

Article

Personality traits and traffic violations: the serial mediating role of theory of planned behavior constructs and intention

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Abstract

Driving behavior is a key factor in traffic accidents. Previous studies have shown a clear link between traffic violations and self-reported road accidents, with intention explaining a large part of the variation in violations. Drawing upon the Theory of Planned Behavior, this study aims to verify the mediating potential of behavioral, normative, and control beliefs on the relationships between personality traits and traffic violations. A sample of 236 drivers filled out several instruments measuring driving behavior, the Big Five personality traits, and the behavioral, normative, and control beliefs. The beliefs were measured for various behavioral situations conducive to traffic violations, constructed from the Theory of Planned Behavior. We performed a mediation analysis with composite values for the Theory of Planned Behavior constructs as mediator variables. The results showed a fully mediating effect of behavioral beliefs (attitude) and intention in the relationships between neuroticism, agreeableness, or conscientiousness and violations. Normative beliefs (subjective and descriptive) and intention had only a moderate mediating effect in the same relationship pattern. Agreeableness remained associated with violations, even after controlling for normative beliefs. Overall, our results highlight the mediating role of Theory of Planned Behavior constructs in the associations between personality traits and driving behavior. They also suggest that changing behavioral and normative beliefs may reduce the effect of personality traits on violations, which could help design more effective interventions to reduce traffic violations.

Keywords

Big Five personality traits, theory of planned behavior, traffic violations

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Road traffic accidents account for approximately 1.35 million deaths each year, representing one of the main causes of mortality in the general population and the primary cause of mortality in young people aged 5–29 (World Health Organization [WHO], 2018). Driver behavior is considered one of the key factors causing road traffic accidents (Demir et al., 2016; Galovski & Blanchard, 2004; Lajunen et al., 2004). Changing dangerous driving behavior is a critical component in the holistic approach to reducing road traffic accidents (WHO, 2018; Zhang & Chan, 2016).

Reason et al. (1990) made a distinction between errors (a cognitive component, unintentional) and violations (a social component, intentional) in explaining aberrant driving behaviors. Studies have shown that the link between violations and accidents is more consistent (de Winter & Dodou, 2016; Precht et al., 2017) than that between errors and accidents (King & Parker, 2008; Reason, 1994). Reducing violations can be done through changing attitudes, such as beliefs about the outcomes of violations, social norms, and the culture of the entity (e.g., the people around the driver) that tacitly accept non-compliance (Reason, 1994). Investigating how behavioral beliefs explain the variation in violations could help us better understand the causes of aberrant behaviors.

The contribution of beliefs to aberrant traffic behaviors notwithstanding, personality traits have been shown to be significantly associated with such behaviors (Demir et al., 2016; Lucidi et al., 2014). The Big Five model (Costa & McCrae, 2008), the personality theory that enjoys the most empirical support, has been used widely to measure various outcome variables in areas ranging from organizational behavior to involvement in accidents. There are personality traits that relate to perceived behavioral outcomes (Sümer, 2003), such as neuroticism (Riendeau et al., 2018; Scott-Parker, 2017), agreeability, and conscientiousness (Starkey & Isler, 2016). Thus, personality traits are considered “background factors” (Ajzen, 2022) or distal predictors of behaviors (Sümer et al., 2005), partially explaining them.

The Contextual Mediated Model (CMM) includes the other variables (e.g., attitudes and beliefs) as part of the proximal context, considering them as mediators of the relationship between the distal context (e.g., personality) and behavioral results (e.g., violations; Demir et al., 2016). Attitudes and beliefs are thought to be closer precursors of intentions and behaviors than personality traits (Fishbein, 2009), mediating the relationship between these and behavior (Ajzen, 2022; Fishbein & Cappella, 2006).

