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The relationship between drivers' illusion of superiority, aggressive driving, and self-reported risky driving behaviors

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ABSTRACT

This study evaluated the relationships between the better-than-average effect, aggressive driving, and risky driving behavior. We also investigated the moderating role of aggressive driving in the relationship between the better-than-average effect and risky driving behavior. The sample included 366 drivers (50.8% were women; *M*age = 39.13, *SD* = 13.63 years). The participants completed scales measuring the better-than-average effect, aggressive driving, and risky driving behavior, as well as demographic information. The results showed that the better-than-average effect was significantly positively associated with risky driving behavior, as well as with verbal and physical aggression and with the use of the vehicle to express anger. Further, the positive association between the better-than-average effect and risky driving behavior was moderated by the use of the vehicle to express anger. The implications for traffic safety and future research are discussed.

1. Introduction

People often believe they are more capable, competent, and talented (for reviews, see Brown, 2007) and also less biased and prone to errors than others (Pronin, Gilovich, & Ross, 2004). These beliefs are considered illusory because it is unlikely for a majority of people to be above average in every domain (e.g., Taylor & Brown, 1988). Robust "better-than-average" effects (BTA) have been found in different domains, including driving (Horswill, Taylor, Newnam, Wetton, & Hill, 2013; Lajunen & Summala, 1995; Svenson, 1981; Waylen, Horswill, Alexander, & McKenna, 2004). Thus, previous studies found that drivers tend to consider themselves superior to other drivers on several dimensions such as reflexes (Delhomme, 1991; Matthews & Moran, 1986), judgment (Glendon, Dorn, Davies, Matthews, & Taylor, 1996; Matthews & Moran, 1986), driving skills (Glendon et al., 1996; Horswill, Waylen, & Tofield, 2004; Matthews & Moran, 1986; McKenna, Stanier, & Lewis, 1991), and safety behaviors (Delhomme, 1991; Horswill et al., 2004).

Drivers' overestimation of their own abilities combined with the lack of understanding of personal limitations is considered a critical safety factor in traffic (Gregersen, 1996). However, while a number of studies showed that it contributes to excessive risk-taking behind the wheel (Svenson, 1981; Williams, 2003), other studies found little evidence for this relation (Horswill et al., 2004). A few other studies sustain that the tendency to overestimate personal driving abilities can determine a driver to engage in aggressive driving behaviors (Stephens & Ohtsuka, 2014). Therefore, further studies are needed in order to understand the relationships between the BTA effect and different types of driving behaviors. Studying the BTA effect is

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necessary, having in view its implications for traffic safety. To advance in the literature, the first aim of the present study is to assess the direct relationship between the BTA effect and risky driving, while our second goal is to test the associations between the BTA effect and aggressive driving. Further, the third aim of the present study is to explore whether the relationship between the BTA effect and a risky driving behavior is moderated by aggressive driving.

1.1. The better than average effect and risky driving behavior

The BTA effect may be motivated by self-enhancement needs (Brown, 1986). Specifically, people hold more positive opinions about themselves than about others because the belief they are above average generates positive emotions. The lack of information about the others and having more information about oneself is another explanation for the fact that many people tend to regard themselves as better than others (Fiedler, 2000; Moore & Small, 2007; Svenson, 1981).

