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EXPLORING THE FACTOR STRUCTURE AND PSYCHOMETRIC PROPERTIES OF THE MANCHESTER DRIVER BEHAVIOR QUESTIONNAIRE (DBQ) IN AN ITALIAN SAMPLE

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The goal of the present study is to provide a contribution to the adaptation and validation of the Italian version of the Manchester Driver Behavior Questionnaire (DBQ). Findings are based on a self-report questionnaire survey filled out by 360 drivers (50% males), between 18 and 41 years of age. Results of the confirmatory factor analysis showed that the hypothesized four-factor structure of the DBQ was identified. Reliability of the scale was also confirmed within the Italian context. In addition to the four first-order factors, two second-order factors (violations and unintentional mistakes) were found, supporting the original structure proposed by Reason, Manstead, Stradling, Baxter, and Campbell (1990). Finally, the present study provided support for the good criterion-related and construct validity of the DBQ. Altogether, the Italian version of the DBQ demonstrated a robust factor structure and good psychometric properties, confirming the reliability and validity of the tool also within the Italian context.

Key words: Manchester Driver Behavior Questionnaire; Psychometric properties; Reliability; Validity; Italian drivers.

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Human factors are the major contributors in road crashes (de Oña, Lopez, Mujalli, & Calvo, 2013; Lambert-Bélanger, Dubois, Weaver, Mullen, & Bédard, 2012; Tractinsky, Ram, & Shinar, 2013). Human factor includes cognitive factors, such as inattention or lapses in memory, behavioral factors, such as the tendency to drive in a risky way or to commit violations (e.g., use of alcohol and drugs, failure to use seatbelt, disregard speed limits, passing where prohibited by traffic signs, etc.), along with demographic factors, such as age and gender. For the development of effective countermeasures and preventive efforts, understanding the psychological mechanisms underlying drivers' behavior has become therefore a priority as well as a major challenge for traffic safety.

According to Reason, Manstead, Stradling, Baxter, and Campbell (1990), an adequate framework for unsafe driver behaviors requires a distinction between two different classes of aberration: errors and violations. More specifically, two different classes of errors are possible. Actions may involuntarily deviate from the original intention (slips and lapses); or planned actions may deviate from some satisfactory path toward a desired goal (mistakes). Slips and lapses result from attention deficit and involve a low risk to others. Mistakes stem from failures in information processing that lead to poor or non-optimal decision outcomes. On the other hand, violations have been defined as deliberate infringements from those social codes or legal rules believed necessary to maintain the safe operation of a potential hazardous system. Thus, according to Reason and colleagues,

errors involve cognitive failures in information processing whereas violations have psychosocial and motivational origins and consequently can be understood only within a social context.

Errors and violations can be distinguished by the intentional or unintentional character of drivers' behavior. Further, these two distinct classes of behavior have different psychological origins and, consequently, different forms of remediation. Errors can be minimized by achieving better information, whereas to change driving violations, the beliefs, norms, and attitudes underpinning those same behaviors should be changed first (Parker, Reason, Manstead, & Stradling, 1995; Reason et al., 1990). In sum, errors refer to driving skills, while violations to driving style (Evans, 2004).

Previous findings showed that drivers' behaviors, and particularly their violations, are significant predictors of accident involvement (de Winter & Dodou, 2010; Parker et al., 1995; Wahlberg, Dorn, & Kline, 2011). Further, findings showed that some personality characteristics, such as sensation seeking, and specifically thrill and adventure seeking, have a strong association with risky driving behaviors, such as driving violations (Arnett, 1996, 1997; Iversen & Rundmo, 2002; Jonah, 1997; Jonah, Thiessen, & Au-Yeung, 2001; Schwebel, Severson, Ball, & Rizzo, 2006).

Finally, some demographic variables, such as age and gender, have a strong influence on drivers' behaviors. Thus, men and young people commit more violations (Åberg & Rimmö, 1998; Blockey & Hartley, 1995; de Winter & Dodou, 2010; Özkan & Lajunen, 2005, 2006; Parker et al., 1995; Reason et al., 1990) whereas women commit more lapses (Özkan & Lajunen, 2006; Parker et al., 1995; Reason et al., 1990).

Given the relevance of the driver's behavior, in order to further deepen our understanding of aberrant driving behaviors in Italy, it would be noteworthy to be able to assess these distinct classes of driving errors and violations. With regard to this, Lawton, Parker, Manstead, and Stradling (1997) developed a valid and reliable version of one of the most widely employed instruments for assessing self-reported driving behavior, that is, the Manchester Driver Behavior Questionnaire (DBQ; Reason et al., 1990). To the best of our knowledge, no validation among Italian drivers has been published of one of the latest versions of the DBQ validated by Lajunen, Parker, and Summala (2004) on Finnish, Dutch, and English samples. Therefore, the goal of the present study was to provide a contribution to the validation of the Italian version of this scale.