The Theory of Planned Behavior (TPB) further helps to understand the occurrence of the real behavior (Batool & Carsten, 2018) and makes an essential contribution to explaining the variation in aberrant behaviors across different situations (Åberg & Wallén Warner, 2008; Atombo et al., 2016; Castanier et al., 2013; Chen et al., 2016; Forward, 2009; Walsh et al., 2008). TPB argues that behavioral attitudes, subjective norms, and perceived behavioral control explain intention to perform a behavior, and that intention (together with perceived behavioral control) accounts for a considerable variation in the actual behavior (Ajzen, 1991; Castanier et al., 2013; Forward, 2009). TPB constructs are essential in explaining the variance of intention and aberrant behavior (Ajzen, 2022; Castanier et al., 2013; Moan, 2013; Norman & Conner, 2010; Potard et al., 2018; Walsh et al., 2008). To better understand the TPB constructs’ mediation effects on the relationship between personality traits and violations, we examined arrays of behavioral situations typically associated with violations of road rules. Furthermore, to examine these complex relationships, our study included descriptive norms, which refer to the modalities in which drivers perceive and are influenced by other drivers (Chen et al., 2016).

This study used the TPB constructs and intention, as mediating variables in the associations between the Big Five personality dimensions and traffic violations. Some prior research has also used TBP constructs as mediating variables (e.g., Davies et al., 2010; Rhodes & Courneya, 2003), but with implications in other fields of inquiry. As personality traits tend to be somewhat stable (Fishbein & Cappella, 2006), it is important to determine if other constructs might contribute to the variation in traffic violations, but which can be more easily intervened upon. Should the mediation effect be statistically significant, it would mean that behavioral, normative, and control beliefs explain the variation of violations along with personality traits. Thus, we formulated the following research question: to what extent will the TPB constructs and intention mediate the associations between personality traits and traffic violations? Since both personality and TPB explain variation

in traffic violations, this study investigated whether TPB constructs and intention mediate the relationship between personality traits and violations.

Method

Participants

We conducted a cross-sectional study on a convenience sample of 236 participants from the Romanian general population, 53.4% female, aged between 18 years and 67 years ($M = 39.19$, $SD = 11.25$), with a driving experience between a few months and 46 years ($M = 14.89$, $SD = 10$). Also, 14% of the sample reported driving experience of fewer than 4 years, 29% between 4 years and 10 years, 31% between 11 years and 20 years, and 26% above 20 years. The ratio of driving purpose was 54.2% personal use and 45.8% work purposes. In terms of education, 4.7% had completed elementary school or less, 17.8% middle school, 43.6% high school, and 42.9% college or more. All participants owned a valid driver license.

Instruments

We measured behavioral outcomes using a previously adapted version of the Driver Behavior Questionnaire (DBQ; Reason et al., 1990; Sârbescu, 2013). Aggressive violations and ordinary violations form one factor, called violations (VIO; 11 items, example of item: “Sound your horn to indicate your annoyance to another road user,” $\alpha = .78$) and errors and lapses form another, called errors. This factor was added for informational purposes only.

We measured personality traits using the previously adapted 300-item NEO IPIP instrument (Goldberg et al., 2006; Iliescu et al., 2015). The measured personality factors are the following: neuroticism (60 items, example of item: “Worry about things,” $\alpha = .94$), extraversion (60 items, example of item: “Make friends easily,” $\alpha = .90$), openness to experience (60 items, example of item: “Have a vivid imagination,” $\alpha = .86$), agreeability (60 items, example of item: “Trust others,” $\alpha = .86$) and conscientiousness (60 items, example of item: “Complete tasks successfully,” $\alpha = .92$).

A questionnaire tailored to the behavioral situations investigated was used (Găianu et al., 2020), constructed according to the guidelines developed by Ajzen (2006). The questionnaire was applied to seven behavioral situations (Table 1). Cronbach’s alpha values for these constructs were calculated for each behavioral situation, listed in the same order as in table. The measuring scales were as follows: (1) intention, as in planning the manifestation of behavior in the previously specified behavioral situations (three items, $\alpha = .85$, $.89$, $.94$, $.89$, $.90$, $.78$ and $.90$, respectively); (2) attitude, reflecting the personal beliefs about whether or not that behavior is correct (13 bipolar adjectives, $\alpha = .90$, $.94$, $.95$, $.94$, $.94$, $.93$ and $.94$, respectively); (3) subjective norms, referring to the belief of necessity, expectation, and acceptance of others behavior (three items, $\alpha = .78$, $.82$, $.88$, $.82$, $.82$, $.83$ and $.87$, respectively); (4) descriptive norms, referring to the belief that other people are performing this behavior as well (three items, $\alpha = .55$, $.77$, $.75$, $.75$, $.67$, $.73$, and $.77$, respectively); and (5) perceived behavioral control, referring to the respondent’s belief that they could control that behavior so that it would not lead to adverse behavioral outcomes (four items, $\alpha = .78$, $.82$, $.91$, $.90$, $.89$, $.95$ and $.92$, respectively). Although intention is not a TPB construct, it was measured with this instrument because (just like TPB constructs) it is linked to behavioral situations.

