furthermore, the questions related to accident history, the number of fines or penalty for traffic violations, seat belt/Helmet wearing behavior are included.

2.3 Data Analysis

A series of analysis using SPSS V23.0 software and AMOS V’s. 16 is conducted to identify the interrelationship between socio-demographic factors, personality traits and driving behavior among Indian drivers. Descriptive Analysis, Reliability Check. As an initial step, descriptive analysis was conducted to identify data’s main characteristics, including variability and central tendency. Reliability analysis was conducted to examine the stability and internal consistency of the measurement scales, confirming that the survey instruments provided consistent results. Exploratory Factor Analysis (EFA) with Principal Component Analysis (PCA). To inspect the factors structure of the Indian version of PADI, an Exploratory Factor Analysis (EFA) was employed using Principal Component Analysis (PCA) in SPSS software. EFA is employed to identify the underlying factors in a set of observed variables. PCA is adopted to extract these factors and find their contribution to the overall deviation in the data. Confirmatory Factor Analysis (CFA) with Maximum Likelihood Estimation (MLE). A Confirmatory Factor Analysis (CFA) was employed using AMOS software to confirm the factors of the PADI instruments established in the EFA. CFA technique is utilized to test whether a specified factor structure fits the data well. It confirms the validity of the measurement model proposed in the study. Maximum Likelihood Estimation (MLE) is employed to estimate the model parameters that best fit the data in CFA. A correlation analysis was conducted to identify the relations between various variables, investigating potential relationships among personality traits, driving behavior and driving characteristics. A Hierarchical Multiple Regression (HMR) analysis was conducted to examine the influence of socio-demographic characteristics, personality traits and driving characteristics on safe and unsafe driving behavior. HMR assesses the unique contributions of various variables to driving behavior while controlling potential invalidating factors. The HMR approach was used to add predictor variables in stages, starting with personality traits, followed by socio-demographic variables, and finally driving characteristics. The present study aimed to gain a comprehensive understanding of the factors affecting driving behavior among Indian drivers. EFA, CFA and regression analysis are combined to identify significant relationships and provide fruitful insights into complex interplay of personality characteristics, socio-demographic characteristics, and driving characteristics in determining safe and unsafe behavior.

3. RESULTS

3.1 Descriptive analysis

The final data set comprised 245 male (59.5%) participants and 153 female (40.5%) participants (Figure 1). Maximum percentage of male drivers belongs to the age group of 18-30 years old (43.2%) and most of the female drivers belong to the age group of 31-45 years old (13.81%). About 28.14 % of participants have driving experience greater than 10 years, 13.31% with a driving experience of 8-10 years, 24.37% drivers with experience 5-7 years and 34.87% with driving experience less than 4 years. Majority of people ride for work (52.5%), followed by educational trips (20.7%), shopping trips (12.3%), leisure trips (7.3%), recreational trips (4.2%) and religious trips (3%). Most of the respondents are graduates (53.7%) and have the highest percentage of income ranging between 0 to Rs. 50000. Most of the respondents wear helmets or seat belts while driving.