The fact that drivers tend to rate themselves as more skillful than other drivers (Dogan, Steg, Delhomme, & Rothengatter, 2012; Horswill et al., 2013; Stephens & Ohtsuka, 2014) has important implications for traffic safety and risk-taking behind the wheel (Horswill et al., 2004). Risky driving includes different types of dangerous driving behaviors, such as speeding, tailgating, driving under the influence of drugs or alcohol, red-light running, drowsy driving, multi-tasking, and disuse of safety belts (Dula, Geller, & Chumney, 2011; Harre & Sibley, 2007; Horswill & McKenna, 1999). Several studies found that drivers that underestimate their driving skills and degree of control in traffic situations are more likely to adopt risky driving behaviors and to be more optimistic about the risk of being involved in an accident (Fernandes, Job, & Hatfield, 2007; Harre & Sibley, 2007; Morgan & Job, 1995; Sümer, Özkan, & Lajunen, 2006). Moreover, there is some evidence for the fact that the participants with an overconfidence in their personal driving abilities and that hold the belief that they are safer than average, also tend to consider that traffic safety campaigns do not apply to them (Ulleberg, 2002; Walton & McKeown, 2001). This is paradoxical given the fact that drivers with high skills may be at greater risk because of the tendency to take risks in traffic. However, another study found no significant link between the self-evaluations bias, concerning driving skills, hazard-perception skills, vehicle-control skills, and the engagement in risky driving behavior (Horswill et al., 2004). The authors only found a marginal relationship between the self-assessment score for overall skills and photographic speed, concluding that drivers who consider themselves more skillful compared with the average drivers manifested a slight tendency to prefer going faster. Based on these results, it can be concluded that more research is needed in order to understand how the BTA effect is related to risky driving behavior. In order to add some evidence for the direct implications of the BTA effect in traffic, the first goal of the present study was to assess the relationship between the BTA effect and an overall measure of risky driving behavior.

1.2. The role of aggressive driving behavior

Aggressive driving includes several forms of behavioral manifestations, expressed verbally, physically, or through the use of one's vehicle (Deffenbacher, Lynch, Oetting, & Swaim, 2002), produced with the intention to cause physical and/ or psychological harm to other traffic participants, including pedestrians or other drivers (Dula et al., 2011). Previous studies suggest that the driver's overconfidence, operationalized by the illusion of high control or self-enhancement bias, predicts aggressive driving (Stephens & Ohtsuka, 2014; Sümer et al., 2006). Feelings of control can trigger anger (e.g. Berkowitz, 1990), which is expressed through aggressive behavior (Bogdan, Măirean, & Havârneanu, 2016). Moreover, feelings of anger and its expressions are more probably to appear when the achievement of a goal is blocked by another person (Berkowitz, 1990). Applied to traffic situations, this assumption suggests that participants with self-enhanced perceptions related to skill and control may be more likely to view obstructions as the result of another driver. Consequently, the perception that the others' driving skills are deficient and the illusion of one's superiority can determine a driver to engage in aggressive behaviors (Stephens & Groeger, 2014). However, the evidence concerning the relationship between the BTA effect and aggressive driving is limited. Therefore, the second goal of the present study was to assess the relation between the BTA effect and three expressions of aggressive driving – verbal and physical aggression, the use of the vehicle to express anger, and adaptive aggression.

Many previous studies confirmed the fact that aggressive driving is positively related to risky driving behavior (Beck, Daughters, & Ali, 2013; Dahlen, Edwards, Tubré, Zyphur, & Warren, 2012; Jovanović, Lipovac, Stanojević, & Stanojević, 2011; Richer & Bergeron, 2012; Sullman, Stephens, & Kuzu, 2013). Moreover, the adaptive expression of aggressive driving was negatively related to speed, a form of risky driving (Sullman, 2015; Sullman et al., 2013). Given the fact that aggressive driving can exacerbate risky driving behavior, we can assume that the relationship between BTA and risky driving is moderated by aggressive driving. However, according to our knowledge, it was not examined how BTA and aggressive driving work together in accounting for variations in risky driving behavior. Therefore, the third goal of the present study was to assess the moderating role of aggressive driving in the relation between the BTA effect and risky driving. The entire set of hypotheses is integrated in the model displayed in Fig. 1.