Table 1. Behavioral situations.

Behavioral situations	Statement of behavioral situation
Situation 1	“You would be willing to go over the speed limit just to impress a passenger.”
Situation 2	“When you are in a rush you may violate certain traffic rules such as: slightly going over the speed limit, running a late yellow light, not respecting a safe distance from the vehicle in front of you etc.”
Situation 3	“If you encounter a vehicle that goes too slowly you do your best to overcome it, even if you are on a road where you are not allowed to do this.”
Situation 4	“If another vehicle annoys you in traffic, you do your best to show indignation to the person driving it.”
Situation 5	“You tend to compete with other drivers, such as forcing entering on a circulation band, abruptly accelerating at the traffic light etc.”
Situation 6	“Sometimes you drive the vehicle even after you have drunk some alcohol.”
Situation 7	“You use your mobile phone while driving without using a hands-free device.”

The measurement of behavioral outcomes and personality traits was based on robust instruments (i.e., NEO IPIP and DBQ), widely used in research. In order to (1) control possible confounding variables, (2) increase internal consistency of the TPB constructs by multiplying items, and (2) better understand the meaning of violations, the questionnaire measuring the TPB constructs, and intention was administered for several behavioral situations separately. These behavioral situations were determined based on a qualitative analysis with the following criteria: (1) identification of situations listed in the literature; (2) generating aberrant behaviors; (3) relative self-exclusion, and (4) covering a broad range of the violations included in the DBQ (Reason et al., 1990) violations scale. Intention, measured with the same questionnaire as the TPB constructs, was also measured for each behavioral situation. The formulation of situations reflects the conditions related to target, action, context, and time (TACT; Ajzen, 2006; see Table 1).

Procedure

Data were collected through several online survey campaigns made on social media networks. The campaigns started in 2018. The campaign post reached 57,440 people, 1,168 people interacted with the post, and 236 people answered all the questionnaires. Participants did not receive any financial compensation for their effort and participation was voluntary. They were informed about the study's aims and the possibility to withdraw from the study at any time during the study. To be eligible to participate in the study, participants had to own a valid driving license and drive regularly (more than once a week).

Ethical considerations

Ethical approval for this study was obtained from the Ethical Commission of the University of Bucharest (31/11.10.2018), Romania. Participants were informed about the aims of the study, the discomfort created by participation (i.e., that they had to allocate time to answer several questions), the possibility to withdraw at any time, and the fact that the information provided was anonymous and therefore confidential.

Data analysis

Since personality traits are linked to perceived behavioral outcomes (Rhodes et al., 2005; Riendeau et al., 2018; Scott-Parker, 2017; Sümer, 2003), which in turn are linked to TPB constructs (Ajzen, 2022; Table 1), mediation analysis was chosen as a statistical approach. Composite scores for TBP constructs and intention were calculated by summing up individual scores for the seven behavioral situations: speeding, minor violations, overtaking, aggressive driving, inappropriate competition, driving under influence and phone use. Regarding power analysis, based on previous recommendations on sample sizes in mediation analysis (Fritz & MacKinnon, 2007), we acknowledge the fact that our sample should have been a bit larger (closer to 300 participants) for optimal statistical power ($>.80$). Nevertheless, the current sample provides acceptable statistical power ($>.70$) for detecting a mediation effect. We used one-way ANOVA to see if there were any differences between the behavioral situations for all TPB constructs and intention. An exploratory factor analysis was carried out for each TPB construct and intention using principal axis factoring, to determine if the investigated behavioral situations refer to a common negative factor (thus justifying the use of composite scores). Hierarchical regressions were used for verifying baseline assumptions concerning TPB's relational patterns. For mediation analyses, model 6 of the Process macro (Hayes, 2012), which examines serial mediation, was used (Figure 1). All used variables' distributions did not deviate substantially from normality (skewness between -2 and 2 , kurtosis between -5 and 5).

