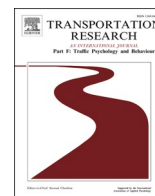




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Investigating sex, masculinity and femininity in relation to impulsive driving and driving anger expression

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ABSTRACT

Human factors constitute a class of prominent road safety related factors. In the present study, human factors of driving were studied by investigating sex differences and gender roles in relation to impulsive driving and driving anger expression. A total of 425 drivers between the ages of 18 and 56 ($M = 25.46$, $SD = 7.58$) participated to the study and completed a series of questionnaires including a demographic information form, the Bem Sex Roles Inventory, the Impulsive Driver Behaviour Scale and the Driving Anger Expression Inventory. According to the ANCOVA results, male drivers showed higher functional impulsivity, lack of premeditation and use of the vehicle to express anger than female drivers. Additionally, hierarchical regression analyses showed that masculinity was positively associated with functional impulsivity, urgency and the dimensions of aggressive anger expression. However, femininity was positively associated with functional impulsivity and adaptive/constructive anger expression, but negatively associated with the dimensions of dysfunctional impulsivity and aggressive anger expression. Overall, the results showed the significant solo effects of masculinity and femininity on impulsive driver behaviours and driving anger expression, over and above the effects of sex, and the interaction between sex and gender roles. In the present study, previously reported findings indicating the relationships between sex and gender roles and driving anger expression were supported and extended by providing the literature with the contribution of answering the question how sex and gender roles are related to impulsive driver behaviours. The findings of the two related concepts of impulsive driving and driving anger expression were discussed in light of the current literature. Contributions, implications and future research directions concerning road safety practices were presented.

1. Introduction

According to the World Health Organization (WHO), 1.35 million road users die as a result of road traffic injuries each year. In fact, most of these deaths are seen in low- and middle-income countries, such as Turkey, where most of the world's population live (WHO, 2018). It is estimated that around 85–90% of these road traffic accidents are preventable. Additionally, more than half of all road traffic accidents are caused by the effects of human factors alone. At the same time, an additional 30–40% of accidents are resulting from the interactions of human factors with vehicular and environmental factors (Lewin, 1982). Since demographic factors (e.g., sex, age),

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personality traits (e.g., impulsiveness, aggression, hostility) and affective factors (e.g., driver anger) have been associated with various driving outcomes (Hennessy, 2011; Taylor, 2011), it is necessary to clarify the precise effects of person-related variables on road safety. Supporting this argument, different studies have examined various factors like impulsive driving (e.g. Bıçaksız, 2015; Mirón-Juárez, García-Hernández, Ochoa-Ávila, & Díaz-Grijalva, 2020), driving anger expression (e.g. Deffenbacher, 2009) and gender roles (e.g. Özkan & Lajunen 2005a) in relation to road safety. In the present study, the literature was provided with a detailed research of impulsive driver behaviours and driving anger expression by investigating them in relation to sex and gender roles.

1.1. Impulsive driving

Impulsivity is one of the factors associated with various driving outcomes, such as aberrant and aggressive driver behaviours (Bıçaksız & Özkan, 2016a). Impulsivity can be defined as the tendency to show inappropriate or maladaptive behaviours and the tendency to deliberate less than others before taking action (de Wit, 2009; Dickman, 1990). Although such lack of deliberation may seem to be negative, some studies assert that impulsive behaviours do not always have negative consequences (Dickman, 1990). For instance, highly impulsive people tend to make more accurate decisions when they have to do so in a very short time (Dickman & Meyer, 1988).

Although clear examples of impulsive behaviours exist, there is no straightforward definition of impulsivity, since it has been studied in different areas via various methods (Evensen, 1999). For example, Depue and Collins (1999) claim that impulsivity falls within the cluster of certain personality traits like sensation seeking, boldness, novelty-seeking and risk-taking. On the other hand, Eysenck and Eysenck (1977) have investigated this concept with respect to the personality factors, namely neuroticism, extraversion and psychoticism. In their research, four specific dimensions of impulsivity: narrow impulsiveness, risk-taking, non-planning and liveliness were identified, each of which relates differently to extraversion, neuroticism and psychoticism (Eysenck & Eysenck, 1977). Moreover, Zuckerman et al. (1991) discussed this concept in terms of a general model of personality. They developed a five-factor model that includes an impulsive sensation-seeking subscale reflecting a lack of planning and the tendency to act without thinking (Zuckerman et al., 1988).

Dickman (1990), however, differentiates between functional and dysfunctional impulsivity. Although both forms of impulsivity share a tendency to engage in rapid, error-prone information processing, with a little forethought, in functional impulsivity, such a style is optimal and beneficial. On the contrary, in dysfunctional impulsivity, this tendency is non-optimal and a source of difficulty. Functional impulsivity is more closely related to enthusiasm, adventurousness and general activity level, resulting in positive consequences. In contrast, dysfunctional impulsivity is more closely related to disorderliness and a tendency to ignore the facts while making decisions, which leads to negative consequences (Dickman, 1990).