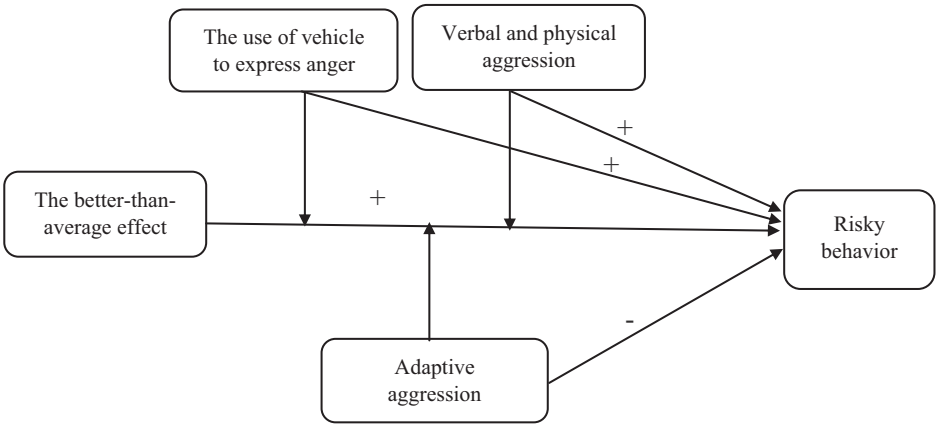

Fig. 1. The hypothesized model.

2. Method

2.1. Participants

A total of 366 drivers took part in this study. From the total of the sample, 50.8% were women. The participants' mean age is 39.13 (*SD* = 13.63) and they had been driving for 13.23 years on average (range 1–55, *SD* = 10.52 years). During their lifetime, the participants reported that they had been involved on average in 0.45 active accidents (range 0–11, *SD* = 0.99), and in 0.81 passive accidents (range 0–10, *SD* = 1.31).

2.2. Instruments

2.2.1. The better-than-average effect

BTA was measured using 9 items that describe how a driver rates his/her driving behavior and driving skills compared to other drivers' behavior and skills (e.g. "Compared to other drivers, I control the vehicle without difficulty".). Ratings are made on a 5-point Likert-type scale, ranging from 1 (totally disagree) to 5 (total agree). The average score was calculated and higher scores indicated higher levels of bias. In our sample, the Alpha Cronbach coefficient is 0.83.

2.2.2. Aggressive driving

The Romanian Driving Anger Expression Inventory (DAX; Sârbescu, 2012) contains 30 items measuring aggressive driving. The ratings are made on a 4-point Likert scale (1 = Almost never, 4 = Almost always). Three types of anger expression can be differentiated (10 items each): Verbal and Physical Aggressive Expression (e.g. "I make negative comments about the other drivers.", "I shake my fist at the other driver."), Using the Vehicle for Aggressive Expression (e.g. "I speed up to frustrate the other driver.") and Adaptive/Constructive Expression (e.g. "I tell myself it is not worth getting angry."). The average scores were computed for each subscale. The internal consistency obtained in the present study was very good (Verbal and Physical Aggressive Expression: $\alpha = 0.84$; Using the Vehicle for Aggressive Expression: $\alpha = 0.81$; Adaptive/Constructive Expression: $\alpha = 0.88$).

2.2.3. The risky driving behavior

A 18-items scale measuring risky driving behavior was derived from two road user behavior questionnaires (Iversen, 2004; Ulleberg & Rundmo, 2003). This version used to assess risky driving was validated for Romanian samples by Măirean, Havârneanu, Popușoi, & Havârneanu (2017). As in previous studies (e.g. Carpentier et al., 2014), the items were selected in order to explore several forms of risky behaviors: speeding and rule violation, drunk-driving, not wearing seat belts, and reckless driving. We excluded items measuring safe behaviors (e.g. "Reduce speed in areas where children play even when no children can be seen."), items describing behaviors which do not depend directly on the driver (e.g. "Ride with a person you know has been drinking too much alcohol."), and items with a similar content in the two scales. The participants rated the frequencies of displaying risky driving behavior, using a 6-point scale from 0 (never) to 5 (very often). An average score was computed with high scores indicating a high level of engaging in risky driving behavior. In our sample, the Alpha Cronbach coefficient was 0.75.