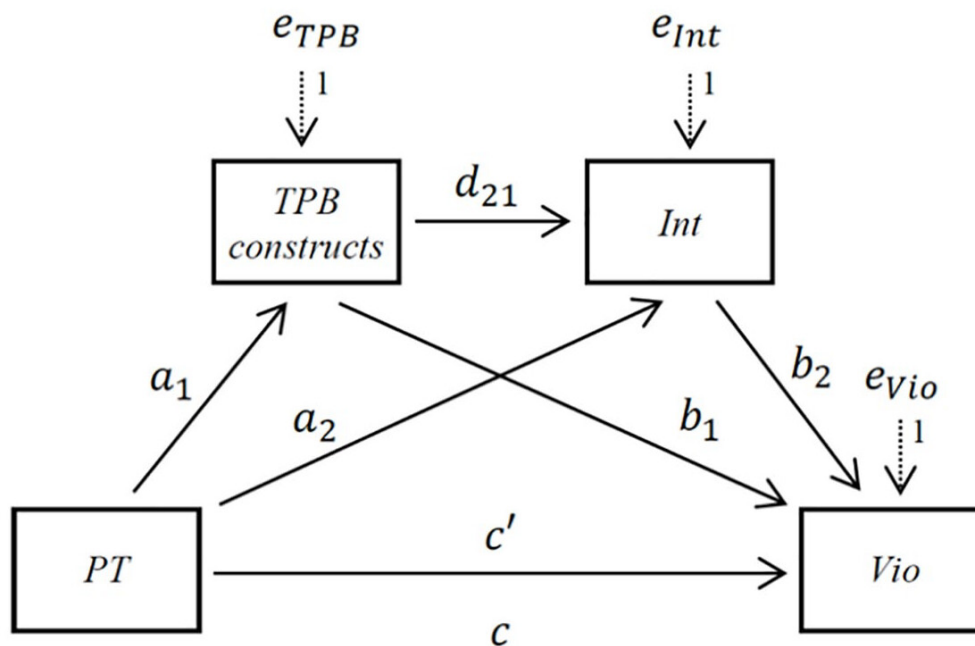


Figure 1. Graphic representation of the mediation model (model 6 process). Note: PT (personality traits) = independent variable (IV), TPB constructs (ATT, SN, DN, or PBC) = the first mediator variable (M_1V), INT = the second mediator variable (M_2V), VIO = dependent variable (DV); the total effect (weight c) is composed of the direct effect (weight c') and indirect effect ($a_1 \times b_1$) plus indirect effect ($a_2 \times b_2$) plus indirect effect ($a_1 \times d_{21} \times b_2$).

Results

Table 2 presents descriptive statistics and correlations between all research variables. Out of the three demographic variables measured (age, gender, and education), only age showed a weak negative association with violations ($r = .19, p < .01$). Neuroticism, agreeableness, and conscientiousness were the personality traits which had a significant correlation coefficient with the composite of the behavioral intentions ($r = .26, -.32, \text{ and } -.27, p < .001$), and violations ($r = .22, p < .01, r = -.34 \text{ and } -.27, p < .001$). Also, the three aforementioned

personality traits had significant correlations with most TPB constructs ($.16 \leq |r| \leq .43$), except for perceived behavioral control ($-.14 \leq r \leq .08$). Attitude, subjective norms, and descriptive norms had a significant correlation coefficient with intention ($r = -.67, -.50, -.43, p < .001$) and violations ($r = -.55, -.34, -.31, p < .001$). Perceived behavioral control correlated only with intention ($r = -.23, p < .05$) and did not correlate with violations ($r = -.14, p = .20$). Intention also had a significant correlation with violations ($r = .69, p < .001$).