As Bıçaksız and Özkan (2016a) point out, such general conceptualisations of impulsivity have been used in studies examining the relations between this construct and different driving-related constructs and outcomes. However, to meet the need for a driving-specific conceptualisation of impulsivity, Bıçaksız (2015) defined driving-specific impulsivity or traffic impulsivity as the tendency to act quickly while driving, whether inaccurately or accurately, without considering the future consequences of those actions. Bıçaksız and Özkan (2016b) developed the Impulsive Driver Behaviour Scale (IDBS) to measure driving-specific impulsive behaviours under four factors, namely driver functional impulsivity, driver urgency, driver lack of premeditation and driver lack of perseverance.

Driver urgency, which corresponds to motor impulsiveness, is defined as acting on the spur of the moment (Bıçaksız, 2015; Patton et al., 1995) and is related to acting without thinking in traffic. Driver lack of premeditation corresponds to non-planning type of impulsivity and is defined as having a lack of self-control or cognitive complexity (Bıçaksız, 2015; Patton et al., 1995). This dimension is related to acting without thinking about the future consequences of behaviours while driving. Driver lack of perseverance reflects attentional or cognitive impulsivity and is characterised by the inability to focus on or finish tasks while driving (Bıçaksız, 2015; Patton et al., 1995). In addition to these three dimensions, which form dysfunctional driver impulsivity, functional impulsivity was also transformed to suit the driving context. Driver functional impulsivity is related to quick thinking and making correct decisions while driving (Bıçaksız, 2015).

Furthermore, researchers have found that driving- or traffic-specific impulsivity contributes more and explains a higher amount of variance than general impulsivity (Bıçaksız, 2015; Bıçaksız & Özkan, 2016b). In terms of driver behaviours, drivers high in driver urgency, driver lack of premeditation and driver lack of perseverance reported higher levels of violations, errors and lapses, while driver functional impulsivity was negatively related to errors and lapses. Additionally, lack of premeditation was negatively related to positive driver behaviours, while driver functional impulsivity was positively related to positive driver behaviours (Bıçaksız, 2015; Bıçaksız & Özkan, 2016b).

Certain demographic variables such as age, exposure to traffic and sex are associated with differences in impulsivity. Berdoulat et al. (2013) found that age was negatively correlated with lack of premeditation and lack of perseverance. In another study, Kováčsová et al. (2016) found a negative correlation between age and dysfunctional impulsivity, while Bıçaksız and Özkan (2016b) found a positive correlation between age and driver functional impulsivity, and negative correlations between age and driver lack of premeditation, lack of perseverance and urgency.

Regarding the relation between exposure to traffic and impulsivity, Bıçaksız and Özkan (2016b) found significant negative correlations between total kilometres and different dimensions such as motor impulsivity, urgency and lack of premeditation. Furthermore, total kilometres was also positively correlated with driver functional impulsivity and negatively correlated with driver urgency. On the other hand, in another study, the relationship between exposure and dysfunctional impulsivity was not significant (Kováčsová et al., 2016). Additionally, Navas et al. (2019), who used a more general conceptualisation of impulsivity, found that males showed more lack of perseverance than females. In the study conducted by Bıçaksız (2015), male drivers reported higher motor impulsivity,

sensation-seeking and dysfunctional impulsivity as forms of general impulsivity, and higher driver functional impulsivity and driver lack of premeditation.

In the literature, different studies have examined the relationship between impulsivity and road safety with various driving-related outcomes, such as risky driving (Monteiro et al. 2018) or driving anger and anger expression (Bıçaksız and Özkan, 2016a; Dahlen, Martin, Ragan, & Kuhlman, 2005; Deffenbacher, Filetti, Richards, Lynch, & Oetting, 2003b; Mirón-Juárez et al., 2020); and have employed a variety of methods, such as self-reports (Bıçaksız & Özkan, 2016b) or driving simulators (Bıçaksız et al., 2019). Individuals with higher impulsivity have less self-control to abstain from engaging in risky behaviours (Barratt, 1994). High level of impulsivity has been related to drunk driving, reduced seatbelt-use (Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996) and aggressive driving (Dahlen et al., 2005). Impulsivity was also significantly related to driving anger (Dahlen et al., 2005; DePasquale et al., 2001). Different forms of aggressive driving anger expression, namely physically aggressive expression, verbally aggressive expression, and use of a vehicle to express anger, were related to impulsivity. Unsurprisingly, drivers with higher levels of impulsivity tend to be more aggressive when expressing their anger (Dahlen et al., 2005; Deffenbacher et al., 2003b).

1.2. Driving anger expression

Driving anger is defined as anger-related feelings and thoughts that are elicited by specific situations in traffic (Deffenbacher, Oetting, & Lynch, 1994). According to Deffenbacher (2009), drivers with higher levels of anger have certain general characteristics that differentiate them from other drivers. More specifically, these drivers experience anger more frequently and more intensely under various situations. They also tend to show more aggressive thinking and behaviours. As a result of these intensely emotional experiences, drivers with higher levels of anger experience more negative outcomes in traffic and are more likely to engage in risky behaviours (Deffenbacher, 2009; Nesbit & Conger, 2012). On the other hand, drivers with lower levels of anger report safer behaviours than those with higher levels of anger (Bachoo et al., 2013; Berdoulat et al., 2013; Dahlen & White, 2006; Deffenbacher, Deffenbacher, Lynch, & Richards, 2003a).