THE MANCHESTER DRIVER BEHAVIOR QUESTIONNAIRE (DBQ)

The DBQ, originally developed in Britain by Reason and colleagues (1990), provides a fundamental contribution to the understanding of aberrant behaviors reported by drivers. The scale contains 50 items assessing three distinct classes of behaviors: violations, which include behaviors such as speeding or overtaking on the inside; errors, which include behaviors such as not noticing pedestrians crossing or not checking mirrors; and lapses, which include behaviors such as forgetting where one's car is parked or driving away in third gear. In the original publication, 500 drivers ranging from 20 to 56 years were asked to rate on a 5-point Likert scale the frequency of risky behaviors executed while they were driving.

Subsequently, Parker and colleagues (1995) selected the 24 items that showed the highest component loadings for the three factors identified on a sample of more than two thousand British drivers, ranging from 17 to 70 years. The original three-factor solution was confirmed.

In 1997, Lawton and colleagues extended the violations scale by adding new items, creating their 28-item version. In this latest version, the violation factor was split into two different

subscales, namely aggressive violations, which imply an interpersonal aggressive component showing an affective character, and ordinary violations, which include intentional action that deviates from safe driving without having a specific aggressive goal.

In the last decades, a large body of research has created, modified and updated this tool, which has progressively acquired wide acceptance in traffic psychology (Åberg & Rimmö, 1998; Blockey & Hartley, 1995; Guého, Granié, & Abric, 2014; Kontogiannis, Kossiavelou, & Marmaras, 2002; Lajunen et al., 2004; Sullman, Meadows, & Pajo, 2000; Xie & Parker, 2002). Hundreds of studies have, in fact, used this tool at least in part or completely (de Winter & Dodou, 2010), making the DBQ one of the most widely used tools for the assessment of drivers' behaviors (Af Wåhlberg, Barraclough, & Freeman, 2015; Cordazzo, Scialfa, Bubric, & Ross, 2014; de Winter, Dodou, & Stanton, 2015).

Moreover, the psychometric properties of the DBQ have been explored in many other countries, such as Australia (Blockey & Hartley, 1995), China (Xie & Parker, 2003), France (Gabaude, Marquié, & Obriot-Claudel, 2010; Guého et al., 2014), Greece (Kontogiannis et al., 2002), Finland and the Netherlands (Lajunen et al., 1999, 2004; Mesken, Lajunen, & Summala, 2002), New Zeland (Sullman et al., 2000), Sweden (Åberg & Rimmö, 1998), and Turkey (Sümer & Özkan, 2002), confirming the goodness of DBQ in measuring several aberrant driver behaviors and reinforcing its validity.

Even if all international studies have supported the original distinction between unintentional mistakes and intentional violations (Reason et al., 1990), significant differences in the factor structure (e.g., original three-factor structure vs. the subsequent four-factor structure — errors, lapses, aggressive violations, and ordinary violations), number of items (e.g., 24-item — Parker et al., 1995 — vs. 104-item — Åberg & Rimmö, 1998) and target populations (e.g., professional drivers vs. elderly drivers) can be found in the international literature on DBQ.

Further, the four-factor structure was recently replicated in a cross-cultural study (Lajunen et al., 2004) carried out among British, Finnish, and Dutch drivers, confirming the validity of the 27-item version of the DBQ. More specifically, the study of Lajunen and colleagues not only demonstrated the goodness of the DBQ's factor structure, replicating a congruent four-factor structure in Britain, Finland, and the Netherlands but also confirmed the original structure proposed by Reason and colleagues (1990), finding two second-order factors — namely violations and unintentional mistakes — in all the three countries. To date, the DBQ 27-item version (Lajunen et al., 2004) is the most commonly used (Guého, et al., 2014).

Regarding the Italian context, different versions of the DBQ have been translated and tested, both the three-factor structure of Parker and colleagues (Cicognani & Zani, 2002) and the three-factor structure of Lawton and colleagues (Giannini & Lucidi, 2007; Lucidi et al., 2010; Lucidi, Mallia, Lazuras, & Violani, 2014; Mallia, Lazuras, Violani, & Lucidi, 2015). However, the DBQ four-factor structure, confirmed cross-culturally by Lajunen and colleagues (2004), has not yet been tested.

AIMS OF THE STUDY

Given the robustness of the 27-item version of the DBQ, which provides a deeper understanding of the different types of aberrant behaviors a driver can execute while driving, the goal

of this study was then to validate the Italian version of the DBQ based on one of the latest versions of this scale (Lajunen et al., 2004) by verifying: 1) the internal structure of the scale, by testing its factor structure and reliability; 2) the criterion-related validity of the DBQ by examining the ability of the scale to discriminate age and gender differences (discriminative validity) and assessing the relations between the scale and some measures theoretically connected, such as dangerous driving, thrill and adventure seeking, and accidents (concurrent validity); and 3) the construct validity by exploring the relationship between the scale and social desirability (discriminant validity). A satisfactory factor structure, good criterion-related and construct validity of the scale were hypothesized.

METHOD

Adaptation of the Manchester Driver Behavior Questionnaire

Two independent professionals translated and adapted to Italian the original version of the DBQ. Following a discussion between the two translators regarding differences in translation, a preliminary agreed translation of the instrument was developed. This was administered to a small sample (N = 20) representative of different cultural backgrounds and socioeconomic statuses in order to evaluate the quality of the translation and collect suggestions regarding language adjustments to improve the clarity of the instrument. No significant difficulties in comprehension of the items of the scale were observed.