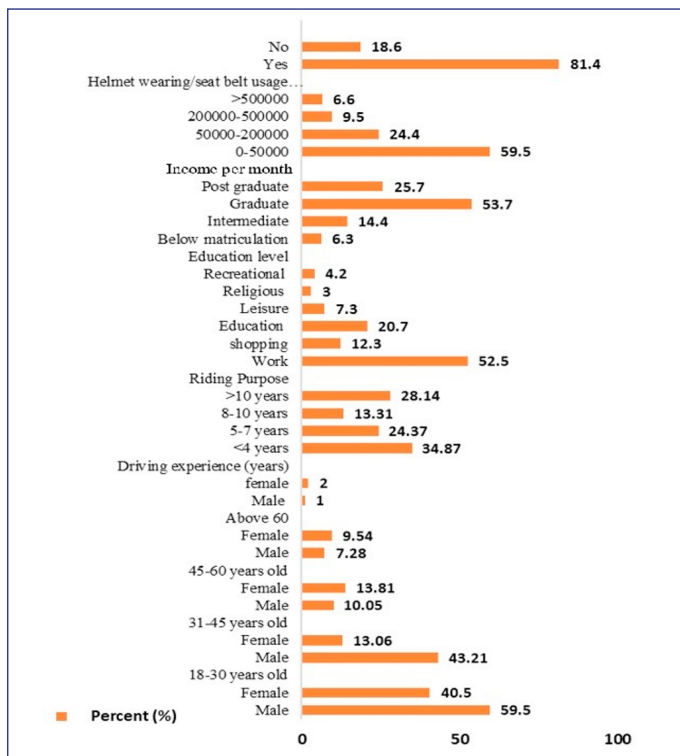


Figure 1: Descriptive statistics

3.2 Reliability Analysis

Details of Cronbach's alpha for two subscales of PADI and two personality traits are provided in Table 2. The prosocial driving sub-scale ranged from 1 to 5 with a mean value 4.07 whereas the aggressive driving sub-scale ranged from 1 to 5 with a mean value of 2.81. All respondents reported more prosocial driving behavior than aggressive driving behavior evidently. All scales showed good internal consistency and reliability except the personality traits i.e. propensity to aggression with Cronbach's α greater than 0.80 (Goldberg, 1999). Altruism obtained Cronbach's α value of 0.86 and PADI subscales received 0.93 for prosocial and 0.92 for aggressive driving behavior which indicates that the data obtained is reliable and has good internal consistency (Table 2).

3.3 Exploratory Factor Analysis and Confirmatory Factor Analysis

29 PADI items yielded a two-factor solution accounting for 56.29% of the variance when undergoing Principal Component Analysis (PCA) with varimax rotation. A scree test supports the two-factor solution with eigenvalue greater than 1. A Kaiser-Meyer-Olkin (KMO) measure of sampling

adequacy obtained as 0.944 with Bartlett test got a significant value of 1945.0 with a p-value <0.001 which confirmed the significance of correlation matrix. The attributes are grouped into two factors namely, prosocial and aggressive driving behavior. Prosocial included 17 items that measured safe driving behaviors of drivers who would be compassionate to other road users. Aggressive driving factors included 12 components that exhibit unsafe and rude driving behavior like honking, over speeding, rude gestures etc. The items extracted after PCA in the Indian version of PADI are the same as those with the original version of PADI by Harris et al., (2014), however factor loadings obtained for each item in Indian PADI are different. The lowest factor loading for prosocial factors is received by item no. 14 i.e. 'decrease vehicle speed when the weather is poor' and the lowest factor loading for aggressive factor is received by item no. 29 i.e. 'Overtaking vehicles using the right lane'. Table 3 presents the results of item loading for PCA for the Indian version of PADI. To confirm the findings of EFA, a Confirmatory Factor Analysis (CFA) was performed employing Maximum Likelihood Estimation (MLE). CFA was fed with 29 PADI items to fit within the two-factor model that segregates driving behavior into two: safe driving and unsafe driving behavior with 17 items and 12 items respectively. In the first trial, an unsatisfactory model fit was obtained (Chi-square (χ^2) = 788.95, CFI= 0.831, p<0.001, TLI = 0.829, RMSEA = 0.05). The original version of PADI also obtained an unsatisfactory fit and hence, nine covariance were introduced to improve the model fit. The Indian version of PADI also required to introduce 9 covariance to improve the model fit (Chi-square (χ^2) = 525.65, CFI = 0.93, P < 0.001, TLI = 0.92, RMSEA = 0.04). Covariance was between items 1 and 9, 3 and 25, 5 and 8, 6 and 19, 7 and 13, 7 and 15, 12 and 25, 17 and 19, and 26 and 27 where item names are provided in Table 4. Thus, the model obtained after confirmatory analysis is compatible with the original version of PADI.

3.4 Correlation Analysis

After establishing the factor structure of the Prosocial and Aggressive Driving Inventory (PADI) through Exploratory and Confirmatory Factor Analysis, a correlation analysis was performed to examine the relationships between the validated constructs and key socio-demographic and personality variables. Correlation analysis was conducted to understand the bilateral relationship between socio demographics, riding characteristics, and the PADI and personality traits (Table 3). Furthermore, the association among the PADI and personality traits such as altruism and propensity to aggression were also assessed. As expected, prosocial driving behavior is very feeble and insignificantly related to aggressive driving behavior.

Characteristics	No. of Items	M	SD	Range	Cronbach's α
Riding characteristics					
Riding experience (years)	-	9.72	8.60	0-40	-
Riding exposure (hrs/week)	-	13.86	18.00	0-150	-
Riding frequency (per day)	-	4.56	8.19	0-10	-
Personality Factors					
Altruism	16	2.99	0.69	1-5	0.86
Propensity for aggression scale	6	3.02	0.94	1-6	0.72
The PADI					
Prosocial driving	18	4.07	0.74	1-5	0.93
Aggressive driving	11	2.81	1.09	1-5	0.92

Table 2: Descriptive and Reliability Analysis for PADI and other personality factors.