Table 2. Descriptive statistics and correlation matrix.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
<i>Demographic data</i>															
1. Age	1														
2. Gen ^a	-.09	1													
3. Ed ^b	.29***	.33***	1												
<i>Personality</i>															
4. N ^c	-.34***	.02	-.15*	(.94)											
5. E ^d	.03	.05	-.01	-.38***	(.90)										
6. O ^e	.00	.30***	.18**	-.19**	.39***	(.86)									
7. A ^f	.09	.24***	.18**	-.29***	.09	.23***	(.86)								
8. C ^g	.25***	.10	.16*	-.52***	.33***	.23***	.35***	(.92)							
<i>Behavioral, normative, and control beliefs (TPB) and intention (composite scores)</i>															
9. ATT ^h	.18**	.09	.11	-.21**	-.02	.06	.43***	.36***	(.97 ^o)						
10. SN ⁱ	.12	.08	.10	-.17*	-.02	.01	.21**	.24***	.61***	(.92 ^o)					
11. DN ^j	.26***	-.06	.10	-.22**	-.06	-.08	.16*	.18**	.39***	.52***	(.90 ^o)				
12. PBC ^k	.11	.06	.06	-.00	-.07	-.06	.08	-.14	.03	.00	.08	(.96 ^o)			
13. INT ^l	-.22**	-.07	-.10	.26***	.01	-.07	-.32***	-.27***	-.67***	-.50***	-.43***	-.23*	(.90 ^o)		
<i>Behavioral outcomes</i>															
14. ERR ^m	-.11	.09	.00	.21**	-.08	.01	-.12	-.32***	-.39***	-.28***	-.30***	-.11	.41***	(.78)	
15. VIO ⁿ	-.19**	-.12	-.05	.22**	-.02	-.01	-.34***	-.27***	-.55***	-.34***	-.31***	-.14	.69***	.55***	(.78)
M	39.19	1.53	4.95	153.9	196.0	212.4	212.4	222.8	546.7	129.6	102.4	81.6	50.6	25.7	22.0
SD	11.25	.50	1.26	26.58	20.86	17.97	17.49	21.81	74.86	17.98	22.64	40.39	21.20	4.95	5.64

The values in brackets on the diagonal are Cronbach's alpha. $N = 236$.

^aGender.

^bEducation.

^cNeuroticism.

^dExtraversion.

^eOpenness.

^fAgreeableness.

^gConscientiousness.

^hAttitude.

ⁱSubjective norms.

^jDescriptive norms.

^kPerceived behavioral control.

^lIntention.

^mErrors.

ⁿViolations.

^oHere the values were calculated for all behavioral situations.

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

Repeated measures ANOVA indicated a significant difference between behavioral situations for all TPB constructs and intention (see Table 3), supporting the self-exclusion condition (i.e., criterion (c) regarding the determination of behavioral situations; see *Instruments*). The link between behavioral situations within each TPB construct was examined to determine whether these situations were grouped, indicating common aspects of behavioral, normative, and control beliefs. The exploratory factorial analysis performed with the items contributed to each composite score extracted one factor for each TPB construct and intention, explaining between 35.66% and 58.62% of the variance (see Table 4). This result justifies the mediation analysis with the composite scores for TPB constructs and intention.

Table 3. ANOVA results with differentiation between behavioral situations for each TPB construct and intention.

Variables	Wilks' Lambda	F	Hypothesis <i>df</i>	Error <i>df</i>	η^2
Attitude	.56	30.12***	6	230	.44
Subjective norms	.54	32.00***	6	230	.45
Descriptive norms	.48	41.50***	6	230	.52
PBC ^a	.63	6.88***	6	73	.36
Intention	.32	78.50***	6	229	.67

^aPerceived behavioral control.

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

Table 4. Exploratory factorial analysis for the seven investigated behavioral situations performed for each TPB construct and intention (principal axis factoring).

Variables	KMO	# of factors extract	Eigenvalues	% variance explained
Attitude	.89***	1	3.48	49.73
Subjective norms	.86***	1	3.13	44.81
Descriptive norms	.85***	1	3.32	47.55
PBC ^a	.86***	1	4.10	58.62
Intention	.80***	1	2.49	35.66

$N = 236$ (attitude, subjective norms, and descriptive norms), $N = 79$ (PBC), $N = 235$ (intention).