The *demographic questionnaire* asked the participants to report their age, gender, their total mileage, the number of accidents they caused (i.e. active accidents), and the number of accidents they were engaged in, without being guilty (i.e. passive accidents).

2.3. Procedure

After signing the informed consent form, the participants completed the self-report questionnaire. They were informed about the fact that participation is voluntary and that the information provided will be kept confidential. Only persons with a valid driving license were included in the study. There were no other exclusion criteria or restrictions based on demographic variables.

2.4. Overview of statistical analysis

We conducted preliminary analyses to examine the descriptive statistics and the associations for all analyzed variables in the present study. Further, we simultaneously tested the relation between the better-than-average effect and risky driving behavior and also the moderating role of aggressive driving using a structural equation model (SEM) framework in AMOS Graphics 22 (Arbuckle, 2011). SEM permits the estimation of the interaction effects of continuous observed variables, by using the same method as in moderated multiple regression (Kline, 2011). Product terms of the centered scores from BTA and each of the three forms of aggressive driving (i.e. verbal and physical aggressive expression, using the vehicle for aggressive expression, and adaptive expression) were computed, in order to test the moderating role on risky driving behavior. These new variables were computed and saved in the data file before stating the statistical data analysis in AMOS. The main effects of the better-than-average effect and aggressive driving forms were entered in model. We also entered the three interaction terms in the model and we allowed the independent variables to correlate with each other. Commonly-used fit indices were employed to assess the overall model fit: the chi-square statistic (χ^2), the normative fit index (NFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). A RMSEA < 0.05, χ^2/df < 3, NFI and CFI > 0.90 indicate a very good model fit (Hu & Bentler, 1999).

3. Results

3.1. Preliminary analysis

Descriptive statistics for the main variables are presented in Table 1. Participants' age did not significantly correlate with risky driving behavior or with the three forms of aggressive driving, *rs* < 0.06; *ps* > .05. Further, the overall number of kilometers and the total number of kilometers from the last year did not significantly correlate with risky driving behavior ($r = -0.03$, $p = .488$ $r = 0.07$, $p = .166$ respectively), verbal and physical aggression ($r = 0.10$, $p = .051$; $r = 0.04$, $p = .408$ respectively), and adaptive aggression ($r = 0.04$, $p = .391$; $r = -0.008$, $p = .877$ respectively). However, the overall number of kilometers and the total number of kilometers from the last year significantly correlated with the use of vehicle to express anger ($r = 0.12$, $p = .016$; $r = 0.12$, $p = .017$ respectively). Moreover, the number of active and passive accidents did not significantly correlate with risky driving behavior ($r = 0.09$, $p = .072$; $r = 0.09$, $p = .085$ respectively) and with the use of vehicle to express anger ($r = 0.09$, $p = .062$; $r = 0.07$, $p = .162$ respectively). Both active and passive accidents significantly correlated with verbal and physical aggression ($r = 0.13$, $p = .013$; $r = 0.11$, $p = .036$ respectively), while only active accidents significantly correlated with adaptive aggression ($r = -0.13$, $p = .008$). The independent sample *t*-test revealed significant gender differences in risky driving, $t(364) = -3.27$, $p < .001$, and in the use of vehicle to express anger, $t(364) = -4.18$, $p < .001$. Women reported a lower level of risky driving ($M = 1.27$, $SD = 0.51$) and a low tendency to use the vehicle to express anger ($M = 1.30$, $SD = 0.35$), compared to men ($M = 1.47$, $SD = 0.60$; $M = 1.48$, $SD = 0.45$). Therefore, the correlations between the main variables were conducted, controlling for the overall numbers of kilometers, the total number of kilometers from the last year, active and passive accidents, and gender.

3.2. Association among the main study variables

Zero-order associations showed that the better-than-average effect is positively associated with risky driving behavior ($r = 0.19$, $p < .001$), as well as with two forms of aggressive driving behavior: verbal and physical aggression ($r = 0.23$, $p < .001$) and the use of the vehicle to express anger ($r = 0.20$, $p < .001$). Verbal and physical aggression is

Table 1
Means, standard deviations, and minimum and maximum values of the main study variables.