To ensure the accuracy of the translation the instrument was back-translated from Italian to English by a bilingual professional fluent in Italian and English who had not seen the original version of the scale. The final translated version of the DBQ is presented in the Appendix.

Participants

A total of 360 participants aged from 18 to 41 years were recruited for the present study. The requirements for participation in the present study were that all respondents had obtained a driver licence and had driven vehicles during the six months prior to filling out the survey. Vehicles included mopeds (with piston displacement lower than 125 cc), motorcycles (with piston displacement higher than 125 cc), and cars. According to the Italian law, a specific driving license is needed to drive all of the above (type A for mopeds and motorcycles and type B for cars), which can be obtained from age 14, 16, and 18, respectively.

The sample was stratified by age and gender to include 30 drivers from each of six age intervals ranging from 18-21 to 38-41. Participants were attending universities, postgraduate courses or specialization schools randomly selected from the metropolitan area of Northern Italy. All participants came from families of middle or high socioeconomic status and more than 70% of respondents reported that both their parents had a high school diploma or university degree. The characteristics of the Italian sample are presented in Table 1.

TABLE 1
Characteristics of the Italian sample

	N = 360
Males (%)	50
Mean age	29.33 (6.80)
Type of driving license (%)	
Type A	4.7
Type B	87.1
Both	8.2
Driving experience in years (%)	
Less than one year	4.6
From one to three years	36.6
From four to five years	21.1
More than five years	37.7
Accidents involved in during previous three years (%)	.55 (1.21)

Measures

Demographic and exposure measures. Participants answered questions about their gender, age, socioeconomic status, parents' education, what type of driving license they held, how long they had had it for, and how many accidents they had been involved in during the previous three years.

Dangerous driving. The Italian version (Chiorri, Mortola, Bottiglieri, Piccinno, & D'Anna, 2008) of the 28-item Dula Dangerous Driving Index (3DI; Dula, 2003; Dula & Ballard, 2003) was used to measure participants' dangerous driving. The scale assesses three subscales, namely risky driving (12 items); aggressive driving (seven items), and negative emotional driving (nine items). Representative items include: "I will illegally pass a car/truck that is going too slow" (risky driving); "I verbally insult drivers who annoy me" (aggressive driving); and "I drive when I am angry or upset" (negative emotional driving). Participants were required to respond to items, rating their behavior on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). Subscale scores were calculated by adding the items within each scale and could range from 12-60, 7-35, and 9-45, respectively, with higher scores indicating greater risky, aggressive, and negative emotional driving. The scale has shown to have a satisfactory reliability (risky driving, $\alpha = .79$; aggressive driving, $\alpha = .76$; negative emotional driving, $\alpha = .81$).

Thrill and adventure seeking. The Italian version (Manna, Faraci, & Como, 2013) of the thrill and adventure seeking subscale of the Sensation Seeking Scale-V (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978) was used to measure the desire to engage in sports or other activities involving speed, danger or risk that is a significant indicator of an individual's sensation seeking. Representative items include "I would like to take up water-skiing" versus "I would not like to take up water-skiing." Participants were required to respond to items using a dichotomous forced choice answer format. The items were summed to form a composite scale, with higher scores indicating more thrill and adventure seeking. Internal consistency coefficient (Cronbach's alpha) was .90.

Social desirability. The Italian adaptation (Manganelli Rattazzi, Canova, & Marcorin, 2000) of the short nine-item version of the Marlowe-Crowne Social Desirability Scale (MC-SDS; Crowne & Marlowe, 1960) was used to measure social desirability. Participants were required to respond to each item on a 6-point Likert scale ranging from 1 (*absolutely false*) to 6 (*absolutely true*). Representative items include "No matter who I'm talking to, I'm always a good listener." A total score is derived from the sum of all items and could range from 9 to 54, with higher scores indicating higher levels of social desirability. Internal consistency coefficient (Cronbach's alpha) was .71.

Procedure

Data were collected during lectures in different undergraduate and graduate courses. An equal number of males and females was selected. Following the guidelines for the ethical treatment of human participants of the American Psychological Association, participants were first informed about the aim of this study on risky driving. After obtaining individual consent to participate, participants replied to the questionnaires anonymously. Questionnaires were answered in random order.

RESULTS

Preliminary Analysis

A preliminary analysis was performed to test the normality of the distribution of the items of the scale (Fox, 2008). Analyses revealed a non-normal distribution for some items, which showed asymmetry and a kurtosis greater than ± 1 (Marcoulides & Hershberger, 1997; Muthén & Kaplan, 1985). Confirmatory factor analysis (CFA) was therefore conducted using robust methods (maximum likelihood estimates otherwise referred to as MLM; Muthén & Muthén, 1998), using the MPLUS version 5.21 statistical program.