^aPerceived behavioral control.

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

To explore (1) how the TPB constructs explain variation in intention and (2) how the TPB constructs and intention explain variation in violations, we performed two hierarchical regression analyses. TPB constructs explained 53.9% of intentions' variance, $R^2 = .53$, $F(4, 74) = 21.66$, $p < .001$, for which only attitude ($\beta = -.60$, $p < .001$), descriptive norms ($\beta = -.31$, $p < .05$), and perceived behavioral control ($\beta = -.18$, $p < .05$) were significant. In the second hierarchical regression, TPB constructs explained 42.9% of violations' variance, $R^2 = .42$, $F(4, 74) = 13.88$, $p < .001$, for which only attitude ($\beta = -.61$, $p < .001$) and descriptive norms ($\beta = -.21$, $p < .05$) were significant. Intention explained an extra 14.4% of violations' variance, $R^2 = .57$, $\Delta R^2 = .14$, $F(2, 73) = 19.57$, $p < .001$.

The mediation analysis (Table 5) showed that the indirect effect was significant in all models, explaining between 61.76% and 81.81% of the total variation. Neuroticism, agreeableness, and conscientiousness were the personality traits considered for these analyses. Violations were linked with the linear combinations of the three personality factors, TPB constructs, and intention. In the second and third models, the linear combination of agreeableness, conscientiousness, and intention did not explain violations' variation. In six out of the nine models examined, no mediation effect was present when violations were linked with a linear combination of personality traits and TPB constructs ($a_1 \times b_1$). In all models, the linear combination of personality traits, TPB constructs and intention ($a_1 \times d_{21} \times b_2$) explained violations' variation. The greatest contribution of a mediation variable (MV_1) to violations' variation was found in the third model, where the linear combination of

conscientiousness, attitude, and intention explained 48.14% of violations' variation. Those constructs were followed by the second model, in which the linear combination of agreeableness, attitude, and intention explained 47.05% of violations' variation. Our mediation model chained two simple models, each with one mediating variable, where a_2 and b_1 symbolize the direct effect of the two models. In the grand mediation model (Figure 1), the individual direct effects of the two chained models have an impact on the direct effect of the model (c'). In this situation, there was at least one total mediation effect in the two chained models. If total mediation did not exist in one or both chained mediation models, as in model 1 (Table 5), the only linear combination that could explain violations' variation was the one encompassing a linear combination of both mediating variables.

Table 5. The indirect effects of TPB constructs and intention together on the associations between PT (neuroticism, agreeableness, and conscientiousness) and violations (Model 6 Process).

Md ^a	a_1	b_1	a_2	b_2	d_{21}	c	c'	Bootstrap for the indirect effect			
								a_1*b_1 95% CI Var. expl. ^b	a_2*b_2 95% CI Var. expl. ^b	$a_1*d_{21}*b_2$ 95% CI Var. expl. ^b	Total indirect effect 95% CI Var. expl. ^b
1	-.22**	-.16*	.12*	.57***	-.65***	.22***	.03	.03 [.00, .07] 13.63%	.07 [.01, .13] 31.81%	.07 [.02, .13] 31.81%	.18 [.08, .28] 81.81%
2	.43***	-.12	-.03	.57***	-.66***	-.34***	-.10	-.05 [-.11, .00] 14.70%	-.02 [-.08, .03] 5.88%	-.16 [-.22, -.11] 47.05%	-.24 [-.33, -.15] 70.58%
3	.35***	-.14	-.03	.57***	-.66***	-.27***	-.06	-.05 [-.10, -.00] 18.51%	-.02 [-.08, .04] 7.40%	-.13 [-.19, -.08] 48.14%	-.21 [-.29, -.11] 77.77%
4	-.17**	.01	.18**	.68***	-.47***	.22***	.03	-.00 [-.02, .01] 0%	.12 [.04, .21] 54.54%	.05 [.01, .10] 22.72%	.18 [.09, .27] 81.81%
5	.21***	.01	-.23***	.66***	-.45***	-.34***	-.13**	.00 [-.02, .02] 0%	-.15 [-.22, -.07] 44.11%	-.06 [-.10, -.02] 17.64%	-.21 [-.29, -.12] 61.76%
6	.24***	.02	-.15**	.67***	-.46***	-.27***	-.09	.00 [-.02, .03] 0%	-.10 [-.19, -.01] 35.03%	-.07 [-.12, -.03] 25.92%	-.18 [-.27, -.08] 66.66%
7	-.22**	-.01	.17**	.67***	-.39***	.22**	.03	.00 [-.02, .02] 0%	.12 [.03, .21] 54.54%	.06 [.02, .10] 27.27%	.18 [.08, .28] 81.81%
8	.16*	-.01	-.26***	.64***	-.39***	-.34***	-.13**	-.00 [-.02, .01] 0%	-.17 [-.24, -.09] 50.00%	-.04 [-.08, -.00] 23.52%	-.21 [-.29, -.12] 61.76%
9	.18**	-.01	-.20***	.66***	-.40***	-.27***	-.09	-.00 [-.02, .01] 0%	-.13 [-.21, -.04] 48.14%	-.04 [-.09, -.00] 14.81%	-.18 [-.27, -.09] 66.66%

