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RESEARCH ARTICLE

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Empathy, impulsiveness, and sensation seeking as mediators between primary psychopathic traits and driving behaviors in French driving offenders

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Abstract

Objective: The aim of this study was to examine the links between primary psychopathic traits and driving behavior on the one hand, and driving anger expression on the other hand, through the specific contribution of empathy, impulsiveness, and sensation seeking, in a sample of French driving offenders.

Methods: One thousand six hundred and eighty-six driving offenders completed a paper-and-pencil questionnaire during 110 drivers' rehabilitation programs.

Results: Primary psychopathic traits were positively associated with violations and aggressive driving anger expression, and negatively associated with prosocial driving behaviors. These associations were partially mediated by empathy, impulsiveness, and sensation seeking. In addition, the negative relation between primary psychopathic traits and adaptive anger expression was fully mediated by these three personal dispositions.

Conclusion: Low empathy, high impulsiveness and sensation seeking are important characteristics of driving offenders with high psychopathic traits. Our results provide a better understanding of French driving offenders' risky behaviors and the role of primary psychopathic traits.

KEYWORDS

driving offenders, empathy, impulsiveness, primary psychopathic traits, sensation seeking

1 | INTRODUCTION

Psychopathic traits are represented in a continuum of severity in the general population, ranging from the absence of such traits to high levels (Hare & Neumann, 2008). They are best conceptualized as a constellation of distinct albeit related affective (e.g., shallow affect, callousness), interpersonal (e.g., meanness, egocentricity, manipulation) and behavioral (e.g., boldness, fearlessness, disinhibition) dimensions (Sellbom & Drislane, 2020). Commonly accepted manifestations of psychopathic traits include difficulties to accept responsibility for one's own actions, low sensitivity to threat and punishment, high sensitivity to reward, and low-risk perception coupled with a tendency to take risks that violate normally accepted norms and values (Anderson et al., 2021; Hosker-Field et al., 2016; Salekin et al., 2014; Sellbom & Phillips, 2013).

There are many conceptualizations of psychopathic traits in the literature, but the present research focuses exclusively on primary psychopathic traits (Evans & Tully, 2016; Levenson et al., 1995; Patrick, 2010; Tsang et al., 2018). These traits refer to the affective and interpersonal style of the individual and are often considered as the core representation of the psychopathic constellation in nonclinical populations (Levenson et al., 1995; Salekin et al., 2014; Savard et al., 2014). Individuals with high levels of primary psychopathic traits are emotionally stable and can appear well adjusted, but they also tend to be callous and manipulative in their relationships and tend to pursue individual goals with little concern for other people in their environment (Sellbom & Drislane, 2020). Many self-report measures of psychopathy have emerged in the past few years. The Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995; Savard et al., 2005) is a highly used measure assessing two psychopathy subtypes: primary psychopathy which refers to individuals with low anxiety as well as interpersonal and affective deficits and secondary psychopathy which is associated with high anxiety, antisociality, and general behavior problems. Its two dimensions are thus primary traits (callous, egocentric, manipulative tendencies) and secondary psychopathic traits (antisocial tendencies, quick temperedness, lack of long-term goals). In the last decade, some authors suggested that the LSRP would be better conceptualized as a three-factor model, the primary scale being subdivided into egocentricity and callousness facets (Sellbom & Phillips, 2013). However, Salekin et al. (2014) showed that internal consistency, convergent and discriminant validity of the primary and secondary scales were better than those of the three-factor model, strengthening our decision to use the first scale of the LSRP to assess primary traits in the present study.

Some traits are often associated with individuals who have high primary psychopathic traits. First, empathy is a multidimensional construct and a fundamental process underpinning human interactions and is considered the hallmark of psychopathy (Campos et al., 2022; Eklund & Meranius, 2020). Numerous definitions of empathy exist to date (Hall & Schwartz, 2019). There is a consensus in the field that empathy is composed of two major components: cognitive empathy which refers to the ability to infer the mental states of others and emotional empathy as an individual's capacity to share others' emotions (Batson, 2011; Campos et al., 2022; Decety & Ickes, 2011; Spreng et al., 2009). Most researchers agree that individuals with high primary psychopathic traits tend to display interpersonal and affective deficits, especially in the form of reduced emotional and cognitive empathy (Maheux-Caron et al., 2018; Sellbom & Phillips, 2013; Turner et al., 2019; White, 2014). However, recent meta-analytical systematic reviews reveal that the magnitude of effect size vary extensively across studies (Burghart & Mier, 2022; Campos et al., 2022). Moreover, Kajonius and Björkman (2020) argue that empathy is not inherently absent in those with high psychopathic traits but rather that they seem to have a low inclination to use this ability. These results are also supported by studies that found that, in the general population, individuals with high affective/interpersonal psychopathic traits did not display deficits in emotion recognition (Seara-Cardoso et al., 2012), and that, among psychopathic offenders, deficits in empathic abilities could be erased by giving clear instructions to empathize with another individual (Arbuckle & Shane, 2017).