Confirmatory Factor Analysis

Factor Structure: First-Order Factors

The factor structure of the scales was tested via confirmatory factor analysis (Jöreskog & Sörbom, 1993). To gauge the fit of the model, the following fit indexes were used: normed chi-square (i.e., NC = χ^2/df), robust comparative fit index (CFI), non-normed fit index (NNFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). Acceptable values for NC range from 1.0 to 3.0 (Kline, 1998); the index is useful for comparing various models of the same data. The CFI indicates the difference in fit of the null and target models relative to the fit of the null model. A CFI value greater than or equal to .95 is the most desirable and values of .90 or greater represent an acceptable fit of the model to the data (Hu & Bentler, 1999; McDonald & Ho, 2002). Similarly, a NNFI value greater than .90 represents an acceptable fit of the model to the data (Bentler & Bonnet, 1980). The RMSEA was chosen following the recommendations of Browne and Cudeck (1993) and Rigdon (1996) to indicate the fit of the empirical and popu-

lation variance-covariance matrices, with values less than .05 indicating excellent fit and values less than .08 indicating reasonable fit. The SRMR is a measure of the average of the standardized residuals between the hypothesized model and the sample data. Values at or below .05 indicate acceptable fit (Byrne, 1998), as the model explains the data to within an average error of .05 or less.

The model of the scale, which included 27 observed variables and four latent variables, showed acceptable fit indices (NC = 1.64; CFI = .93; NNFI = .92; RMSEA = .05; SRMR = .06). Still, some indices were lower than the suggested cut-off values, indicating that the model could benefit from refinement. Modification indices were examined to identify sources of misfit. Consequently, misfit was reduced by adding one correlation between pairs of item errors terms. This choice appeared theoretically justified because the items are associated with the use of similar phrasing, which may have caused correlated measurement errors: "Non rispettare i limiti di velocità su una strada residenziale" ["Disregard the speed limit on a residential road"] (Item 10) and "Non rispettare i limiti di velocità in autostrada" ["Disregard the speed limit on a motorway"] (Item 27). We therefore proceeded to repeat the analysis. Consequent to this additional link, a significant increase in the model fit was found, confirming the adequacy of the tested modified structure (NC = 1.47; CFI = .95; NNFI = .94; RMSEA = .04; SRMR = .05). Furthermore, the analysis carried out on this model revealed significant saturation ($p < .001$) for all 27 items of the scale (Figure 1). Finally, the correlations among the four dimensions indicated a very strong and positive relationship between all the dimensions ($p < .001$).

Factor Structure: Second-Order Factors

In line with the study of Lajunen and colleagues (2004), the very high correlations among the four latent factors suggested that also in the Italian version of the DBQ second-order factors could emerge. For this reason, a second-order structure was tested via confirmatory factor analysis. The model included two second-order factors namely violations, which was constituted by aggressive and ordinary violations, and unintentional mistakes, constituted by errors and lapses. Results of confirmatory factor analysis showed good fit indices (NC = 1.47; CFI = .95; NNFI = .94; RMSEA = .04; SRMR = .05).

Furthermore, the analysis carried out on this model revealed significant saturation ($p < .001$) for all the first-order factors and all 27 items of the scale (Figure 2). The correlations between the two second-order factors indicated a strong and positive relationship ($p < .001$).

Reliability Analysis

The internal consistency of the first- and second-order factors was measured to evaluate the degree of homogeneity or consistency of the items within the scale. The coefficient alpha was as follows: aggressive violations = .72; ordinary violations = .84; errors = .87; lapses = .83; violations = .87; mistakes = .90. Thus, alpha reliability coefficients for the DBQ were found to range from fairly good to good across all first- and second-order factors (Nunnally & Bernstein, 1994), showing an even better internal consistency than those previously found in British, Finnish, and Dutch samples (Lajunen et al., 2004).