Variables	N	Mean	SD	Minimum	Maximum
1. BTA	366	3.54	0.82	1.33	8.44
2. DAX_VP	366	1.60	0.52	0.89	3.76
3. DAX_VEH	366	1.39	0.41	1.00	3.50
4. DAX_AD	366	3.08	0.65	1.00	4.50
5. Risky driving	366	1.37	0.56	0.17	3.44

Note. BTA = better-than-average effect; DAX_VP = verbal and physical aggression; DAX_VEH = the use of vehicle to express anger; DAX_AD = adaptive aggression.

significantly positively related to risky behavior ($r = 0.42$, $p < .001$). Furthermore, as expected, the use of vehicle to express anger is positively related to risky driving behavior ($r = 0.52$, $p < .001$), while adaptive aggression is negatively associated with risky behavior ($r = -0.44$, $p < .001$). Controlling for the overall numbers of kilometers, the total number of kilometers from the last year, active and passive accidents, and participants' gender did not change the results. Therefore, these variables were not controlled in the subsequent analysis. Based on Cohen's (2013) criteria for magnitude of effect sizes, the results presented above revealed small to medium effect sizes. These results are displayed in Table 2.

3.3. Testing for direct relations and moderation

The fit for our overall model is very good (Fig. 2): χ^2 (3) = 3.008, $p = .390$; $\chi^2/df = 1.002$; NFI = 0.99; CFI = 1; RMSEA = 0.003 (CI: 0.00, 0.08).

There was a significant, positive link between BTA and risky driving behavior ($\beta = 0.11$, $p = .012$). A high level of BTA predicted a high level of risky driving behavior. Further, the use of vehicle to express anger and verbal and physical aggression positively predicted risky driving behavior ($\beta = .35$, $p < .001$; $\beta = 0.11$, $p = .045$ respectively), while adaptive aggression negatively predicted risky driving behavior ($\beta = -0.28$, $p < .001$). Moreover, our results showed that the use of vehicle to express anger moderated the relation between BTA and risky driving ($\beta = -0.09$, $p = .043$). The model explained 37.4% of the variance in risky driving behavior.

The nature of the significant interaction term was graphically displayed in Fig. 3. The relation between BTA and risky driving is significant only for low levels of aggressive driving manifested through the use of vehicle ($b = 0.09$, $p = .040$). Participants with low levels of BTA reported a low level of risky driving, when they also reported a low level of aggressive driving manifested through the use of vehicle. When the use of vehicle to express anger was high, the relation between BTA and risky driving is nonsignificant ($b = 0.01$, $p = .826$).

4. Discussions

The present study investigated the relations between the BTA effect and two types of driving behaviors: aggressive driving, and risky driving. Furthermore, we explored whether the aggressive driving behavior moderates the relationship between the BTA effect and risky driving behavior.

Our results revealed that the BTA effect is positively associated with risky driving behavior. This result confirmed previous studies that also suggested the fact that the overestimation of personal driving skills and of the degree of control in traffic situations is associated with a higher tendency to engage in risky driving behaviors (Fernandes et al., 2007; Sümer et al., 2006). An overestimation of personal driving skills may predispose drivers to adopt a biased perception of traffic hazardous situations (e.g., McKenna, 1993), which in turn results in a higher level of risk acceptance. In order to train safe driving, techniques to reduce the drivers' biases should be considered. Thus, in light of these results, drivers should be trained to identify the hazards in traffic and to correctly asses their ability to cope with them. Future studies are needed in order to clarify if BTA effect involves a 'positive self' (McKenna et al., 1991) or 'negative others' (Walton, 1999), because the implications for traffic safety training could be different.