Impulsiveness and sensation seeking are personal dispositions that have also been studied in relation with psychopathic traits (Armstrong, Boisvert, Wells, & Lewis, 2020; Armstrong, Boisvert, Wells, Lewis, et al., 2020; Gray et al., 2019; Van Dongen et al., 2021). Impulsiveness is a multidimensional construct which predicts behaviors that appear to be ill-considered, inconsiderably risky, inappropriate to the context, and often result in negative consequences (Billieux et al., 2012), while sensation seeking can be defined as the need to seek new, intense, and

varied sensations and experiences, and the willingness to take risks (physical, financial, social, etc.,) to obtain such sensations (Zuckerman & Neeb, 1979). These two dispositions are often considered as important features of individuals with high secondary psychopathic traits whose behaviors are often marked by disinhibition and lack of self-control (Maheux-Caron et al., 2018; Savard et al., 2014; Sellbom & Drislane, 2020). However, results regarding primary psychopathic traits are more heterogenous depending on study samples. For example, associations between impulsiveness, sensation seeking, and psychopathic traits appear somewhat stronger in community samples than in forensic samples (Weidacker et al., 2017). Moreover, in a sample of prisoners, primary psychopathic traits were not significantly related to most impulsiveness facets and sensation seeking (Gray et al., 2019), while, in community samples, authors found positive associations between these constructs (Armstrong, Boisvert, Wells, & Lewis, 2020; Maheux-Caron et al., 2018).

In the last decade, psychopathic traits have received increasing attention in the context of driving as they have been found to be positive predictors of aggressive and risky driving behaviors, and driving anger expression (Ball et al., 2018; Burtăverde et al., 2016; Monteiro et al., 2018; Panayiotou, 2015; Salekin et al., 2014). However, it is unclear how primary psychopathic traits specifically influence driving behaviors, especially in high-risk populations such as driving offenders. In previous research, these drivers have been found to be more sensitive to reward, to perceive less risk in recreational activities, to have angrier and less cautious driving styles, higher levels of aggressiveness and sensation seeking, and to be involved in serious car crashes more often than nonoffending drivers (Martí-Belda et al., 2019; Padilla et al., 2018). Moreover, Watson et al. (2015) showed that high-range speeding offenders (who had been fined at least twice for exceeding the speed limit by more than 30 km/h) were more likely to have a criminal history, to commit other driving offenses, and to be involved in serious car crashes, than other drivers.

In France, like in most European countries, driver's licenses are regulated by the demerit point system (French Road Safety Observatory, 2020). Experienced French drivers have 12 points on their licenses while probationary drivers start with 6 points and gain 2 points each year if they do not commit driving offenses. Drivers can be disqualified if they lose all their license points. Once a year, offending drivers can participate in a rehabilitation program aimed at raising awareness of the dangers associated with violating driving rules and laws. They can register voluntarily, to recover four license points, or they can be legally required to do so. Mandatory participation can occur when young drivers get at least three demerit points during the probationary period, or when drivers are sanctioned for serious offenses (driving under the influence of drugs or alcohol [DUI], causing serious injuries by careless driving, etc.,). Rehabilitation programs last for 2 consecutive days and are conducted by two instructors: a psychologist and a specialized driving trainer. Between 340,000 and 380,000 French driving offenders participated in such programs every year from 2010 to 2019 (French Road Safety Observatory, 2020). The participants in the rehabilitation programs tend to have more difficulties in accepting responsibility for their actions, be more impulsive, have higher levels of sensation-seeking, and report higher numbers of road-traffic crashes than regular drivers (Nallet et al., 2010; Weber et al., 2014).

The main objective of the current study is to examine the associations between primary psychopathic traits and driving behaviors (both dangerous and prosocial) on the one hand and driving anger expression (both aggressive and adaptive) on the other hand in a sample of French driving offenders participating in a rehabilitation program. The second aim is to explore the specific contribution of empathy, impulsiveness, and sensation seeking in these associations.

1.1 | Violations

Violations are voluntary deviations from the highway code and are associated with a higher risk of road-traffic crashes (Reason et al., 1990; de Winter et al., 2015). Although no available published research has studied the specific links between primary psychopathic traits and these behaviors, authors found psychopathic traits, assessed as a single factor, to be positive predictor of risky driving and violations (Monteiro et al., 2018; Salekin et al., 2014).

Moreover, higher levels of empathy have been found to be associated with fewer violations (Nordfjærn & Şimşekoğlu, 2014) and with less tendency to take risks while driving (Baran et al., 2021). On the contrary, impulsiveness and sensation seeking are positive predictors of aberrant driving behaviors (Delhomme et al., 2012; Navas et al., 2019; Zhang et al., 2019). In the current study, we expect primary psychopathic traits to be positive predictors of violations through the contribution of low empathy and high impulsiveness and sensation seeking (H1).