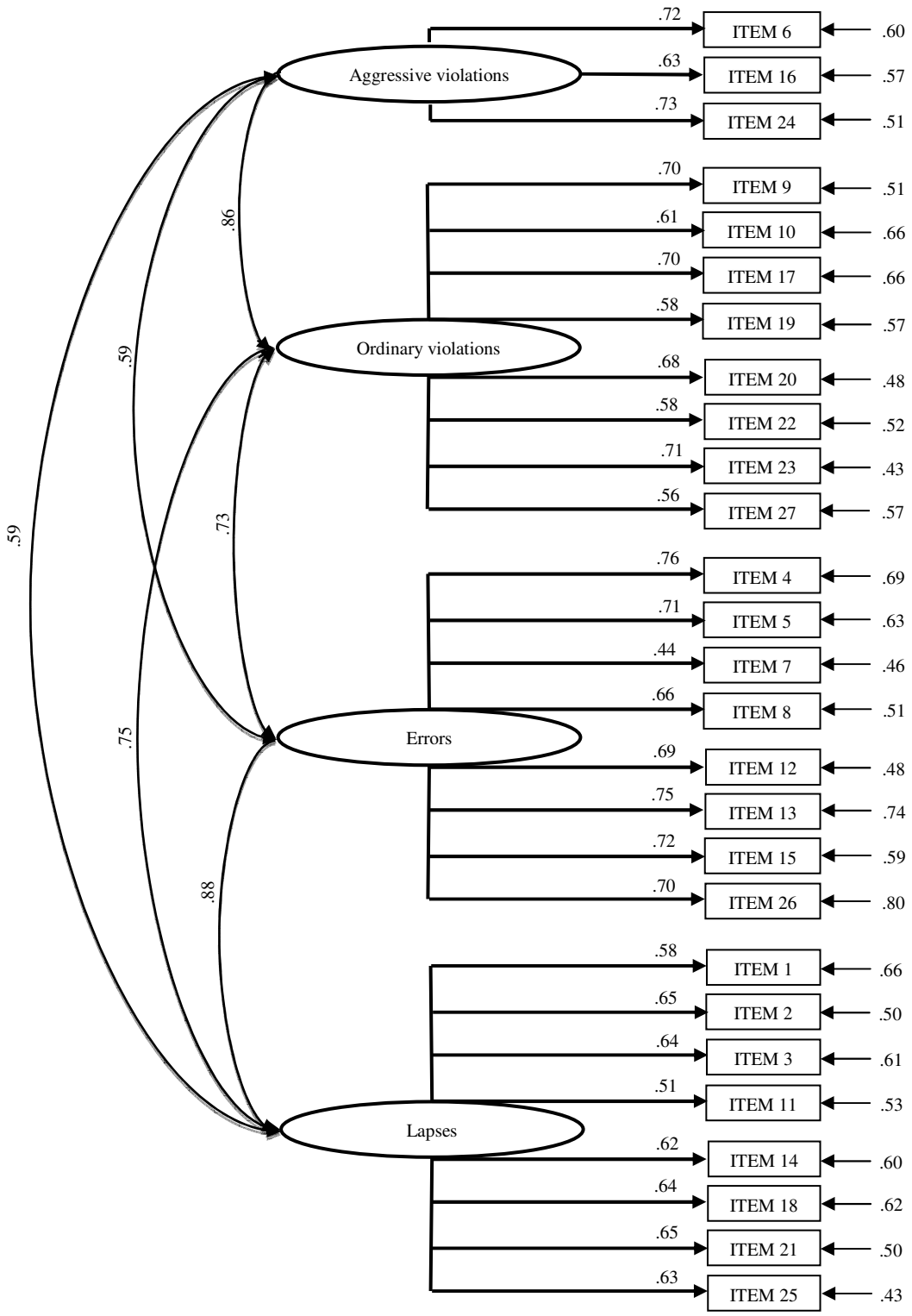

FIGURE 1
The statistical model of the first-order factors of the DBQ.
Standardized solution is reported.