Furthermore, as we expected, the BTA effect is positively related with two forms of aggressive driving: verbal and physical aggression and the use of the vehicle to express anger. These results add to previous literature on the relationship between driving biases involving overconfidence and aggressive driving behavior (Stephens & Ohtsuka, 2014; Stephens & Groeger, 2014). The feeling of superiority can justify extreme negative reactions to the actions of others, such as an impulsive response to the unexpected maneuver of another driver. Driving practice for the development of driving skills probably increases confidence in personal abilities, especially among less experienced drivers, and this may be associated to a high tendency to use the abilities for anger expression and for engaging in risky driving behaviors. Moreover, the participants with self-enhanced perceptions related to their skills and control in traffic may consider other drivers as responsible for

Table 2
Correlations among the main study variables.

	1	2	3	4	5
1. BTA		0.21***	0.15**	−0.003	0.17**
2. DAX_VP	0.23***		0.67***	−0.32***	0.44***
3. DAX_VEH	0.20***	0.67***		−0.35***	0.52***
4. DAX_AD	−0.01	−0.32***	−0.36***		−0.42***
5. Risky driving	0.19***	0.42***	0.52***	−0.44***	

Note. Lower left – zero-order associations; upper right – partial correlations controlling for the overall numbers of kilometers, the total number of kilometers from the last year, active and passive accidents, and gender. BTA = better-than-average effect; DAX_VP = verbal and physical aggression; DAX_VEH = the use of vehicle to express anger; DAX_AD = adaptive aggression.
$N = 366$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

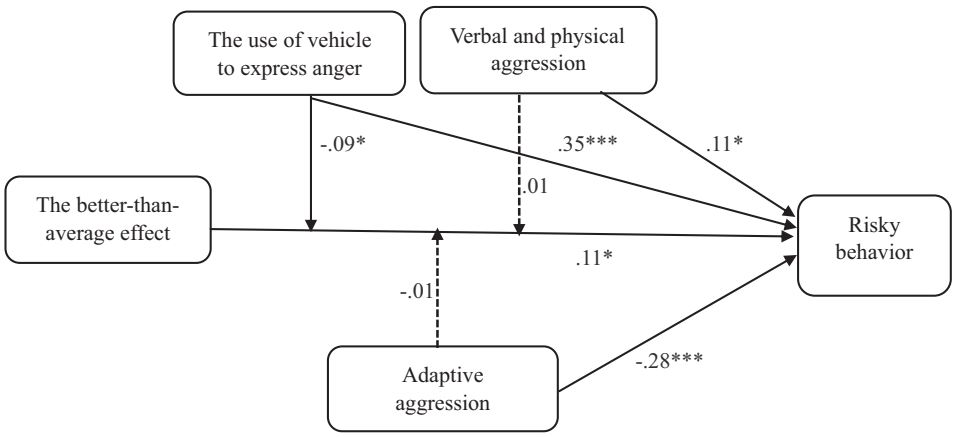

Fig. 2. Structural equation model and path analysis of the determinants of risky driving behaviour (N = 366). Standardized path coefficients are reported. Nonsignificant paths are indicated with dotted lines.

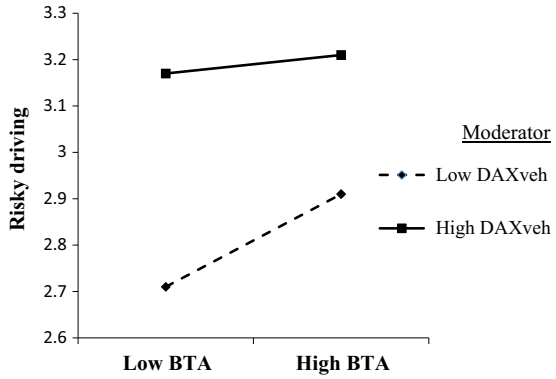

Fig. 3. Graphical representation of the interaction between the use of vehicle to express anger and BTA in predicting risky driving behavior.

obstructions encountered in different traffic situations. This perception may predispose the driver to engage in aggressive behavior, given the fact that anger and its expressions through aggressive behavior are more likely to appear when other persons block the achievement of personal goals (Berkowitz, 1990).