PADI Item No.	PADI Item Statements	M	SD	Prosocial driving	Aggressive driving
10	More careful driving to accommodate vehicles or people on the roadside?	4.15	1.01	0.81	
5	Pay special attention when making turns?	4.24	1.01	0.81	
8	While turning, do you check blind spots and use mirrors?	4.17	1.05	0.80	
4	Drive carefully around bicyclists.	4.25	0.97	0.80	
13	Do you completely stop your vehicle at the stop line?	4.02	1.09	0.77	
9	Do you decrease vehicle speed when road conditions are bad?	4.06	1.01	0.77	
11	Do you maintain a safe distance with other vehicles?	4.22	1.03	0.77	
7	Applying brake slowly to alert drivers behind?	4.16	1.07	0.76	
6	Do you pay attention to traffic and the environment while driving?	4.15	1.00	0.75	
3	Do you pay special attention when approaching intersections?	4.06	1.04	0.75	
2	Do you pay special attention when approaching pedestrians?	4.18	1.02	0.74	
17	Do you obey posted speed limits in school zones?	4.16	1.12	0.74	
12	Do you slowdown in the construction zone?	4.10	1.10	0.71	
16	Do you obey traffic signs?	3.96	1.12	0.69	
15	Do you yield your vehicle when the right way belongs to others?	4.21	1.03	0.68	
1	Do you take care of pedestrians while you drive?	3.98	1.18	0.62	
14	Do you decrease vehicle speed when the weather is bad?	3.75	1.25	0.49	
24	Accelerate into a traffic section when the traffic light is changing from yellow to red?	2.79	1.49		0.84
23	Weave in and out over lanes while overtaking a vehicle?	2.64	1.39		0.82
20	Do you follow the vehicle ahead closely to stop the merging of other vehicles in front of you?	2.82	1.44		0.80
21	Do you overtake a vehicle in front of you less than a car length?	2.81	1.45		0.80
18	Do you use turns signals to notify me of my intention of turning?	2.72	1.49		0.79
19	Do you drive speedily when another vehicle tries to overtake you?	3.01	1.42		0.78
22	Do you try to merge into traffic when another vehicle driver tries to close the gap between the vehicles?	2.88	1.41		0.77
26	Do you flash beams of vehicles to move slower vehicles out of your way?	2.56	1.42		0.73
25	Do you drive 25 km per hour faster than the minimum speed limit?	2.77	1.41		0.73
28	Do you honk when other drivers do something inappropriate?	3.53	1.31		0.72
27	Do you make rude gestures at other drivers when you do something that you don't like?	3.01	1.31		0.59
29	Do you overtake other vehicles using the right lane?	2.90	1.40		0.44

Table 3: Results of Principal Component Analysis PCA) for the PADI

PADI Item No.	Std. R.W.	Estimate	S.E.	C.R.	P-value	PADI Item No.	Std. R.W.	Estimate	S.E.	C.R.	P-value
10	0.81	1			<0.001	1	0.62	0.95	0.06	14.12	<0.001
5	0.81	1.12	0.08	14	<0.001	14	0.49	0.88	0.05	12.57	<0.001
8	0.8	1.05	0.07	15.12	<0.001	24	0.84	1.2	0.09	13.33	<0.001
4	0.8	1.08	0.09	12.22	<0.001	23	0.82	1.18	0.08	14.09	<0.001
13	0.77	1.04	0.08	13.34	<0.001	20	0.8	1.15	0.07	15.02	<0.001
9	0.77	1.1	0.07	14.82	<0.001	21	0.8	1.14	0.09	12.78	<0.001
11	0.77	1.06	0.08	13.78	<0.001	18	0.79	1.09	0.07	14.52	<0.001
7	0.76	1.07	0.07	15.08	<0.001	19	0.78	1.11	0.08	13.91	<0.001
6	0.75	1.02	0.07	14.57	<0.001	22	0.77	1.08	0.07	14.29	<0.001
3	0.75	1.09	0.09	12.11	<0.001	26	0.73	1.04	0.06	15.2	<0.001
2	0.74	1.05	0.08	13.64	<0.001	25	0.73	1.07	0.07	14.85	<0.001
17	0.74	1.08	0.07	14.25	<0.001	28	0.72	1.02	0.06	15.35	<0.001
12	0.71	0.98	0.07	13.24	<0.001	27	0.59	0.95	0.05	12.88	<0.001
16	0.69	1.02	0.06	12.71	<0.001	29	0.44	0.9	0.05	12.21	<0.001
15	0.68	1.06	0.08	13.9	<0.001						