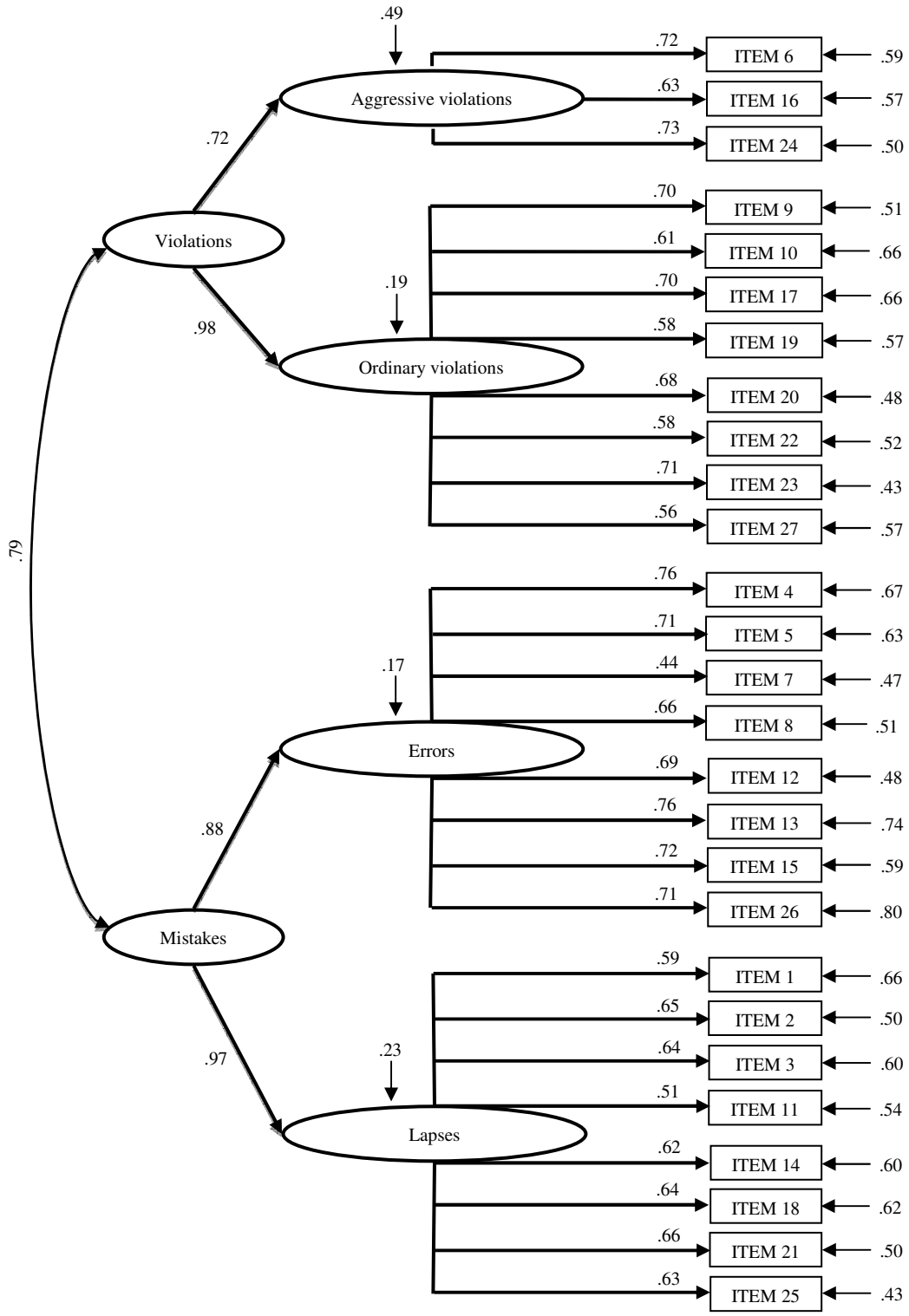

FIGURE 2
The statistical model of the second-order factors of the DBQ.
Standardized solution is reported.

Criterion-Related Validity of the DBQ

Discriminative Validity

Age differences. Discriminative validity of DBQ was analyzed assessing the differences between younger and older drivers via univariate analyses of variance (ANOVAs), with age group as a fixed factor. Results are presented in Table 2. Younger drivers commit more violations — both aggressive and ordinary violations — than older drivers. Also the number of mistakes — both errors and lapses — drops with age.

TABLE 2
Mean and standard deviation of DBQ factors by age groups

Factors	Age group (years)						ANOVA *F*	η^2	Bonferroni post-hoc
	18-21 (A)	22-25 (B)	26-29 (C)	30-33 (D)	34-37 (E)	38-41 (F)			
AV	2.15 (1.06)	1.85 (.77)	1.61 (1.17)	1.42 (.94)	1.14 (1.08)	1.26 (.77)	6.38***	.10	A>E,D B>E
OV	2.10 (.74)	1.63 (.60)	1.47 (.56)	1.35 (.68)	.94 (.66)	1.36 (.79)	16.28***	.22	A>C,D,E,F B,C>E
E	1.40 (.43)	1.01 (.56)	.97 (.55)	.90 (.54)	.66 (.57)	.73 (.44)	10.50***	.15	A>C,D,E,F
L	1.83 (.59)	1.50 (.71)	1.50 (.70)	1.35 (.68)	1.11 (.63)	1.02 (.47)	7.76***	.12	A>E,F
V	2.12 (.75)	1.74 (.61)	1.54 (.81)	1.39 (.73)	1.04 (.75)	1.31 (.69)	12.61***	.18	A>D,E,F B,C>E
M	1.61 (.48)	1.25 (.57)	1.23 (.57)	1.13 (.58)	.88 (.56)	.87 (.42)	10.40***	.15	A>C,D,E,F

Note. AV = aggressive violations; OV = ordinary violations; E = errors; L = lapses; V = violations; M = mistakes. All Bonferroni post-hoc are significant (at least $p < .05$).
*** $p < .001$.

Gender differences. In addition, discriminative validity of DBQ was analyzed assessing the differences between males and females via univariate analyses of variance (ANOVAs), with gender as a fixed factor. Males showed significantly higher scores on aggressive violations factor than did females, $M = 1.82$, $SD = 0.76$ versus $M = 1.43$, $SD = 1.04$, respectively; $F(1, 366) = 4.60$, $p < .05$; $\eta^2 = .02$. Further, males showed significantly higher scores on ordinary violations factor than did females, $M = 2.03$, $SD = 0.76$ versus $M = 1.28$, $SD = 0.70$, respectively; $F(1, 366) = 37.74$, $p < .001$; $\eta^2 = .11$. Finally, males showed significantly higher scores on violations factor than did females, $M = 1.92$, $SD = 0.77$ versus $M = 1.35$, $SD = 0.78$, respectively; $F(1, 366) = 17.94$, $p < .001$; $\eta^2 = .06$. On the other hand, females showed significantly higher scores on lapses factor than did males, $M = 1.15$, $SD = 0.49$ versus $M = .89$, $SD = 0.59$, respectively; $F(1, 366) = 6.38$, $p < .01$; $\eta^2 = .02$. Further, females showed significantly higher scores on mistakes factor than did males, $M = 1.92$, $SD = 0.77$ versus $M = 1.35$, $SD = 0.78$, respectively; $F(1, 366) = 4.84$, $p < .05$; $\eta^2 = .02$. No significant differences between females and males emerged for errors, $M = 1.58$, $SD = 0.61$ versus $M = 1.38$, $SD = 0.71$, respectively; $F(1, 366) = 2.73$, *ns*.

Concurrent Validity

Concurrent validity of the DBQ was examined by computing the Pearson product-moment correlation coefficients between scores on DBQ and those on dangerous driving, thrill and adventure seeking, and accidents. Correlations between DBQ scores and risky driving, aggressive driving, negative emotional driving, thrill and adventure seeking, and accidents (for this last variable, participants with fewer than three years experience were omitted) are reported in Table 3. Results showed significant positive associations between all first and second-order factors of the DBQ and all the variables taken into account in the present study.