1.2 | Prosocial driving behaviors (PDB)

Prosocial Driving Behaviors (PDB) are positive behaviors that aim to facilitate traffic fluidity and promote safety for all road users (Özkan & Lajunen, 2005). Drivers' empathy has been linked to an increase in such behaviors (Karras et al., 2020), while impulsiveness and sensation seeking have both been associated with their decrease (Bıçaksız & Özkan, 2016a, 2016b). To the best of our knowledge, no published study has explored the links between primary psychopathic traits and PDB. In 2014, however, White found empathy to partially mediate the negative associations between primary psychopathic traits (measured by the LSRP) and anonymous prosocial behaviors in general. In the current study, we expect primary psychopathic traits to be negative predictors of PDB through the contribution of low empathy and high impulsiveness and sensation seeking (H2).

1.3 | Driving anger expression

Psychopathic traits, impulsiveness and sensation seeking have all been found to be positive predictors of the tendency to feel anger while driving and to express this anger in an aggressive manner (verbally, physically, or through the use of the vehicle) (Ball et al., 2018; Berdoulat et al., 2018; Olandoski et al., 2019). Psychopathic traits tend to decrease drivers' ability to express their anger in a constructive and adaptive way (through anger management strategies) (Burtăverde et al., 2016). Furthermore, although no published study has examined the links between empathy and driving anger expression specifically, authors found that cognitive empathy was negatively associated with the tendency to feel anger and to express it aggressively, and positively associated with the ability to inhibit negative anger expressions in social settings (Day et al., 2012; Mohr et al., 2007). In the current study, we expect primary psychopathic traits to be positive predictors of aggressive driving anger expression (H3) and negative predictors of adaptive driving anger expression (H4) through the contribution of low empathy and high impulsiveness and sensation seeking.

2 | METHODS

2.1 | Procedure

The present study was conducted in compliance with the ethical standards of the French Society of Psychology and was systematically monitored for compliance with the ethical guidelines of Paris-Nanterre University.

Driving offenders were recruited between April and August 2019 within 110 drivers' rehabilitation programs in seven Metropolitan France regions. Participants were presented the purpose of the study by one of the two instructors during the first day of the program. They also received a written description of the study and signed a consent form following the APA guidelines. Participation in the study was voluntary and anonymity and confidentiality were ensured. Participants completed a paper-and-pencil questionnaire (25 min on average). Of the

1853 offending drivers approached through these programs, 167 declined to participate or did not fully complete the questionnaire (91% participation rate).

2.2 | Participants

The final sample consisted of 1686 offending drivers (22.4% female) ranging from 18 to 87-years-old ($M = 39.95$, SD = 15.19). Half of the participants had at least 2 years of higher education (50.4%); the others declared having obtained a high school degree (18.7%) or not having completed high school (30.9%). Most of the drivers (53.4%) indicated working full-time jobs, 21.7% were self-employed, 7.6% were retired, 7.5% were students, 6.6% were unemployed, and 3.3% had part-time jobs. Most participants were married or living maritally (50.3%).

Most of the included drivers were participating in a drivers' rehabilitation program for the first time (58%), but for 17.5% of them it was at least the third program since obtaining their driver's license. Participation in the current program was voluntary (81.4%), mandatory through probationary license (13.8%) or court-ordered (4.8%). On average, participants had had their driver's license for 20.12 years (SD = 15.16), had driven 34,817 kilometers per year (SD = 32,496), had gotten between 0 and 32 demerit points on their license in the 3 years before the study ($M = 7.27$, SD = 3.44), and 29% of them had been involved in at least one road-traffic crash in the same period (damage only or with injury). The current driver's license was not the first one for 10% of the driving offenders. Moreover, 30% of the final sample had had their driver's license suspended at least once since first obtaining it, and 14.5% had driven without a valid license. Participants had been sanctioned for various offenses: exceeding the speed limit by less than 20 km/h (64.1% of the total sample), using their mobile phone while driving (24.1%), failing to stop at a red light (23%), exceeding the speed limit by 20 to 39 km/h (21.1%), drunk driving (13.5%), exceeding the speed limit by 40 km/h or more (8.8%), failing to comply with a stop sign (6.8%), crossing a white line (5.5%), not wearing a seatbelt (5.4%), driving while under the influence of cannabis (2.6%) and not complying with other priority regulations (1.5%).

2.3 | Measures

Levenson Self-Report Psychopathy Scale (LSRP, Levenson et al., 1995; French adaptation: Savard et al., 2014). The 16 items of the first scale of the LSRP assess primary psychopathic traits and are rated on a 4-point Likert scale ranging from one (*strongly disagree*) to four (*strongly agree*). It is a reliable scale with good convergent and discriminant validity (Salekin et al., 2014) that performs well at distinguishing among individuals with varying levels of primary psychopathic traits (Tsang et al., 2018). Internal consistency was good (Cronbach's $\alpha = 0.81$) in the current study as well as in the French validation study on a community sample ($\alpha = 0.78$) (Savard et al., 2014).

Short-French Toronto Empathy Questionnaire (Short-FTEQ, Karras et al., 2020) is the French adaptation of the Toronto Empathy Questionnaire (TEQ, Spreng et al., 2009). Although the Short-FTEQ did not allow us to retain the same unifactorial structure of general empathy as the original TEQ, it is a short reliable scale that can be used to assess the emotional aspect of empathy with items such as "I enjoy making other people feel better" or "it upsets me to see someone being treated disrespectfully." The Short-FTEQ is composed of six items rated from one (*never*) to five (*always*). Cronbach's α is 0.72 in the current study and was 0.77 in the adaptation study in a sample of French drivers (Karras et al., 2020).