At this point, it is essential to consider the consequences of driving anger and how it is related to aggressive and risky driving. According to literature, drivers with higher levels of anger are more likely to experience adverse traffic-related outcomes (Iversen & Rundmo, 2002) and report higher levels of lapses, errors and violations (Berdoulat et al., 2013). Furthermore, these drivers tend to show higher levels of minor losses of vehicular control (Dahlen & White, 2006; Sullman et al., 2014). High-anger drivers also show more speeding behaviours, and their times and distances to the collision are also shorter in high impedance simulations (Deffenbacher et al., 2003a).

Besides, anger also decreases the performance of drivers in a driving simulator, resulting in higher speed and more acceleration (Roidl et al., 2013). High-anger drivers also express their anger more aggressively and experience more negative outcomes such as risky behaviours in different situations (Deffenbacher et al., 2002; Deffenbacher et al., 2003a; Nesbit & Conger, 2012). Additionally, they express their anger more frequently in both verbal and physical ways (Deffenbacher et al., 2003a). Considering the relationship with driving outcomes, when aggressive driving increases, the severity of injuries also increases (Paleti et al., 2010). Moreover, drivers who use their vehicle to express anger reported higher levels of fines. The adaptive expression is negatively correlated with risky driving behaviours (Ge et al., 2015).

Drivers' levels of anger and anger expression are influenced by various driver characteristics (Berdoulat et al., 2013; Lajunen & Parker, 2001). For instance, Lajunen and Parker (2001) and Li et al. (2014) found that younger drivers are more likely to experience and report higher levels of anger while driving. Additionally, younger drivers in different countries also express their anger more aggressively (Esiyok, Yasak, & Korkusuz, 2007; Herrero-Fernández, 2011; Paleti, Eluru, & Bhat, 2010; Sărbescu, 2012; Sullman, 2015). One possible explanation for this age difference is that older, more experienced drivers might be more tolerant of anger-provoking traffic situations than younger drivers (Lajunen et al., 1998). However, contradictory findings indicated no difference between young and old drivers (Bachoo et al., 2013). Similarly, researchers have also found that drivers with high and low exposure to traffic do not differ in terms of their level of anger (Deffenbacher et al., 2003a; Deffenbacher, Lynch, Oetting, & Yingling, 2001). However, Sullman (2015) reported that, as the kilometres driven increase, drivers report higher levels of aggressive behaviours.

In addition to the effects of age and traffic exposure, sex differences in driving anger and driving anger expression have also been reported in various studies. Male drivers more frequently express their anger in aggressive ways (González-Iglesias et al., 2012) and by using their vehicle to express anger, whereas female drivers tend to show more adaptive and constructive anger expression (Esiyok et al., 2007). Additionally, while male drivers tend to show higher frequencies of aggressive behaviours while driving, female drivers become angrier than males when there are traffic obstructions that cause roadblocks (González-Iglesias et al., 2012). In another study with Romanian and Serbian samples, Sărbescu et al. (2014) investigated sex differences in driving anger expression after controlling the statistical effects of kilometres driven. In the Romanian sample, sex difference was found only in the use of the vehicle to express anger, with male drivers expressing anger in this way more than females. In the Serbian sample, male drivers also used their vehicle to express anger more frequently, while female drivers reported to display more adaptive/constructive anger expression. This pattern of anger expression was also reported by Gras et al. (2016) who found that male drivers exhibited more physically aggressive expressions and used vehicle more frequently to express anger, whereas female drivers displayed more adaptive/constructive anger expression.

1.3. Gender roles in driving

As discussed by Sümer (2003) in the contextual mediated model, different forms of behaviours (driving anger expression and impulsive driver behaviours in the present study) were affected by various distal context variables such as demographic variables and

Table 1
Descriptive and correlation values of study variables.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Age	1											
2. Lifetime km	0.58**	1										
3. Masculinity	0.01	0.07	1									
4. Femininity	0.14**	0.11*	0.24**	1								
5. Functional	0.06	0.16**	0.31**	0.18**	1							
6. Urgency	-0.16**	-0.06	0.13**	-0.24**	0.08	1						
7. Premeditation	-0.08	0.07	-0.10*	-0.39**	-0.28**	0.41**	1					
8. Perseverance	-0.08	-0.10	-0.09	-0.22**	-0.41**	0.37**	0.45**	1				
9. Verbally agg.	-0.06	-0.04	0.06	-0.18**	0.09	0.50**	0.14**	0.21**	1			
10. Physically agg.	-0.01	-0.00	0.09	-0.23**	-0.02	0.38**	0.35**	0.36**	0.50**	1		
11. Use of vehicle	-0.03	0.07	0.16**	-0.18**	0.18**	0.58**	0.40**	0.28**	0.52**	0.63**	1	
12. Adaptive exp.	0.11*	0.04	0.10*	0.28**	0.13**	-0.39**	-0.32**	-0.15**	-0.21**	-0.13**	-0.28**	1
<i>M</i>	25.46	39397.04	4.90	5.59	3.78	2.68	1.81	2.33	2.28	1.24	1.63	2.61
<i>SD</i>	7.58	70809.37	0.75	0.75	0.60	0.72	0.46	0.66	0.65	0.40	0.54	0.58

Note. * $p < .05$, ** $p < .01$. Functional: Driver functional impulsivity, Urgency: driver urgency, Premeditation: Driver lack of premeditation, Perseverance: Driver lack of perseverance, Verbally agg.: Verbally aggressive expression, Physically exp.: Physically aggressive expression, Adaptive exp.: Adaptive/constructive expression.

relatively stable personality characteristics. Two of those distal context factors that are also addressed in the present study are sex and gender roles. Briefly, people learn how to behave or how to interact based on conceptions of masculinity and femininity. It is essential to clarify the significance of gender roles because masculinity and femininity are closely related to a person's self-concept. Femininity refers to the attributions, behaviours and roles which are more typical and desirable for a woman than for a man, whereas masculinity refers to the attributions, behaviours and roles that are typical for men (Bem, 1974).