TABLE 3
Correlations between DBQ scores and dangerous driving
(i.e., risky driving, aggressive driving, negative emotional driving) and thrill and adventure seeking

DBQ scores	AV	OV	E	L	V	M
Risky driving	.42**	.56**	.28**	.21**	.47**	.26**
Aggressive driving	.60**	.44**	.19**	.21**	.60**	.22**
Negative emotional driving	.44**	.41**	.16**	.23**	.46**	.21**
Thrill and adventure seeking	.30**	.50**	.63**	.46**	.43**	.57**
Accidents	.17**	.18**	.13*	.14*	.18**	.13*

Note. AV = aggressive violations; OV = ordinary violations; E = errors; L = lapses; V = violations; M = mistakes.
* $p < .05$. ** $p < .01$.

Construct Validity of the DBQ

Discriminant Validity

Discriminant validity was estimated by computing the Pearson product-moment correlation coefficients between scores on DBQ and those on social desirability. Results showed significant but weak negative associations between social desirability and aggressive violations ($r = –.22$, $p < .001$), ordinary violations ($r = –.23$, $p < .001$), lapses ($r = –.16$, $p < .007$), errors ($r = –.14$, $p < .017$), violations ($r = –.22$, $p < .001$), and mistakes ($r = –.16$, $p < .006$).

DISCUSSION

The present study provides a significant contribution to the validation of the translated and adapted Italian version of the DBQ. Findings, based on data from Italian drivers aged from 18 to 41 years, appear to confirm the aberrant behavior classification identified by Lawton and colleagues (1997), supporting the distinction among aggressive violations, ordinary violations, errors, and lapses. In addition, in line with what was observed in British, Finnish, and Dutch drivers (Lajunen et al., 2004), also in the structure obtained in the Italian sample two second-order factors emerged, reflecting the original distinction between deliberate violations and involuntary mistakes proposed

by Reason and colleagues (1990). Moreover, according to the original version, both factors of first- and second-order demonstrated good reliability and item homogeneity.

Our results further reinforce the validity of conceptual distinction between these different types of aberrant driving behaviors, confirming the validity of the DBQ factor structure also in the Italian context. The substantial equivalence of the Italian factor structure to the British, Finnish, and Dutch ones seems to suggest the goodness of the Italian adaptation of the scale. Further, findings suggest that Italian drivers interpret DBQ items in a similar way to drivers of these different countries. After all, despite some specificities among Western countries in driving violations (e.g., Italy, Spain, and France honk faster than drivers in Germany; de Winter et al., 2015), Italy, England, Finland, and the Netherlands are countries with rather equivalent driving cultures, confirming how it should be possible to use DBQ with confidence in Western European countries (Lajunen et al., 2004).

Beyond the factor structure of the scale, there are other ways in which our data are consistent with DBQ literature. More specifically, also in the Italian context DBQ factors are associated with demographic variables such as gender. Thus, in line with results of previous research, violations and mistakes drop with age (Åberg & Rimmö, 1998; Blockey & Hartley, 1995; de Winter & Dodou, 2010; Özkan & Lajunen, 2006; Rimmö & Hakamies-Blomqvist, 2002). Moreover, males are more likely to report higher traffic violations (Åberg & Rimmö, 1998; Blockey & Hartley, 1995; de Winter & Dodou, 2010; Özkan & Lajunen, 2005, 2006; Parker et al., 1995; Reason et al., 1990), whereas females report higher unintentional lapses and mistakes (Özkan & Lajunen, 2006; Parker et al., 1995; Reason et al., 1990), confirming the discriminative power of the scale.

In addition, as expected, the correlation between the DBQ aberrant behaviors and measures of self-reported dangerous driving — such as risky driving, aggressive driving, negative emotional driving — thrill and adventure seeking, and accidents was significant and satisfactory. In line with previous research (Arnett, 1996, 1997; Iversen & Rundmo, 2002; Jonah, 1997; Jonah et al., 2001; Richer & Bergeron, 2012; Rimmö & Åberg, 1999; Schwebel et al., 2006), these significant and satisfactory correlations between the DBQ factors and equivalent measures, such as dangerous driving, and theoretically associated constructs, such as sensation seeking suggested the concurrent validity of the scale. Similarly, the magnitude of the DBQ factors-accidents correlation is consistent with correlations obtained in previous studies (r = .13, de Winter & Dodou, 2010; r = .14, de Winter et al., 2015; r = .19, de Winter, 2013), further suggesting the validity of the scale.

Despite the significant correlations between the DBQ factors and the other self-report questionnaires and self-reported accidents, it should be stressed that these significant associations do not necessarily imply the concurrent validity of the scale. According to Af Wåhlberg and colleagues (Af Wåhlberg & Dorn, 2012; Af Wåhlberg, Dorn, & Freeman, 2012; Af Wåhlberg, Dorn, & Kline, 2011), such correlations could, in fact, be almost entirely caused by common method variance effects, which refer to variance that is attributable to the measurement method rather than to the construct of interest (Fiske, 1982).