Interpersonal Reactivity Index (IRI), Perspective Taking Scale (Davis, 1983). The French version of the IRI (Gilet et al., 2013) was used to assess cognitive empathy (perspective taking, PT) with seven items. This self-report scale is rated on a 7-point Likert scale ranging from one (*this statement does not describe me at all*) to seven (*this statement describes me perfectly*). Internal consistency was acceptable ($\alpha = 0.66$) in the current study as well as in the original French validation study ($\alpha = 0.71$).

Short Form of the UPPS-P Impulsive Behavior Scale (Billieux et al., 2012). This short impulsiveness scale was derived from the original 59-item UPPS-P scale (Cyders & Smith, 2008; Whiteside & Lynam, 2001). It is composed of 20 items rated on a Likert scale ranging from one (*I completely agree*) to four (*I completely disagree*). Only three four-item subscales were used in the current study: positive urgency (the tendency to act impulsively while experiencing positive emotions, $\alpha = 0.70$), negative urgency (the tendency to act impulsively while experiencing negative emotions, $\alpha = 0.75$), and lack of premeditation (the tendency to act without considering the possible negative consequences of one's behavior, $\alpha = 0.73$). A total impulsiveness score resulting from the sum of the three subscales was also used in our analyses ($\alpha = 0.81$).

Driving-Related Sensation Seeking Scale (DRSS, Taubman et al., 1996; French adaptation: Delhomme et al., 2009). The unifactorial DRSS was used to assess sensation seeking while driving with seven items rated on a Likert scale ranging from one (*completely disagree*) to five (*completely agree*). Cronbach's α of the scale was 0.77 which is higher than in the French adaptation study ($\alpha = 0.68$, Delhomme et al., 2009).

Driver Behavior Questionnaire-Transgressions (DBQT, Lawton et al., 1997; French adaptation: Villieux & Delhomme, 2008). Participants were asked how often they engage in traffic violations. The 12 items of the DBQT are rated on a Likert scale ranging from one (*never*) to five (*very often*), and provide a total violation score as well as a "fast driving" score (five items), an "anger/hostility" score (three items), and a "transgressions to maintain progress" score (four items). In the current study, the third scale failed to reach acceptable internal consistency ($\alpha = 0.51$) and was therefore removed from statistical analyses. The Cronbach's α were 0.83 for the total score, 0.72 for fast driving, and 0.73 for anger/hostility. In the original French adaptation, alphas ranged from 0.69 to 0.86 (Villieux & Delhomme, 2008).

Positive Driver Behaviors Scale (PDBS, Özkan & Lajunen, 2005). To assess PDB, the PDBS was translated into French for the current study. This scale is comprised of 13 items designed to assess how often drivers engage in behaviors that promote the safety and well-being of all road users. The scale is rated on a 6-point Likert scale ranging from one (*never*) to six (*very often*) and showed good internal consistency ($\alpha = 0.82$ in the current study and 0.84 for the original scale).

Driving Anger Expression Inventory-Short Form (DAXI, Stephens & Sullman, 2014; French adaptation: Villieux & Delhomme, 2008, 2010). The DAXI was used to assess how often participants tend to express their anger in an aggressive manner (through verbal or physical aggression, or through their vehicles, e.g., by driving faster or very close to the other driver's bumper), or in a constructive and adaptive manner. The DAXI-aggressive subscale comprises 10 items ($\alpha = 0.83$) and the DAXI-adaptive subscale comprises five items ($\alpha = 0.83$). All items are rated on a 4-point Likert scale ranging from one (*almost never*) to four (*almost always*).

The sociodemographic variables were gathered. They included age, gender, education, marital status, driven annual kilometers, and years since obtaining the driver's license. Participants indicated if they had been involved in car crashes in the last 3 years, and how many demerit points they had gotten in the same period. Finally, they were asked if they had previously completed other rehabilitation programs, if they had had their license suspended or disqualified in the past, and if they had kept driving during suspension or disqualification.

2.4 | Data analyses

Less than 2% of the data were missing. Cases with missing values were deleted listwise for each specific analysis. Using SPSS 23.0 software, correlations were first computed to establish associations between the study variables and rule out multicollinearity. To test our hypotheses, multiple regression analyses of total and direct effects of primary psychopathic traits and bootstrapped 95% confidence intervals (CIs) of the indirect effect (through empathy, impulsiveness, and sensation seeking) were computed using the PROCESS macro in SPSS (Hayes et al., 2017) with 5000 bootstrapped samples. CIs that do not contain zero indicate a significant indirect effect (mediation). To test for unique associations between our target variables, gender, age, and annual kilometers were included as covariates.

3 | RESULTS

3.1 | Descriptive statistics

Internal consistency coefficients, means, and standard deviations for all continuous variables are reported in Table 1. The normality assumption was checked for all variables: skewness and kurtosis coefficients were within the recommended interval of (−2:+2) (Gravetter et al., 2020). Student's *t*-test was computed to compare men's and women's scores.