N = 236.

IV = independent variable, M_1V = the first mediator variable, M_2V = the second mediator variable, DV = dependent variable; the total effect (c) is composed of the direct effect (c') and indirect effect (a_1*b_1) plus indirect effect (a_2*b_2) plus indirect effect ($a_1*d_{21}*b_2$).

Model 1: IV = Neuroticism; MV_1 = Attitude; MV_2 = Intention; DV = Violation.

Model 2: IV = Agreeableness; MV_1 = Attitude; MV_2 = Intention; DV = Violation.

Model 3: IV = Conscientiousness; MV_1 = Attitude; MV_2 = Intention; DV = Violation.

Model 4: IV = Neuroticism; MV_1 = Subjective norms; MV_2 = Intention; DV = Violation.

Model 5: IV = Agreeableness; MV_1 = Subjective norms; MV_2 = Intention; DV = Violation.

Model 6: IV = Conscientiousness; MV_1 = Subjective norms; MV_2 = Intention; DV = Violation.

Model 7: IV = Neuroticism; MV_1 = Descriptive norms; MV_2 = Intention; DV = Violation.

Model 8: IV = Agreeableness; MV_1 = Descriptive norms; MV_2 = Intention; DV = Violation.

Model 9: IV = Conscientiousness; MV_1 = Descriptive norms; MV_2 = Intention; DV = Violation.

^aModel.

^bVariance explained.

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

Discussion

This study investigated the effect of TPB constructs (given by a composite of behavioral, normative, and control beliefs, and adding the effect of behavioral intention) on the relationship between personality traits and violations through mediation analysis. Mediation analysis with the Big Five model in the distal context shows an extension (e.g., Găianu et al., 2020) and a generalization of traffic violations. For the study design, we started from the fact that violations have been frequently linked to road accidents (de Winter & Dodou, 2016; Precht et al., 2017) and that TPB constructs were shown to be effective in predicting intention and violations (Armitage & Conner, 2001). Some prior studies that integrated TPB did examine different behavioral situations (e.g., Castanier et al., 2013; Chen et al., 2016; Forward, 2009), but none of them included a comprehensive list of these situations at the same time, on the same sample, as it was carried out in this study. Composite scores for

TPB constructs increased the overall understanding of the mediation effect, as the behavioral situations covered as many instances of violations as possible, associated with a common negative factor.

Not all TPB constructs were associated with intention, but all were tested as possible mediator variables. Subjective norms were not associated with intention, and perceived behavior control was not associated with violations; thus, the TPB theory was only partially supported. This aspect is in line with Ajzen's (2002) argument, in which it is stated that nothing in the TPB theory suggests that all TPB constructs should associate significantly with intention.