Table 4: Confirmatory Factor Analysis

Fit Index	Initial Model Index	Final Model (After Covariance Adjustments)
Chi-square (χ^2)	788.95	525.65
CFI (Comparative Fit Index)	0.831	0.93
TLI (Tucker -Lewis Index)	0.829	0.92
RMSEA (Root Mean Square Error of Approximation)	0.05	0.04
P-value	<0.001	<0.001

Table 5: Fit Indices

Moreover, it is positively and significantly associated with altruism and has a mild association with propensity of aggression with no significance. On the other hand, aggressive driving behavior is positively and significantly associated with propensity to aggression and negatively associated with altruism. While considering the demographics, it is understood that female gender and age (18-30 years old) had a significant negative relationship with prosocial driving behavior but positive and significant relationship with aggressive driving behavior. The correlation analysis reveals that gender, age, education, and income influence driving behavior, with male and younger drivers exhibiting more aggression ($r=0.25$, $r=0.32$, $p<0.01$). Higher education promotes prosocial behavior ($r=0.14$, $p<0.01$), while higher income is linked to more aggression ($r=0.24$, $p=0.01$). Profession shows no significant correlation, suggesting it has minimal impact on driving tendencies. Riding experience (less than 4 years) has a high positive and significant correlation on aggressive driving behavior whereas with prosocial driving behavior, the relation is very feeble and insignificant. Monthly income (>Rs. 50000) has a negative and significant relationship with prosocial driving behavior but a positive and significant relationship with aggressive driving behavior. Among personality traits, altruism strongly promotes prosocial behavior ($r=0.25$, $p<0.01$), while personality traits, along with riding characteristics, are stronger predictors of driving behavior than socio-demographics.

3.5 Hierarchical Multiple Regression Analysis

This study employs Hierarchical Multiple Regression (HMR) modeling which is considered as a model framework rather than a statistical method to investigate the relationship between driving behavior (prosocial and aggressive) and person-

ality traits. HMR is a way to illustrate if independent variables of interest explain a statistically significant amount of variance of dependent variables after accounting for other variables. Two hierarchical regression models were obtained with prosocial driving behavior and aggressive driving behavior as dependent variables. Two hierarchical multiple regression analyses were performed with prosocial and aggressive driving behaviors as dependent variables. In each hierarchical regression analysis, the drivers' socio demographic characteristics, riding characteristics and personality traits are entered into model 1, 2 and 3 respectively. Overall, the significance level of prediction of demographic variables is comparatively lower than riding characteristics and personality traits. Demographic variables account for 15% and 5% respectively for aggressive and prosocial driving behavior, riding characteristics account for 20% and 11% respectively for aggressive and prosocial driving behavior and personality traits account for 33% and 19% respectively for aggressive and prosocial driving behavior. In general, gender and age marginally predicted prosocial and aggressive driving behavior (Table 5).

Drivers' income and educational qualification were found to be significant predictors of drivers' prosocial behavior to the extent that highly qualified drivers reported to have behavior prosocially whereas high income people are less prosocial on road. Also, among riding characteristics riding frequency was found to predict prosocial driver behavior with significance ($\beta = -0.23$, $p < 0.001$). As expected, altruism ($\beta = 0.30$, $p < 0.001$) significantly predicted prosocial behavior of driver. Profession was not a significant predictor of either prosocial or aggressive driving behaviour. As expected, altruism ($\beta = 0.30$, $p < 0.001$) significantly predicted prosocial behavior of driver. The predictors of aggressive driving behaviors were age ($\beta = 0.20$, $p < 0.001$) and education ($\beta =$

	Gender	Age	Profession	Education	Monthly Income	Rid_Exp	Rid_Freq	Altruism	Prop_Agres	Prosocial	Aggressive
Gender	1										
Age	0.35**	1									
Profession	0.09	0.52**	1								
Education	0.16**	0.21**	0.14**	1							
Monthly Income	0.14**	0.36**	0.32**	0.17**	1						
Rid_Exp	0.13**	0.67**	0.47**	0.19**	0.39**	1					
Rid_Freq	0.04	0.10*	0.11*	0.04	0.25**	0.21**	1				
Altruism	0.03	0.15**	0.08	0.06	0.17**	0.25**	0.18**	1			
Prop_Agres	-0.06	-0.05	-0.05	-0.01	0.13**	0.03	0.17**	0.26**	1		
Prosocial	-0.04	-0.01	0.04	0.14**	-0.12*	0.06	-0.19**	0.25**	-0.00	1	
Aggressive	0.25**	0.32**	0.156**	0.02	0.24**	-0.37**	0.17**	-0.35**	0.32**	0.09	1

Note: Prosocial = Prosocial driving behavior, Aggressive= aggressive driving behavior, Gend = Gender (females), Rid_exp = riding experience less four years, Rid_freq = riding frequency (work), prop_agress = propensity to aggression; **0.01 level; *0.05 level.