Women scored higher than men in emotional and cognitive empathy, and impulsiveness, while men reported higher levels of primary psychopathic traits, DRSS, and violations.

3.2 | Correlation analyses

Pearson's correlations between study variables are presented in Table 2. As expected, primary psychopathic traits were negatively correlated with empathy, both emotional and cognitive, PDB and adaptive expression of driving anger. Moreover, they were positively correlated with all impulsiveness dimensions, DRSS, all forms of traffic violations, and a tendency to aggressively express driving anger.

TABLE 1 Study variables' mean scores (SD in parentheses) and comparison between men and women

	Cronbach's α	$N = 1686$	Male $n = 1308$	Female $n = 378$	Cohen's d
Age		39.95 (15.19)	39.92 (15.05)	40.04 (15.68)	-
Short-FTEQ[a]	0.73	23.70 (3.70)	23.32 (3.72)	25.01 (3.31)	0.46
IRI-perspective taking[a]	0.66	33.25 (7.05)	32.92 (7.07)	34.40 (6.85)	0.21
LSRP[a]	0.81	33.74 (7.21)	34.56 (7.20)	30.92 (6.50)	0.51
UPPS-total[a]	0.81	27.55 (5.66)	27.30 (5.46)	28.44 (6.25)	0.20
UPPS-negative urgency[a]	0.75	9.42 (2.69)	9.34 (2.64)	9.72 (2.84)	0.14
UPPS-positive urgency[a]	0.70	10.18 (2.43)	10.05 (2.38)	10.62 (2.59)	0.24
UPPS-premeditation	0.73	7.95 (2.36)	7.91 (2.37)	8.10 (2.32)	-
DRSS[a]	0.77	18.49 (6.10)	19.01 (5.95)	16.68 (6.26)	0.38
DBQT-total[a]	0.83	26.02 (7.61)	26.38 (7.77)	24.78 (6.89)	0.21
DBQT-fast driving[a]	0.72	12.58 (3.99)	12.75 (4.03)	11.99 (3.79)	0.19
DBQT-anger/hostility	0.73	6.39 (2.58)	6.44 (2.61)	6.23 (2.46)	-
PDBS	0.82	60.51 (9.76)	60.41 (9.63)	60.86 (10.19)	-
DAXI-aggressive	0.83	16.56 (5.09)	16.59 (5.24)	16.44 (4.53)	-
DAXI-adaptive	0.83	12.73 (3.66)	12.81 (3.68)	12.43 (3.57)	-

Abbreviations: DAXI, Driving Anger Expression Inventory; DBQT, Driving Behavior Questionnaire-Transgressions; DRSS, Driving-Related Sensation Seeking; IRI, Interpersonal Reactivity Index; LSRP, Levenson Self-Report Psychopathy; PDBS; Positive Driver Behavior Scale; SD, standard deviation; Short-FTEQ, French Toronto Empathy Questionnaire-Short Form; UPPS, UPPS impulsive behavior scale.

[a]Significant difference between men and women ($p < 0.05$).

TABLE 2 Pearson's correlations between study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	-													
2. Short-FTEQ	0.08*	-												
3. IRI-perspective taking	0.06*	0.40*	-											
4. LSRP	−0.21*	−0.41*	−0.35*	-										
5. UPPS-total	−0.19*	−0.05*	−0.27*	0.29*	-									
6. UPPS-negtavie urgency	−0.16*	−0.01	−0.23*	0.20*	0.85*	-								
7. UPPS-positive urgency	−0.18*	−0.02	−0.16*	0.23*	0.79*	0.60*	-							
8. UPPS-premeditation	−0.09*	−0.09*	−0.22*	0.22*	0.62*	0.28*	0.18*	-						
9. DRSS	−0.37*	−0.15*	−0.12*	0.29*	0.23*	0.15*	0.23*	0.14*	-					
10. DBQT-total	−0.35*	−0.16*	−0.21*	0.30*	0.28*	0.22*	0.24*	0.18*	0.54*	-				
11. DBQT-fast driving	−0.32*	−0.14*	−0.16*	0.23*	0.21*	0.14*	0.19*	0.14*	0.53*	0.90*	-			
12. DBQT-anger/hostility	−0.29*	−0.11*	−0.21*	0.28*	0.28*	0.26*	0.22*	0.16*	0.38*	0.75*	0.48*	-		
13. PDBS	0.32*	0.36*	0.34*	−0.38*	−0.29*	−0.24*	−0.21*	−0.22*	−0.28*	−0.44*	−0.34*	−0.41*	-	
14. DAXI-aggressive	−0.34*	−0.16*	−0.22*	0.27*	0.29*	24*	0.24*	0.16*	0.48*	0.71*	0.56*	0.71*	−0.40*	
15. DAXI-adaptive	0.23*	0.19*	0.28*	−0.24*	−0.31*	−0.27*	−0.20*	−0.18*	−0.26*	−0.33*	−0.24*	−0.39*	0.35*	−0.45*

Abbreviations: DAXI, Driving Anger Expression Inventory; DBQT, Driving Behavior Questionnaire-Transgressions; DRSS, Driving-Related Sensation Seeking; IRI, Interpersonal Reactivity Index; LSRP, Levenson Self-Report Psychopathy; PDBS; Positive Driver Behavior Scale; Short-FTEQ, French Toronto Empathy Questionnaire-Short Form; UPPS, UPPS impulsive behavior scale.