Gender roles are endorsed by individuals regardless of their sex and have been found to be associated with aberrant driver behaviours (Özkan & Lajunen, 2005a), driving skills (Özkan & Lajunen, 2006) and driving anger expression (Sullman, Paxion, & Stephens, 2017a; Sullman, Stephens, & Hill, 2017b). More specifically, Özkan and Lajunen (2005a) found an asymmetric relationship between gender roles and aberrant driver behaviours such that masculinity had a positive relationship with aggressive and ordinary violations and offences. In contrast, femininity was negatively associated with aggressive and ordinary violations, errors, offences and accidents. In another study, Albentosa et al. (2018) found that higher masculinity was associated with higher trait driving anger, whereas femininity was not significantly related to this variable. They argued that, though the effects were not that strong, masculinity could be considered a predisposition to anger. Moreover, a similar asymmetric relationship was also observed in the intensity of state anger, such that masculinity was positively related to the intensity of state anger, while femininity was negatively related to this variable.

Additionally, Sullman et al. (2017b) found that femininity was positively associated with adaptive/constructive anger expression and negatively associated with aggressive anger expression. Furthermore, while the sex of the drivers did not affect different forms of driving anger expression, femininity contributed most to the prediction of adaptive/constructive anger expression (Sullman et al., 2017b). Sullman et al. (2017a) also found that drivers with higher levels of masculinity showed higher frequencies of aggressive anger expression, while femininity was positively associated with adaptive/constructive anger expression. Overall, the general pattern of relationships indicates that masculinity and femininity generally show asymmetric relationships with unsafe driving outcomes, such as aberrant and aggressive driver behaviours and offences.

1.4. The current study

As highlighted earlier, sex differences and gender roles have also been found to affect various driver behaviours and driving outcomes. Moreover, the previous literature showed that both impulsive driver behaviours and driving anger expression have been associated with various driving outcomes and have substantial effects on road safety. As stated earlier, drivers with high impulsivity are more prone to exhibit driving anger and aberrant driver behaviour. Ball et al. (2018) also discussed that impulsivity could be a predisposition to become aggressive and show aggressive behaviours while driving. Similarly, Pérez-Moreno, Hernández-Lloreda, Gallego-Largo, and Castellanos (2015) found impulsiveness was positively associated with aggressiveness while driving.

Since impulsivity is one of the predictors of driver anger expression (Mirón-Juárez et al., 2020; Pérez-Moreno et al., 2015) and driver anger expression is also related to risky behaviours in traffic (e.g., Deffenbacher, 2009), it is thought that investigating the relations of certain variables (sex and gender roles in the current study) on driver anger expression and impulsive driver behaviour together will provide a better opportunity to examine the relations of these antecedents with these variables, and will benefit from a more detailed understanding of the relationship between these two groups of behaviours. In light of these findings, the present study was conducted to analyse how sex and gender roles are related to impulsive driver behaviours and driving anger expression. To the best of our knowledge, this is the first time that the relationship between gender roles and impulsive driver behaviours has been investigated. Additionally, the present study is the first study examining the relationship between sex, gender roles and driving anger expression relationship with a Turkish sample.

Accordingly, the two main objectives of the study were:

- (1) to examine the sex differences in impulsive driver behaviours and driving anger expression;
- (2) to examine the relations of sex and gender roles with impulsive driver behaviours and driving anger expression.

2. Method

2.1. Participants and procedure

In the present study, 425 participants between the ages of 18 and 56 ($M = 25.46$, $SD = 7.58$, $Median = 23.00$) were recruited. The average lifetime kilometres driven was 39397.04 ($SD = 70809.37$). In terms of the sex distribution, 44.5% of the participants were females ($N = 189$), and 55.5% were males ($N = 236$).

After receiving ethical approval (Protocol No: 2015-SOS-142) from the Applied Ethics Research Center of Middle East Technical University, a survey link and paper–pencil forms of the survey were distributed to participants, who were recruited using convenience and snowball sampling. The link was distributed through social media channels. Besides, the authors also contacted university staff to distribute the survey link. Some of the participants earned bonus points in courses for their voluntary participation. The anonymity and confidentiality of all participants were ensured in both the online and paper–pencil forms of the survey. The informed consent form and measurements were given separately to the participants who filled out the questionnaire in classrooms. The informed consent form was only used to determine the participants receiving bonus points. Those participants were also able to take the package with them to complete later and bring it back to the first author’s office. In the online system, bonus points were automatically given to the students by generating an anonymous id for each participant. Except for the bonus point process, no identifier was used, and the data collection process was completely anonymous and confidential.