Table 6: Correlation Analysis between demographics, PADI and personality attributes.

-0.80, $p < 0.05$). Among riding characteristics, riding exposure was identified as a significant predictor of aggressive driving behavior with moderate loading ($\beta = -0.23$, $p < 0.001$) and among personal traits, both factors such as altruism and propensity to aggression were also found to be significantly predicting aggressive driving behavior. Altruism has received a standard loading of $\beta = -0.19$ with a p value less than 0.001 and propensity to aggression with a loading of $\beta = 0.27$ with p value less than 0.001.

4. DISCUSSION

People's behavior on the roads is reflected in the way they use their vehicles. In India, prosocial behaviors of aiding others and aggressive violations of traffic laws are frequent characteristics of driving behavior. The purpose of this study is to investigate the aggressive and prosocial driving practices among Indian drivers. This study will specifically investigate how socio-demographic characteristics, driving characteristics and personality traits affect drivers' driving conduct. The objectives of the study include validating the Personality and Driving Inventory (PADI) in an Indian setting and examining the connection between personality characteristics and driving habits. The investigation concluded that the Indian PADI version is credible and valid. The Indian PADI version showed good consistency and dependability with the original version. The Indian PADI has a reasonably high coefficient for internal consistency. When personality traits and PADI scores were correlated, it was discovered that prosocial driving behavior had a positive association with riding exposure and experience whereas aggressive driving behavior had a negative relationship. The scales for aggressive and prosocial driving behavior items produced findings that were logically at odds with one another, pointing to a poor correlation between them. The reliability and applicability of the Indian version of PADI to the Indian context were confirmed by the two variables, (unsafe) aggressive driving behaviour and (safe) prosocial driving behaviour that were recovered by exploratory factor analysis (EFA).

The relationship between drivers' personality qualities and their driving behavior was investigated using hierarchical regression and correlation studies. The study's findings are consistent with prior research and theoretical predictions, showing that tendency to aggression is negatively correlated with aggressive driving behavior while altruism is favorably correlated with prosocial driving behavior. Safe driving behaviors were found to be positively related with 'altruism' and negatively related to 'propensity to aggression' which is rational with the hypothesis and other study findings. Contrarily, unsafe driving behaviors were positively and significantly related to propensity to aggression and have significant negative relationship with altruism. A hierarchical regression analysis was conducted to ascertain the factors predicting Indian drivers' behavior on road. The results found that safe driving behaviors could be positively predicted by altruism and negatively predicted by propensity to aggression; whereas unsafe driving could be positively predicted by propensity aggression and negatively predicted by altruism which is compatible with the previous studies (Sullivan et al., 2011; Precht et al., 2017; Bryman and Cramer, 1999). The study results found a strong relation with prosocial driving behavior and altruism that indicates that an altruistic driver will illustrate more prosocial driving behaviors than other drivers. Altruism is a personality trait that defines an individual's cooperativeness, toleration, and kind heartiness (Eisenberg et al., 2007; Yang et al., 2013). Research highlights that altruism is positively and negatively related to prosocial and aggressive driving behavior respectively. Drivers who are altruistic in nature were less likely to drive in truculent manner even in provoking circumstances compared to less altruistic drivers (Shi and Zhang, 2017; Chandra and Mohan, 2018). Also, altruistic people are always willing to work for the benefit of other people and society, which comprehends prosocial behavior (Lajunen et al., 1998; Sullman, 2006). The study results found a significant negative relationship of altruism with aggressive driving behavior which is compatible with previous studies. Yang et al., (2013) found altruism is related to dangerous driving behavior and can also predict