*$p < 0.05$.

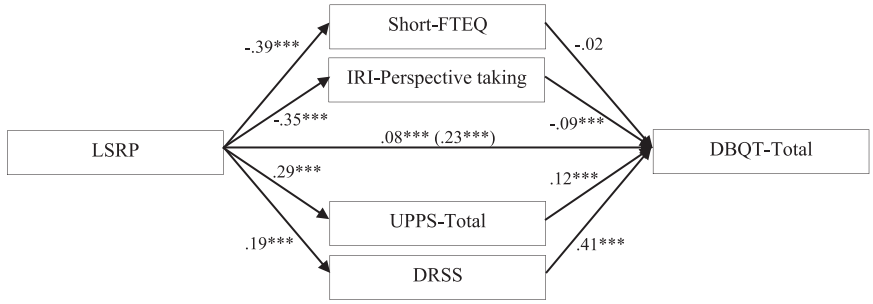

FIGURE 1 Results of the mediation analyses on the associations between primary psychopathic traits and driving behaviors. Standardized regression coefficients are reported, with the total effect of primary psychopathic traits on driving behaviors presented in parentheses. DBQT, Driving Behavior Questionnaire-Transgressions; DRSS, Driving-Related Sensation Seeking; IRI, Interpersonal Reactivity Index; LSRP, Levenson Self-Report Psychopathy; Short-FTEQ, French Toronto Empathy Questionnaire-Short Form; PDBS, Positive Driver Behavior Scale; UPPS, UPPS impulsive behavior scale. ***$p < 0.001$.

3.3 | Mediation by regression

To examine the direct and indirect effects of primary psychopathic traits on driving behaviors, we conducted two mediation analyses (Figure 1) with violations (DBQT total score) and Prosocial Driving Behaviors (PDBS score) entered as dependent variables. Age, gender, and annual kilometers were entered as covariates. Since annual kilometers reported by the participants were not normally distributed, they were divided into four categories: low annual kilometers (150–15,500 km driven each year, 27% of the sample), middle low (16,000–25,000 km, 23.8% of the sample), middle high (26,000–42,000 km, 24.2% of the sample), and high annual kilometers (45,000–450,000 km, 25% of the sample). These categories were used in the following analyses.

Consistent with predictions, regression analyses revealed that primary psychopathic traits predicted more violations and fewer PDB. They also predicted lower emotional and cognitive empathy as well as higher levels of impulsiveness and DRSS. Cognitive empathy predicted fewer violations and more PDB, while impulsiveness and DRSS predicted more violations and fewer PDB. Emotional empathy only significantly predicted more prosocial behaviors. After controlling for the effect of cognitive and emotional empathy, impulsiveness, and DRSS, primary psychopathic traits still predicted violations and PDB, indicating a partial mediation effect. There was an indirect effect of primary psychopathic traits on violations ($b = 0.148$, 95% CI [0.113, 0.184]) through cognitive empathy, impulsiveness, and DRSS. There was also an indirect effect of primary psychopathic traits on PDB ($b = -0.198$, 95% CI [−0.233, −0.166]) through both emotional and cognitive empathy, impulsiveness, and DRSS.