2.2. Measures

2.2.1. Bem sex-role inventory

The short version of the Bem Sex-Role Inventory (BSRI), which consists of three subscales: masculine, feminine and neutral, was used to measure gender stereotypes. In the present study, 20 items representing masculine and feminine characteristics were used and rated on a 7-point Likert-type scale ranging from 1 (almost never true) to 7 (almost always true). The short version of the scale was adapted into Turkish by Özkán and Lajunen (2005b). In this adaptation, the masculinity subscale includes 10 items measuring male characteristics in society, such as being dominant, and the femininity dimension includes ten items focusing on female characteristics in society, such as being emotional. The Cronbach’s alpha reliabilities of masculinity and femininity were 0.74 and 0.80, respectively.

2.2.2. Impulsive driver behaviour scale

The Impulsive Driver Behaviour Scale (IDBS) was developed to measure the impulsive behaviours of drivers in traffic (Bıçaksız & Özkan, 2016b). This is a four-factor scale consisting of 42 items rated on a 5-point Likert-type scale ranging from 1 (does not reflect me at all) to 5 (completely reflects me). The first factor, driver functional impulsivity, is assessed with 13 items. A sample item for this subscale is “I can make up my mind very quickly in an emergency”. The second factor, driver urgency, is measured via 11 items, such as “Although I am not in a hurry, I am impatient while driving”. The third factor is driver lack of premeditation, which is assessed with 10

Table 2
Sex differences in impulsive behaviours and anger expression.

Variables	Sex	<i>M</i>	<i>SD</i>	<i>F</i> (1, 410)	<i>p</i>	η_p^2
Functional	Male	3.89	0.57	15.43	0.000	0.04
	Female	3.64	0.61			
Urgency	Male	2.72	0.69	1.57	0.210	0.00
	Female	2.61	0.76			
Premeditation	Male	1.87	0.47	6.54	0.011	0.02
	Female	1.73	0.44			
Perseverance	Male	2.29	0.64	1.73	0.189	0.00
	Female	2.38	0.68			
Verbally agg.	Male	2.27	0.66	0.23	0.629	0.00
	Female	2.30	0.65			
Physically agg.	Male	1.26	0.41	0.53	0.465	0.00
	Female	1.23	0.40			
Use of vehicle	Male	1.72	0.55	12.53	0.000	0.03
	Female	1.51	0.52			
Adaptive exp.	Male	2.56	0.60	2.38	0.124	0.01
	Female	2.66	0.56			

Note: Functional: Driver functional impulsivity, Urgency: driver urgency, Premeditation: Driver lack of premeditation, Perseverance: Driver lack of perseverance, Verbally agg.: Verbally aggressive expression, Physically agg.: Physically aggressive expression, Adaptive exp.: Adaptive/constructive expression.

items, an example of which is “I drive by paying attention to the weather conditions” (reversed item). The final factor, driver lack of perseverance, was measured using 8 items. A sample item for this subscale is “I may not act appropriately in an emergency because of absence of mind”. The Cronbach’s alpha reliabilities of the subscales were 0.89 for driver functional impulsivity, 0.85 for driver urgency, 0.75 for driver lack of premeditation and 0.79 for driver lack of perseverance.

2.2.3. Driving anger expression inventory

The Driving Anger Expression Inventory (DAX) was used to measure how drivers express their driving anger in traffic situations. This is a four-factor scale consisting of 49 items scored on a 4-point Likert-type from 1 (almost never) to 4 (almost always). In previous studies, the Cronbach’s alpha reliabilities of the subscales have been between 0.80 and 0.90 (Deffenbacher et al., 2002). In the present study, the Turkish adaptation was used (Esiyok et al., 2007). The first factor, “verbally aggressive expression” was measured via 12 items, such as “I make negative comments about the other driver”. The second factor, “physically aggressive expression” was assessed with 11 items, e.g., “I try to get out of the car and tell the other driver off”. The third DAX factor is “using the vehicle for aggressive expression”, which was measured via 11 items. The sample item for this factor is “I try to cut in front of other drivers”. The final factor, “adaptive/constructive expression”, was assessed via 15 items, such as “I think things through before I respond”. The Cronbach’s alpha reliabilities of the subscales were 0.90 for verbally aggressive expression, 0.88 for physically aggressive expression, 0.88 for use of the vehicle for aggressive expression and 0.89 for adaptive/constructive anger expression.

2.2.4. Demographic information form

Participants also completed a demographic information form that included questions related to their general and driving-related details, such as age, sex and total kilometres driven.

2.3. Analyses

A total of 664 responses was collected for the study. Participants with partial responses and those with outlier scores (z-scores of 3.5) in terms of lifetime kilometres and age ($N = 239$) were removed from the data and not included into the further analyses. In the first phase of analysis, descriptive statistics and bivariate correlations were computed and are presented in Table 1. Eight ANCOVA analyses were then conducted to test sex differences in impulsive driver behaviours and driving anger expression after controlling the statistical effects of age and lifetime kilometres driven. In line with the second objective, i.e., investigating main and interaction effects of sex (male and female) and gender roles (masculinity and femininity) on impulsive driver behaviours and driving anger expression, eight hierarchical regression analyses were performed to test the effects of sex and gender roles on impulsive driver behaviours and driving anger expression. In the regression analyses, age and lifetime kilometres driven were entered in the first step as initial control variables. The variance inflation factor values indicated there were no problems of multicollinearity regarding age and lifetime kilometres. In the second step, sex, masculinity and femininity were entered, and then, the interaction terms were entered in the model. Masculinity and femininity were centred, and then interaction terms were calculated by following the procedure outlined by Aiken and West (1991). In the second and third steps, the centred version of the gender roles and interaction terms were used. Analyses were conducted using SPSS v.24. To avoid repetition, dimensions of impulsive driver behaviours were written without “driver” (e.g. “urgency” rather than “driver urgency”).