		Gender	Age	Profession	Education	Monthly_Income	Rid_Exp	Rid_Freq	Altruism	Prop_Agress	F	R ²	Δf	ΔR
Model 1	Prosocial	Beta	-0.05	-0.03	0.09	0.18	-0.17				13.44	0.15	13.44	0.15
		t	-0.91	-0.4	1.5	3.5	-3.14							
		Sig.	0.36	0.68	0.13	0	0							
		Beta	-0.02	-0.15	0.07	0.17	-0.16	0.21	-0.20		13.89	0.2	12.95	0.05
		t	-0.4	-2.05	1.26	3.39	-2.84	3.03	-3.94					
		Sig.	0.68	0.04	0.2	0	0	0	0					
		Beta	-0.02	-0.15	0.08	0.16	-0.17	0.14	-0.23	0.3	21.15	0.33	37.36	0.13
		t	-0.44	-2.12	1.58	3.43	-3.31	2.14	-4.79	6.13				
		Sig.	0.65	0.03	0.11	0	0	0.03	0	0.69				
Model 2	Aggressive	Beta	0.15	0.23	-0.02	-0.07	0.15				4.44	0.05	4.44	0.05
		t	3.13	3.85	-0.36	-1.62	3.08							
		Sig.	0	0	0.71	0.1	0							
		Beta	0.19	0.06	-0.06	-0.08	0.09	-0.29	0.08		6.43	0.11	10.85	0.05
		t	3.87	0.92	-1.15	-1.88	1.76	4.43	1.8					
		Sig.	0	0.35	0.25	0.06	0.07	0	0.07					
		Beta	0.2	0.09	-0.02	-0.08	0.03	-0.23	0.02	-0.19	9.81	0.19	19.45	0.08
		t	4.52	1.44	-0.55	-2.04	0.75	-3.76	0.46	-4.4	6.14			
		Sig.	0	0.14	0.57	0.04	0.45	0	0.64	0	0			

Table 7: Hierarchical Multiple Regression Modelling for Prosocial and Aggressive.

ordinary violations. Shi and Zhang, (2017) studied the relationship between altruism and characteristics of aberrant driving. In day-to-day life, even though it is strenuous to alter an individual's personality, it is practicable to motivate drivers to be prosocially behave on roads in the way which altruistic drivers showcase. This gives way to the importance of giving training for defensive driving, which is essentially a manner of driving that undertakes safe driving strategies that is beyond the training practices of traffic procedures and law.

Propensity to aggression could significantly and positively predict aggressive driving behavior; inversely, it could negatively predict prosocial driving behavior which is rational with the study hypothesis. In the context of Indian road traffic, aggressive driving is often a response to highly unpredictable traffic conditions, inadequate infrastructure, and a mix of different road users, including pedestrians, cyclists, and slowing-moving vehicles. The absence of strict lane discipline, frequent encounters with reckless driving, and competition for road space in congested urban areas create an environment where drivers may feel pressured to adopt aggressive maneuvers to navigate efficiently.

Previous studies suggested that angry-prone drivers reported driving at very high-speed keeping less compliance with speed limit and have reduced control over driving leading collisions or near to collisions (Deffenbacher et al., 2002; Parker et al., 2002). Deffenbacher et al., (2002) found that high anger-prone drivers maintain less headways than low anger-prone drivers in non-provoking traffic simulations. Indian drivers were found to show a higher level of anger because of the traffic obstruction. However, in many studies, Indian drivers reported a low level of anger when compared to other countries (Sullman et al., 2007). And this showcases a high degree of disregard to enforcement and law. The score level difference in anger of Indian drivers with other European or Asian countries can be due to the difference in geographical context, traffic rules enforcement, etc. Riding characteristics such as riding experience and riding frequency were also found to predict the drivers' prosocial and aggressive behaviors. Less riding experience was found to strongly predict prosocial driving behavior than aggressive driving behavior with significance. This emphasizes the finding that novice drivers tend to show aggressive driving behavior than experienced. Similarly, the more the riding frequency, less chance of the driver to exhibit prosocial behavior. Results of the study are concord with previous studies conducted by various researchers (Deffenbacher et al., 2002; Fei et al., 2019) who found that experienced drivers were more likely to exhibit driving anger than novice drivers.

The present study has several applications which are significant among Indian drivers. Major applications include educational programs, driver training, license issuance, renewal criteria, road safety campaigns, targeted interventions for aggressive drivers, insurance premiums, designing traffic infrastructure, public policy, legislation and cross-cultural comparisons. The study found that prosocial driving practices are more prevalent in drivers who display high levels of altruism which suggests that driver education and training courses might include sections on cultivating empathy, showing consideration for other road users, and motivating prosocial driving behavior. The aim is to increase general road safety and decrease instances of aggressive driving by developing these traits. The targeted therapies for aggressive drivers can benefit from knowledge of the relationship between aggression and aggressive driving behavior. This helps individuals in controlling their emotions and lowering aggressive driving habits, these interventions can include stress reduction strategies, anger management classes, and counseling. Such programs promote the value of prosocial driving practices.