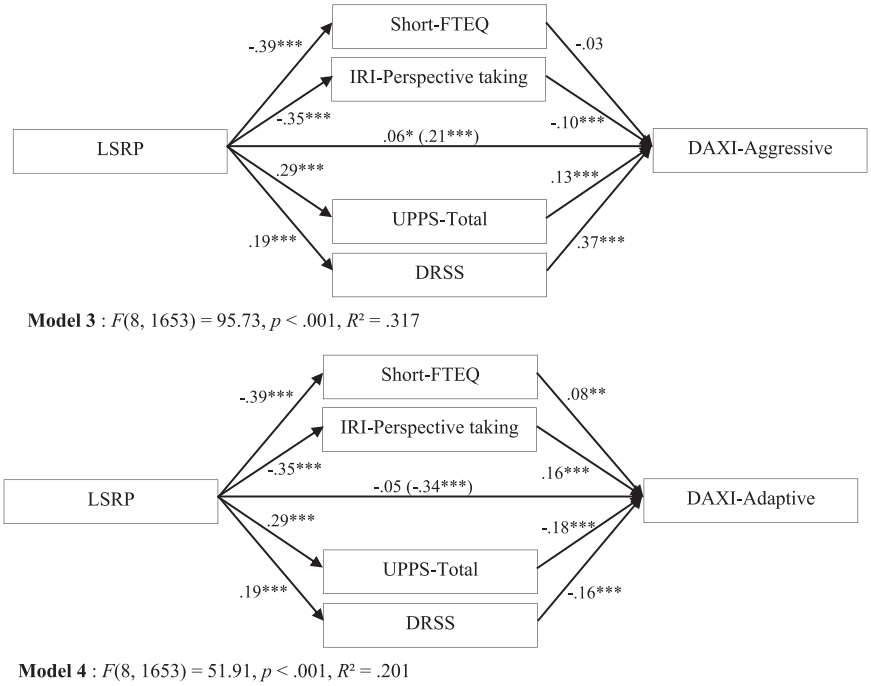

FIGURE 2 Results of the mediation analyses on the associations between primary psychopathic traits and driving anger expression. Standardized regression coefficients are reported, with the total effect of primary psychopathic traits on driving anger expression presented in parentheses. DAXI, Driving Anger Expression Inventory; DRSS, Driving-Related Sensation Seeking; IRI, Interpersonal Reactivity Index; LSRP, Levenson Self-Report Psychopathy; Short-FTEQ, French Toronto Empathy Questionnaire-Short Form; UPPS, UPPS impulsive behavior scale. $^{**}p < 0.01$, $^{***}p < 0.001$.

Two other mediation models were computed to further examine the direct and indirect effects of primary psychopathic traits on driving anger expression (Figure 2). Consistent with predictions, regression analyses revealed that primary psychopathic traits predicted more aggressive anger expression and less adaptive anger expression. Cognitive empathy predicted less aggressive and more adaptive anger expression, while impulsiveness and DRSS predicted more aggressive and less adaptive anger expression. Emotional empathy only predicted more adaptive expression of anger. After controlling for the effect of cognitive and emotional empathy, impulsiveness, and DRSS, primary psychopathic traits still predicted more aggressive driving anger expression (Model 3), indicating a partial mediation effect. However, they no longer predicted adaptive anger expression (Model 4), indicating a full mediation effect. There was an indirect effect, through cognitive empathy, impulsiveness, and DRSS, of primary psychopathic traits on aggressive expression of driving anger ($b = 0.154$, 95% CI [0.120, 0.185]), and on the adaptive expression of driving anger, with the additional contribution of emotional empathy ($b = -0.171$, 95% CI [−0.203, −0.138]).

4 | DISCUSSION

The aim of this study was to examine the relationships between primary psychopathic traits and driving behaviors (violations and PDB) on the one hand and driving anger expression (aggressive and adaptive) on the other hand, in a population of French driving offenders. The second objective was to investigate the specific contribution of personal dispositions commonly associated with primary psychopathic traits to these relationships (low empathy, high impulsiveness, and sensation seeking).

The results provide support for the proposition that primary psychopathic traits predict violations, PDB, and aggressive as well as adaptive driving anger expression in driving offenders, even after controlling for gender, age, and annual kilometers. These results are consistent with other studies that found psychopathic traits to be associated with more aggressive and risky driving behaviors (Monteiro et al., 2018), and a tendency to express anger more aggressively and less adaptively while driving (Burtăverde et al., 2016). Furthermore, our results show that, among driving offenders, primary psychopathic traits predict lower emotional and cognitive empathy, and higher impulsiveness, and DRSS. Previous studies include inconsistent findings regarding these associations. For example, some authors found, as in the present study, negative associations between psychopathic traits and both empathy components (Jonason & Kroll, 2015; Sellbom & Phillips, 2013), while others found that cognitive empathy was not significantly associated with psychopathic traits (Pajevic et al., 2018; Turner et al., 2019). These traits were also found to be positive predictors of impulsiveness and sensation seeking in some studies (van Dongen et al., 2021; Sellbom & Phillips, 2013; Weidacker et al., 2017) but not in others (Anderson et al., 2021; Gray et al., 2019). A possible explanation for these inconsistencies could be the lack of convergence between theoretical conceptualizations of psychopathic traits, measures (self-reported scales or clinician-rated measures), and research populations (students, community samples, offenders, etc.,) across studies (Burghart & Mier, 2022; Campos et al., 2022; Sellbom & Drislane, 2020). Indeed, in the present study, we adopted a two-factor conceptualization of psychopathic traits and focused on the primary component which refers to the affective and interpersonal style of individuals and is often considered the core representation of these personality traits (Salekin et al., 2014; Savard et al., 2014). However, there are different models of psychopathic traits that could be included in future research to confirm and extend our results.

Mediation analyses showed three main results. First, there are partial mediations between primary psychopathic traits and violations, on the one hand, and aggressive driving anger expression, on the other hand, through cognitive empathy, impulsiveness, and DRSS. Second, there is a partial mediation between primary psychopathic traits and PDB through the added contribution of emotional empathy. Third, there is a total mediation between primary psychopathic traits and adaptive driving anger expression through all four personal dispositions. These findings converge with those of other research where self-centeredness, lack of concern for others, impulsiveness, and the psychopathic trait of fearlessness were associated with intentional violations (Panayiotou, 2015), and where psychopathic traits predicted angry driving through impulsiveness and aggressiveness (Ball et al., 2018). Moreover, these results are consistent with those of Karras et al. (2020) which showed that, among drivers in general, cognitive empathy predicts fewer violations, and both emotional and cognitive empathy predict more PDB. In the general population, White (2014) also found that primary psychopathic traits were negatively associated with anonymous prosocial behaviors (positive behaviors displayed when nobody is watching), but positively associated with public prosocial behaviors (when other people are watching), and that empathy mediated these associations. On the road, even though drivers must share a public space with other users, they are often alone and isolated in their vehicles which can lead to feelings of impunity and anonymity. Future research could investigate the influence of passengers on the PDB of driving offenders with high psychopathic traits.