3. Results

3.1. Descriptive statistics and correlations

Descriptive statistics and bivariate correlation analyses’ results for all study variables are provided in Table 1. Results indicated that higher age was associated with higher lifetime kilometres driven, femininity and adaptive/constructive expression and lower urgency. Higher lifetime kilometres driven was related to higher femininity and functional impulsivity. Masculinity was positively associated with femininity, functional impulsivity, urgency, use of the vehicle and adaptive/constructive expression, and negatively associated with driver lack of premeditation. Femininity was positively associated with higher functional impulsivity and adaptive/constructive expression, and negatively associated with dimensions of dysfunctional impulsivity and aggressive expression. The dimensions of dysfunctional impulsivity were positively associated with each other, while functional impulsivity was negatively related to lack of premeditation and lack of perseverance. The dimensions of aggressive expression were positively related to each other and negatively associated with adaptive/constructive expression. Higher adaptive/constructive expression associated with higher functional impulsivity and lower dysfunctional impulsivity. The dimensions of aggressive expression were positively related to the dimensions of dysfunctional impulsivity.

3.2. Sex differences among impulsive behaviours and anger expression

To test sex difference among impulsive driver behaviours and anger expression, eight different ANCOVA analyses comparing male ($N = 233$) and female ($N = 181$) drivers were conducted (see Table 2) in which age and lifetime kilometres driven were entered as control variables. Significant sex differences were found for functional impulsivity, lack of premeditation and use of the vehicle for aggressive expression. Male drivers reported higher functional impulsivity, lack of premeditation and use of the vehicle for aggressive expression scores as compared to female drivers.

Table 3
Hierarchical regression analyses on impulsive driver behaviours.

	Driver Functional Impulsivity					Driver Urgency					Driver Lack of Premeditation					Driver Lack of Perseverance				
	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	F	β	p
1. Demographic Variables	0.03	0.03**	5.82		0.003	0.03	0.03**	5.97		0.003	0.03	0.03**	6.08		0.002	0.01	0.01	1.83		0.162
Age				-0.06	0.280				-0.19	0.001				-0.19	0.002				-0.02	0.719
Lifetime km				0.19	0.001				0.05	0.374				0.18	0.003				-0.08	0.185
2. Sex and gender roles	0.15	0.13***	20.37		0.000	0.12	0.09***	13.35		0.000	0.18	0.15***	24.80		0.000	0.06	0.05***	7.54		0.000
Sex (1 = male, 2 = female)				-0.19	0.000				0.00	0.929				-0.07	0.125				0.10	0.044
Femininity				0.14	0.003				-0.28	0.000				-0.36	0.000				-0.22	0.000
Masculinity				0.24	0.000				0.20	0.000				-0.04	0.444				0.00	0.999
3. Interactions	0.16	0.01	0.73		0.532	0.12	0.01	0.79		0.502	0.18	0.00	0.22		0.885	0.07	0.01	1.08		0.355
Sex * Femininity				0.19	0.203				0.07	0.662				-0.11	0.455				-0.27	0.081
Sex * Masculinity				-0.16	0.310				-0.06	0.711				-0.01	0.936				0.02	0.900
Femininity * Masculinity				-0.00	0.942				-0.06	0.180				0.00	0.993				0.00	0.965

Note. Change in R²: * p < .05, ** p < .01, *** p < .001. Df, F-Test: 1st Step = 2, 411; 2nd Step = 5, 408, 3rd Step = 8, 405.

Table 4
Hierarchical regression analyses on driver anger expression.

	Verbally Aggressive Expression					Physically Aggressive Expression					Use of the Vehicle					Adaptive/Constructive Expression				
	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	FΔ	β	p	R ²	ΔR ²	FΔ	β	p
1. Demographic Variables	0.00	0.00	0.70		0.499	0.00	0.00	0.02		0.979	0.01	0.01	2.95		0.053	0.01	0.01	2.63		0.073
Age				-0.06	0.334				-0.01	0.840				-0.11	0.058				0.13	0.029
Lifetime km				0.00	0.999				0.01	0.929				0.14	0.020				-0.04	0.495
2. Sex and gender roles	0.05	0.05***	6.64		0.000	0.08	0.08***	11.20		0.000	0.10	0.09***	13.28		0.000	0.09	0.08***	11.27		0.000
Sex (1 = male, 2 = female)				0.07	0.148				0.03	0.609				-0.12	0.016				0.04	0.387
Femininity				-0.21	0.000				-0.27	0.000				-0.21	0.000				0.25	0.000
Masculinity				0.13	0.010				0.17	0.001				0.19	0.000				0.05	0.293
3. Interactions	0.05	0.00	0.29		0.832	0.08	0.00	0.56		0.645	0.11	0.01	0.70		0.551	0.09	0.00	0.32		0.809
Sex * Femininity				0.10	0.500				-0.10	0.505				0.16	0.274				0.02	0.922
Sex * Masculinity				0.04	0.788				0.19	0.251				0.06	0.725				-0.14	0.393
Femininity * Masculinity				-0.02	0.685				0.01	0.800				-0.03	0.547				0.03	0.567

Note. Change in R²: * p < .05, ** p < .01, *** p < .001. Df, F-Test: 1st Step = 2, 411; 2nd Step = 5, 408, 3rd Step = 8, 405.