In our analysis (the double mediation), except for the first and third models, the linear combination between personality traits and the TPB constructs explained little or nothing in the variation of violations. This was because intention produced a total mediation effect in the relation between TPB constructs and violations, whereas for the TPB constructs, only attitude produced a total mediation effect in the relationship between neuroticism or conscientiousness and intention. The change of behavioral beliefs along with that of intention would decrease the direct effect of agreeableness on violations and completely reduce that of neuroticism and conscientiousness. In our study (as well as those of others), agreeableness was the most powerful personality factor that has been linked to violations (e.g., Starkey & Isler, 2016).

As expected and in line with other studies (e.g., Armitage & Conner, 2001; Atombo et al., 2016; Castanier et al., 2013), intention mediated the relationship between neuroticism, agreeableness or conscientiousness and violations, as well as the TPB constructs and violations; therefore, the indirect effects on these linear combinations were expected to be large. In all the models we examined, the effect of neuroticism and conscientiousness on violations was due to the mediation variables, especially attitude and intention. However, although there was a mediation effect in the case of agreeableness, its effect on violations remained significant. This points to the fact that, despite being considered a distal predictor of behavior, agreeableness will explain violations variation both directly and indirectly. Further research is still needed to shed more light on this result.

The possible implications of our results relate to several different aspects. First, they provide a better understanding of the relationship between personality and traffic violations. Specifically, they (somewhat) cast a shadow of a doubt concerning the importance of personality in explaining driving outcomes. Although not important, it appears that intention and the TPB constructs play a more important role (when it comes to traffic violations). Second, the results provide additional evidence for the importance of focusing on drivers' attitude and intention (when the outcome is to reduce traffic violations). Specific interventions can train drivers to better understand the consequences of their behaviors, thus targeting an attitudinal change concerning dangerous driving behaviors (e.g., to perceive them more as life-threatening, rather than exciting). The third possible implication of our results regards how they can relate to the African traffic context. South Africa has one of the highest road death rates on the globe (32 deaths per 100,000 population; WHO, 2018), thus implicitly suggesting that effective interventions for reducing traffic violations are necessary. Previous studies (e.g., Sinclair, 2013) acknowledged the importance of attitudes and norms in driving behavior, especially in young drivers. Our results provide additional support for the idea of targeting such constructs (attitudes, norms, and intention) when aiming to reduce dangerous driving behaviors. Also (although to a lesser extent), our results point toward focusing on young drivers with such interventions (through the negative association between age and traffic violations).

Limitations

Despite the promising results, several limits must be mentioned. First, it is unclear how close the perception of behavioral outcomes to actual behaviors is. Second, data collection was carried out using self-reports, and even though this practice is common in the published literature, it may have led to participants providing socially desirable answers in some cases (e.g., driving under influence). The fact that the data were collected anonymously may have mitigated such issues but possibly not completely eliminated them. Third, the length of the 300-item NEO IPIP questionnaire and the repetition of the TPB measure for several behavioral situations were likely to increase the dropout rate and may have caused fatigue, with possible negative effects on the validity of our findings. Participants' ability to interrupt and resume their completion of the instruments later may have helped with the reduction of fatigue, although it is unlikely that it would fully eliminate it. Fourth, we believe that one of the reasons why the perceived behavioral control did not meet the conditions to be a mediator variable was due to the need to introduce a skipping question in the measure, to not force the respondents to answer to situations that they never experienced (e.g., driving under influence). This aspect reduced the number of participants who responded to the perceived behavioral control, which affected the statistical analyses. Fifth, this study measured personality based on the Big Five model (even though it is one of the most robust and conceptually sound ways of measuring personality). Specific models of personality measurement would likely reach other, more specific results, and these would most likely reveal other implications. Finally, another limitation would be that from the proximal context, we only addressed behavioral, normative, and control beliefs (based on TPB). Future studies could also address other variables that are found in the proximal context and that can explain the variation of violations, such as the motives, interests, values, cultural aspects, and national policies.

Conclusion

Overall, personality traits did not directly explain more of violations' variation than they did through the proximal context (i.e., through behavioral and normative beliefs). These findings highlight the importance of focusing on attitude and intention (in driving interventions) and could have specific implications for reducing traffic violations. Thus, further research could investigate the effect of changing behavioral and normative beliefs on the relationship between personality and violations.

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