To raise awareness and promote safer driving habits, these programs may target particular demographics or high-risk groups. Present study results found that less experienced drivers are more likely to drive aggressively than experienced drivers. This data may be considered when establishing requirements for issuing or renewing driver's licenses. Further testing may be necessary for the inexperienced drivers to conform to the development of safer driving practices. The study findings also might affect how transportation infrastructure is created. For example, increasing the number of pedestrian crossings, bicycle lanes and traffic calming measures could encourage good deeds and reduce the probability of aggressive driving in particular locations. Also, while calculating insurance premiums, insurance companies may take personality factors into consideration. Drivers who have good scores on altruism may be deemed to have lesser risk that could result in cheaper rates; however, those who score highly on aggression may pay higher premiums to reflect the higher risk. The findings of the study can be considered by policymakers when creating new traffic laws and regulations. More effective regulations can be developed using research's insights into the elements that influence driving behavior to enhance safety. The study also emphasizes the significance of comparing driving behavior across cultures. Studying cultural influences help to create regulations and interventions that are more culturally appropriate and effective.

The findings of our study suggest that aggressive driving in India is influenced by a combination of personality traits and external stressors, which differs from Euro-American contexts. In the U.S. and Europe, aggressive driving behavior is largely linked to personality traits such as impulsivity, sensation-seeking, and hostility (Jonah, 1997; Deffenbacher et al., 2002). In contrast, Indian drivers exhibit aggressive driving behaviors primarily as an adaptive response to infrastructure challenges, heavy congestion, and lack of stringent enforcement (Nabi et al., 2005). Moreover, while previous studies in Euro-American context have found that higher-income drivers exhibit aggressive driving behavior due to better road etiquette and training, our study aligns with Indian research indicating that high-income groups are not necessarily less aggressive (Shen et al., 2018). The prevalence of aggressive driving among this group may be attributed to perceived social status, impatience, and expectations of priority on the road. Aggressive driving in India is caused by multiple interrelated factors. Firstly, infrastructural deficiencies, such as poor road conditions, lack of pedestrian facilities, and inadequate signage, create an environment where drivers must compete for limited space, leading to frustration and aggression. Secondly, high congestion levels, particularly in metropolitan cities, contribute to driver stress, making them more prone to risky and aggressive behavior (Sullman, 2006).

Cultural factors also play a crucial role. In many parts of India, non-compliance with traffic regulations is socially accepted, and traffic violations often go unpunished due to inconsistent enforcement (Nabi et al., 2005). Unlike in Western nations, where traffic laws are strictly enforced, Indian drivers often perceive aggressive maneuvers as necessary for efficient navigation rather than violations. Moreover, the hierarchical nature of Indian society influences driving behavior, where drivers of larger vehicles often assume dominance over smaller vehicles and pedestrian. Lastly, psychological factors such as driving stress, time pressure, and emotional regulation play a role. Research on Indian drivers has shown that aggressive behavior often from frustration due to external traffic conditions rather than inherent personality traits (Yang et al., 2013). This highlights the need for behavioral interventions focusing on stress management and defensive driving training.

The findings of the study provide crucial insights into road safety policies, driver education programs, and behavioral interventions. Given the influence of personality traits and socio-demographic, and behavioral interventions. Given the influence of personality traits and socio-demographic factors on driving behavior, targeted measures can help promote safer driving practices and reduce aggressive tendencies on the road. One effective approach is the implementation of therapeutic programs for problem drivers, such as Cognitive-Behavioral Therapy (CBT) and mindfulness training, which can help individuals manage impulsiveness, stress, and aggression while driving. Additionally, simulation-based training using virtual reality can enhance risk perception, decision-making, and emergency handling skills, making it a valuable addition to licensing programs. Moreover, telematics-based monitoring systems can be used to track real-time driving behavior, allowing for personalized feedback and encouraging responsible driving habits. Usage-based insurance models and GPS-based monitoring for commercial drivers can further promote adherence to traffic regulations. Specific interventions for high-risk groups, such as defensive driving courses for young and novice drivers, and stress management programs for professional drivers, can help cultivate safer driving behaviors. Public awareness campaigns through social media and community-driven initiatives can also play a significant role in discouraging aggressive driving behaviors like honking, reckless overtaking, and speeding. At policy level, stricter enforcement of traffic laws, psychological assessments in driver licensing, and periodic behavioral training programs can serve as long-term solutions to improving road safety. By integrating these evidence-based interventions, authorities and transportation agencies can foster a safer and more responsible driving culture, ultimately reducing road conflicts and accidents.