Further, the results showed that the relation between the BTA effect and risky driving behavior is moderated by the use of the vehicle to express anger. Specifically, when the level of BTA increase, risky driving also increase, but only for the participants with a low level of aggressive driving manifested through the use of vehicle. When the level of aggressive driving manifested through the use of vehicle is high, the relation between BTA and risky driving is nonsignificant. In other words, when a high tendency to use the vehicle to express anger was reported, high levels of risky driving were also reported, regardless of the level of BTA. The other two forms of aggressive driving examined in this study do not moderate the relation between BTA and risky driving. These results may suggest that using the vehicle for aggressive expression may be the most dangerous form of aggressive driving. Since few studies have examined the relationship between BTA and risky driving, and no other study explored the moderating role of aggressive driving expression in this relationship, we cannot compare our results with other empirical findings. However, in a previous study, the use of the vehicle to express anger was the only form of aggressive driving associated with negative consequences in traffic (i.e. major crashes) (Sullman, 2015). The explanation for the fact that only the use of vehicle to express anger plays a moderating role in the relationship between BTA and risky driving may rely on the specific of behaviors manifested by the drivers who use vehicles in order to express their anger. These behaviors like driving a little faster or cut in front of the other drivers imply a high level of risk. People who assume these risks, in order to express their anger, may also have a high tendency to engage and in other risky behaviors, in different traffic situations. The implication of our results consists on the fact that low levels of BTA are not enough to reduce risky driving on the road. The driving style should be considered, since particular styles (e.g. aggressive driving) may facilitate the engagement in risky behaviors on the road.

Certain limitations need to be considered when interpreting these results. Firstly, our data rely on self-report that can elicit socially desirable answers. Although some previous findings suggest that the influence of social desirability on self-reported driving behavior is limited and not substantial (Sullman & Taylor, 2010), more research using objective behavioral

measures is needed to explore the relationship between the BTA effect and driving behavior. Secondly, the cross-sectional design of our study does not allow us to clearly establish causal relations between variables. Thirdly, we used an overall measure of risky driving behavior. Since there is evidence that the drivers' cognitive biases are differently associated with different types of risky behavior (Fernandes et al., 2007), future studies should assess the different associations of the BTA effect with different categories of risky driving behaviors.

Despite the limitations presented above, our results have practical implications for traffic safety and driving training, because identifying how cognitive biases may be associated with driving behavior is an important first step in developing strategies to reduce dangerous driving behavior. Interventions designed to improve traffic safety should determine drivers to adopt a realistic perception of their own skills and abilities and should focus them on personal behavior rather than on other drivers' behavior, which may cause the feeling of anger and its expression through aggressive driving. In many countries, including Romania, driving training is mainly focused on skill training, not on the development of a driving style, which shapes the idea that a good driver is a highly skilled driver. The negative consequences of this fact, in terms of driving cognitive biases, should be considered by practitioners, in order to reduce the costs associated with inappropriate driving behavior (e.g. aggressive and risky driving behavior).

Our results could also be used to help practitioners to identify high risk drivers and train them to engage in nonaggressive and responsible driving behavior. If risky driving and aggressive driving can be identified using cognitive biases, researchers and practitioners could use these in interventions designed to improve traffic safety. If effective, the important contributions of these interventions for traffic safety will be completed with minimal training costs by focusing only on the most dangerous drivers. Therefore, traffic campaigns should focus on a target population based on their driving style and personal variables, rather than based on traffic skills. The development of safety driving skills should be considered beginning with driver education and licensing.

As a conclusion, the findings of this study showed that the BTA effect is related with both aggressive driving behavior and risky driving behavior. Moreover, the relationship between the BTA effect and risky driving is moderated by aggressive driving. Future studies should extend these findings, by analyzing the relationship between different cognitive biases and different types of driving behavior.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.trf.2018.02.037.

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