3.3. Sex, gender roles and impulsive driver behaviours

To test the relations of sex and gender roles with impulsive driver behaviours, four different hierarchical regression analyses were conducted. In the first step, demographic variables age and lifetime kilometres were entered to the model as control variables. In the second step, sex and gender roles (femininity and masculinity) were entered. Finally, the interactions (sex * femininity, sex * masculinity, femininity * masculinity) were entered (see Table 3). For functional impulsivity, the model was significant, $F(8, 405) = 9.56$, $p < .001$, and explained 16% of the variance ($R^2 = 0.16$). From the demographic variables, lifetime kilometres driven (95% CI [0.00, 0.00]) was positively related to functional impulsivity. Sex (95% CI [-0.34, -0.11]) was negatively related to functional impulsivity, and both masculinity (95% CI [0.11, 0.26]) and femininity (95% CI [0.04, 0.19]) were positively related to functional impulsivity. After controlling the statistical effects of demographic variables, being male, higher masculinity and higher femininity were associated with higher functional impulsivity. For urgency, the model was significant, $F(8, 405) = 6.92$, $p < .001$, and explained 12% of the variance ($R^2 = 0.12$). From the demographic variables, age (95% CI [-0.03, -0.01]) was negatively related to urgency. Moreover, masculinity (95% CI [0.10, 0.29]) was positively related to urgency, while femininity (95% CI [-0.35, -0.17]) was negatively related to this dimension of impulsivity. After controlling the statistical effects of demographic variables, higher masculinity and lower femininity were associated with higher urgency.

For lack of premeditation, the model was significant, $F(8, 405) = 11.10$, $p < .001$, and explained 18% of the variance ($R^2 = 0.18$). From the demographic variables, lifetime kilometres driven (95% CI [0.00, 0.00]) was positively related to lack of premeditation, while age (95% CI [-0.02, -0.00]) was negatively related to lack of premeditation. Moreover, femininity (95% CI [-0.28, -0.16]) was negatively related to lack of premeditation. After controlling the statistical effects of demographic variables, higher femininity was related to lower impulsive driver behaviours associated with lack of premeditation. For lack of perseverance, the model was significant, $F(8, 405) = 3.71$, $p < .001$, and explained 7% of the variance ($R^2 = 0.07$). Sex (95% CI [0.00, 0.26]) was positively related to lack of perseverance, while femininity (95% CI [-0.28, -0.11]) was negatively related to lack of perseverance. After controlling the statistical effects of demographic variables, being female and lower femininity were associated with more impulsive driver behaviours related to lack of perseverance.

Overall, femininity was positively associated with functional impulsivity and negatively associated with the three dimensions of dysfunctional impulsivity: urgency, lack of premeditation and lack of perseverance. Additionally, masculinity positively related to functional impulsivity and urgency. The results also showed that being female is significantly positively associated with lack of perseverance and negatively associated with functional impulsivity. None of the interaction effects were significant.

3.4. Sex-roles and driving anger expression

To test the relations of sex and gender roles with driving anger expression, four different hierarchical analyses were conducted. In the first step, demographic variables age and lifetime kilometres were entered to the model as control variables. In the second step, sex and gender roles (femininity and masculinity) were entered. Finally, the interactions (sex * femininity, sex * masculinity, femininity * masculinity) were entered in the third step (see Table 4). In terms of verbally aggressive expression, the model was significant, $F(8, 405) = 2.76$, $p = .006$, and explained 5% of the variance ($R^2 = 0.05$). Masculinity (95% CI [0.03, 0.20]) was positively associated with verbally aggressive expression, while femininity (95% CI [-0.27, -0.10]) was negatively associated with verbally aggressive expression. After controlling the statistical effects of demographic variables, higher masculinity and lower femininity were associated with higher rates of verbally aggressive expression. For physically aggressive expression, the model was significant, $F(8, 405) = 4.40$, $p < .001$, and explained 8% of the variance ($R^2 = 0.08$). Masculinity (95% CI [0.04, 0.14]) was positively associated with physically aggressive expression, and femininity (95% CI [-0.20, -0.09]) was negatively associated with physically aggressive expression. After controlling the statistical effects of demographic variables, higher masculinity and lower femininity were associated with higher rates of physically aggressive expression.