5. CONCLUSION

The study examines the complex interplay between prosocial and aggressive driving behavior among drivers in India. With the rapid increase in the number of vehicles and drivers on Indian roads, understanding the underlying factors that shape driving behavior is crucial for promoting road safety and reducing accidents. The study investigates the relationship between prosocial behavior (such as giving way to other drivers, helping stranded motorists, etc.) and aggressive behavior (such as honking, yelling, and engaging in risky maneuvers) in Indian drivers. Using questionnaire survey data, the study explores the factors that influence drivers' behavior, including demographic variables, driving experience, traffic conditions, and cultural factors. Drivers need to deal with various factors on roadways which affect their driving, however, certain of them are out of control. However, psychological factors can be mastered by the driver depending on the way he/she handles it. Findings of the study provide insight into personality and driving behaviors which are helpful in identifying the factors such as demographic, riding and psychological attributes contributing towards safe and unsafe driving behavior. This study's practical implications have the potential to improve road safety, reduce aggressive driving behavior, and promote prosocial behaviors among Indian drivers. By understanding the relationship between personality traits and driving behavior, policymakers and authorities can design targeted interventions and implement effective strategies to create safer road environments. Theoretical findings of this study explored Indian drivers' behavior along with the intercultural comparisons of driver behavior in traffic psychology. In the practical aspect, the findings of the study will be helpful for policy makers to recognize the menace

of driver behavior along with the importance of drivers to be prosocial on the road. And this highlights the need of developing a multiple dimension comprehensive, valid and reliable tool to measure driving behavior in Indian context. This study helps in dispensing supportive evidence to lead drivers towards more safe driving behaviors. Campaigns should be conducted to educate individuals on standing or adjusting skills, etiquettes on the road, and defensive driving practices. With blatantly flouted and stringent traffic rules in issuing driving licenses to no proper training given to novices, India faces a lot of challenges in terms of road safety leading to high number of accidents. Therefore, implementing and enforcing such defensive driving practices in India will help in bringing down the accident figures due to unsafe driving practices and help drivers to conquer negative psychological factors such as emotional stress, fatigue, road rage, etc.

The study has certain limitations based on the generalizability. First, the selection of cities and the availability of data on registered vehicles might have constrained the representation of some regions. Additionally, factors such as non-response bias and self-selection could have influenced the final sample. Future studies should consider other personality factors such as sensation seeking, hostility, locus of control, etc. The scope of the present study is only limited to the evaluation of driving behaviors measured in terms of self-reported questionnaires, therefore, additional sources like longitudinal follow-up studies, simulation studies, natural observation studies, etc. can be employed in future studies. Also, future research should explore the impact of other psychological variables on driving behavior to create a more comprehensive understanding of the psychological factors that influence driving behavior. This study aims to provide insights into prosocial and aggressive driving behavior among Indian drivers. By examining the role of psychological and socio-demographic factors, the study can contribute to the development of interventions that aim to promote safer driving behavior in India. It is expected that the findings of this study will be relevant not only to India but also to other countries that share similar driving patterns and cultural contexts. The findings of this study have important implications for policymakers, traffic safety experts, and other stakeholders involved in promoting safe driving behavior in India. By identifying the underlying factors that shape prosocial and aggressive driving behavior, this study provides insights into the development of targeted interventions and strategies to promote safe and responsible driving behavior on Indian roads. The present study findings confirm that neuroticism and extraversion are strong predictors of aggressive driving, while conscientiousness and agreeableness promote a safer driving behaviors. These insights align with global research on personality and driving but also emphasize the role of external stressors unique to the Indian context. Future research should explore how personality interacts with environmental stressors, cultural driving norms, and law enforcement practices to shape driving behavior. Incorporating personality-based training and psychological screening in driver education programs could be an effective strategy for reducing road aggression and improving overall traffic safety. Cross-cultural studies can provide a more comprehensive understanding of driving behavior and the influences of personality traits across diverse populations. Therefore, while the study's findings might offer valuable insights into the relationship between personality traits and driving behavior in the Indian context, their direct generalizability to other countries may be limited. Further research in different countries is necessary to establish the universality or context-specific nature of the identified relationships.

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