For this reason, discriminant validity was also assessed. In line with previous studies (Af Wåhlberg, 2010; Lajunen & Summala, 2003; Wickens, Toplak, & Wiesenthal, 2008), the low correlations between aberrant driving behaviors and social desirability suggested the good discriminant validity of this tool as well as the weak impact of social desirability factors on DBQ answers.

Although the DBQ, similarly to any other self-report tool, is sensible to common method variance and memory limitations, on the whole, the Italian version of the DBQ showed satisfactory factor structure and psychometric properties, confirming how the DBQ constitutes a suitable measure for the assessment of individuals' aberrant driving behaviors, also within the Italian context. The moderate sample size and the weak representativeness of the sample may limit the generalizability of our findings and, consequently, the replication of our results in a bigger and more representative sample would be useful. However, in spite of this, the present study provides a promising foundation for the adaptation and the validation of the Italian version of this tool.

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APPENDIX

The Italian Version of the Manchester Driver Behavior Questionnaire

1. Scontrarsi con un ostacolo che non avevi visto durante una svolta [Hit something when reversing that you had not previously seen]

2. Pur essendo diretto verso il punto A, "svegliarti" d'un tratto e ritrovarti diretto verso il punto B [Intending to drive to destination A, you "wake up" to find yourself on the road to destination B]

3. Imboccare la corsia sbagliata mentre ti avvicini a una rotatoria o a un incrocio [Get into the wrong lane approaching a roundabout or a junction]

4. Mentre sei in coda per immetterti a sinistra su una via principale, concentrarti così tanto sul traffico di questa via da tamponare quasi la macchina che ti precede [Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front]

5. Non notare i pedoni che attraversano la strada mentre ti immetti da una strada secondaria su una strada principale [Fail to notice that pedestrians are crossing when turning into a side street from a main road]

6. Suonare il clacson per esprimere il tuo disappunto nei confronti di un altro guidatore [Sound your horn to indicate your annoyance to another road user]

7. Non guardare nello specchietto retrovisore prima di uscire, di cambiare corsia, ecc. [Fail to check your rear-view mirror before pulling out, changing lanes, etc.]

8. Inchiodare su una strada scivolosa o sterzare nella direzione sbagliata durante uno sbandamento [Brake too quickly on a slippery road or steer the wrong way in a skid]

9. Uscire da un incrocio così velocemente da obbligare un altro conducente che avrebbe la precedenza a fermarsi per farti passare [Pull out of a junction so far that the driver with right of way has to stop and let you out]

10. Non rispettare i limiti di velocità su una strada residenziale [Disregard the speed limit on a residential road]

11. Accendere qualcosa, ad esempio i fari, mentre intendevi accendere qualcos'altro, ad esempio il tergicristallo [Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers]

12. Svoltando a destra, investire quasi un ciclista che sta procedendo di fianco a te [On turning left nearly hit a cyclist who has come up on your inside]

13. Non vedere i segnali di precedenza ed evitare a malapena una collisione con le macchine che hanno la precedenza [Miss "Give Way" signs and narrowly avoid colliding with traffic having right of way]

14. Cercare di ripartire in terza da un semaforo [Attempt to drive away from the traffic lights in third gear]

15. Cercare di sorpassare qualcuno senza notare che aveva già messo la freccia per segnalare la sua intenzione di svoltare a sinistra [Attempt to overtake someone that you had not noticed to be signaling a right turn]

16. Arrabbiarti con un altro guidatore e inseguirlo per dirgliene quattro [Become angered by another driver and give chase with the intention of giving him/her a piece of your mind]

17. Rimanere su una corsia fino all'ultimo momento pur sapendo che ci sarà un restringimento di carreggiata, per poi immetterti prepotentemente sull'altra corsia [Stay in a motorway lane that you know will be closed ahead until the last minute before forcing your way into the other lane]

18. Dimenticare dove hai parcheggiato la macchina [Forget where you left your car in a car park]

19. Sorpassare a destra una macchina che procede lentamente [Overtake a slow driver on the inside]

20. Partire a tutta velocità davanti a un semaforo con l'intenzione di "battere" il conducente accanto [Race away from traffic lights with the intention of beating the driver next to you]

21. Leggere male la segnaletica e prendere l'uscita sbagliata da una rotatoria [Misread the signs and exit from a roundabout on the wrong road]

22. Avvicinarsi alla macchina che ti precede a tal punto da rendere difficile una frenata in caso di emergenza [Drive so close to the car in front that it would be difficult to stop in an emergency]

23. Attraversare un incrocio quando il semaforo sta per diventare rosso [Cross a junction knowing that the traffic lights have already turned against you]

24. Arrabbiarti con un guidatore ed esprimergli la tua rabbia con ogni mezzo possibile [Become angered by a certain type of a driver and indicate your hostility by whatever means you can]

25. Renderti conto di non avere un ricordo nitido della strada che hai appena percorso [Realise that you have no clear recollection of the road along which you have just been travelling]

26. Sottovalutare la velocità di un veicolo in arrivo durante un sorpasso [Underestimate the speed of an oncoming vehicle when overtaking]

27. Non rispettare i limiti di velocità in autostrada [Disregard the speed limit on a motorway]