Impulsiveness and sensation seeking are well-known predictors of speeding (Sârbescu & Rusu, 2021) and French driving offenders who participated in three or more driver's rehabilitation programs within 5 years were found to be impulsive and have a high tendency towards sensation seeking (Weber et al., 2014). Sensation seeking increases aggressive anger expression, road-traffic crashes (Delhomme et al., 2012; Olandoski et al., 2019), and violations (de Winter et al., 2018), and is positively correlated with ticketed offenses (Zhang et al., 2019), while impulsiveness seems to predict more violations (Bıçaksız & Özkan, 2016b), aggressive driving, and speeding (Berdoulat et al., 2018). Driving entails many interactions with other road users and can generate strong negative emotions (stress, fear, anxiety, anger, etc.,). Impulsive individuals tend to react without thinking when they feel such emotions. Therefore, for impulsive drivers, risky driving could be a way to soothe feelings that can be otherwise difficult to process. Another component of impulsiveness is the lack of premeditation. This could also play a part in risk-taking as drivers might have difficulties planning their actions even before entering their vehicles. For example, leaving late for an important appointment could lead to speeding. Identically, failing to develop strategies before drinking alcohol (making sleeping arrangements or planning for

someone else to take them home afterwards, etc.,) could lead to make the decision to drive even when above the legal alcohol limit. Indeed, Navas et al. (2019) found that lack of premeditation increased the risk of being arrested for DUI.

The aim of this study was to identify primary psychopathic traits among offending drivers participating in rehabilitation programs and not to diagnose psychopathic personality disorders. Interestingly, the present findings suggest that having elevated primary psychopathic traits as well as reduced empathic tendencies, high impulsiveness, and high DRSS, can increase driving offenders' risk for dangerous driving outcomes. Individuals with high primary psychopathic traits are often described as apparently well adjusted, with good emotional stability and stress resistance (Sellbom & Drislane, 2020). However, it seems plausible that a psychopathic interpersonal style, even in a mild form, could be situationally amplified and have negative consequences (Levenson et al., 1995). In a driving context where the majority of violations go undetected by law enforcement, and road-traffic crashes are rare events (de Winter et al., 2015), violations might reflect a motivational pattern underpinned by short-term sensation seeking and impulsiveness, and lack of fear for potential negative long-term outcomes. Drivers with high primary psychopathic traits and lower empathic tendencies might thus be less likely to respond positively to safety campaigns designed to raise awareness of the consequences of breaking traffic rules for themselves and others. Road safety interventions should therefore take into account the characteristics and specific needs of this type of population. Driver's rehabilitation programs' instructors could be better trained to recognize participants' personal dispositions and adapt their intervention methods accordingly. Moreover, such programs rely entirely on group dynamics and interactions between participants. In this context, drivers with high primary psychopathic traits can be difficult to manage. Consideration could be given to including these participants in smaller groups than is currently practiced or, better yet, to offering individual counseling with trained psychologists. Finally, rehabilitation programs might benefit from implementing strategies that aim at developing impulse control and adaptive emotion regulation skills in offending drivers.

A strength of the present study is the inclusion of a large sample of offending drivers recruited in different areas around France. However, it also presents some limitations. One is its cross-sectional design that does not allow grasping causal relations between variables. Another limitation of this study might be that it relies on self-reported information. In the field of driving behaviors research, the use of self-reported scales is common, and studies have shown that they are not very sensitive to social desirability bias (Lajunen & Summala, 2003; Sullman & Taylor, 2010). Concerns about self-report of primary psychopathic traits could be raised because manipulation and deceitfulness are construed as core features of individuals with high psychopathic traits. However, studies examining the relations between the LSRP and social desirable responding found that they were mildly negatively associated (Garofalo et al., 2019; Maheux-Caron et al., 2018; Ray et al., 2013). The present study is the first to examine the links between primary psychopathic traits and driving behaviors through the contribution of personal dispositions in driving offenders. Further research is necessary to complete and confirm these results and could include other variables relevant to both psychopathic traits and risky driving such as substance abuse, sensitivity to reward and to punishment.

In conclusion, exploring primary psychopathic traits through the specific contribution of empathy, impulsiveness, and sensation seeking provides an interesting theoretical framework within which driving behaviors can be better understood. It also brings together findings from studies examining all these traits separately. The present study confirms that driving offenders with high primary psychopathic traits also tend to have low emotional and cognitive empathic skills, be impulsive, and seek sensation through the driving activity. Taken together, these findings offer an interesting insight into driving offenders' personal dispositions that might play a role in how they behave on the road, how they perceive traffic rules, and how they react to safety campaigns, and prevention interventions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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