In terms of use of the vehicle to express anger, the model was significant, $F(8, 405) = 6.03$, $p < .001$, and explained 11% of the variance ($R^2 = 0.11$). Masculinity (95% CI [0.07, 0.21]) was positively associated with physically aggressive expression, while both sex (95% CI [-0.24, -0.02]) and femininity (95% CI [-0.22, -0.08]) were negatively associated with physically aggressive expression. After controlling the statistical effects of demographic variables, being male, higher masculinity and lower femininity were positively related to higher use of the vehicle for anger expression. For adaptive/constructive expression, the model was significant, $F(8, 405) = 5.03$, $p < .001$, and explained 9% of the variance ($R^2 = 0.09$). Femininity (95% CI [0.12, 0.27]) was positively associated with adaptive/constructive expression. After controlling the statistical effects of demographic variables, femininity was positively associated with adaptive/constructive expression.

The results indicated positive relations between masculinity and the dimensions of aggressive anger expression (verbally anger expression, physically anger expression and use of the vehicle), and negative relations between femininity and dimensions of aggressive anger expression. Femininity was positively associated with adaptive/constructive anger expression, but the effect of masculinity was not significant. Besides, none of the interaction effects were significant.

4. Discussion

The present study focused on two objectives. The first objective was to examine sex differences in relation to impulsive driver behaviours and driving anger expression. The second objective was to investigate the relations of sex and gender roles with impulsive driver behaviours and driving anger expression.

Together with the first objective of the study, significant sex differences were found in three types of driver behaviours (i.e. functional impulsivity, lack of premeditation and use of the vehicle to express anger). Similar to the findings of [Bıçaksız \(2015\)](#), after controlling the statistical effects of age and lifetime kilometres driven, male drivers showed higher frequencies of functional impulsive behaviours and lack of premeditation than female drivers. Besides, in line with previous studies, males also showed more aggressive behaviours through the use of their vehicles than female drivers ([Gras et al., 2016](#); [Sârbescu, Stanojević, & Jovanović, 2014](#); [Stephens & Sullman, 2014](#)). As discussed by [Stephens & Sullman, 2014](#), using vehicle to express anger enables male drivers to express their anger more directly and in different ways, such as speeding and tailgating.

In general, the evidence that male drivers show a wider variety of violations than female drivers ([Martinussen, Møller, & Prato, 2014](#); [Reason, Manstead, Stradling, Baxter, & Campbell, 1990](#); [Rowe, Roman, McKenna, Barker, & Poulter, 2015](#); [Stephens & Fitzharris, 2016](#)) was also partially supported by the findings of the current study. However, no significant difference was found between male and female drivers with regards to urgency, lack of perseverance, verbally aggressive expression, physically aggressive expression and adaptive/constructive anger expression. Additionally, it should also be highlighted that the differences observed had rather small effect sizes. This may indicate that individual differences, in terms of impulsive driver behaviours and the expression of driving anger, might be related to factors other than sex. Similarly, [Özkan and Lajunen \(2005a\)](#) and [Sullman et al. \(2017a\)](#) also found that gender roles have a more essential role in relations to aggressive driver behaviours than sex.

In terms of the role of femininity, higher femininity was associated with higher functional impulsivity and adaptive/constructive anger expression. On the other hand, femininity was negatively related to the dimensions of dysfunctional driver impulsivity and aggressive anger expression. Similar to the findings of [Sullman et al. \(2017a\)](#), age and femininity were the only factors being related to adaptive/constructive anger expression. In other words, older drivers and drivers with higher feminine traits reported more adaptive/constructive forms of anger expression. Additionally, in line with the findings of [Sullman et al. \(2017b\)](#), higher femininity was associated with higher adaptive/constructive expression and lower aggressive anger expression. Moreover, femininity was also the most substantial contributor to different dimensions of driving anger expression. Regarding the effects of femininity on various impulsive driver behaviours and forms of driving anger expression, the general pattern of relationships showed that endorsement of femininity was positively related to functional impulsivity and adaptive/constructive anger expression, but negatively related to different forms of dysfunctional driver impulsivity and aggressive anger expression.

Based on these results, it can be concluded that femininity plays a positive role in safety by being associated with fewer negative forms of impulsive driver behaviours and driving anger expression. Similarly, [Öztürk, Fındık, and Özkan \(2019\)](#) also found that femininity was associated positively with positive driver behaviours and negatively with aberrant driver behaviours. Besides, [Özkan and Lajunen \(2005a\)](#) suggested that femininity could be associated with more careful driving since it is related to “caring for others”. Similarly, the general idea of respect and courtesy to others might be associated with the presence of more adaptive/constructive ways of anger expression and functional impulsivity. This might be the indicator of how femininity can be positively associated with road safety by being negatively associated with dangerous behaviours and positively related to positive behaviours.

In contrast to the relationships between femininity and forms of driving anger expression, the results of the present study also showed that masculinity is only related to aggressive forms of anger expression. This finding supports the previous research by [Sullman et al. \(2017a\)](#), who also found that higher masculinity is associated with higher aggressive expression, but not with adaptive/constructive anger expression. In other words, drivers high in masculinity are more likely to display different forms of aggressive anger expression. Moreover, higher masculinity was associated with higher functional impulsivity and urgency. As discussed by [Özkan and Lajunen \(2005a\)](#), masculinity is associated with being dominant and assertive, as well as with risk-taking. All of these characteristics might be linked to different situations where highly masculine drivers get a chance to express their aggressive and impulsive behaviours.

In addition to the effects of gender roles, sex was significantly associated with just three forms of driver behaviour (two impulsive driver behaviours and one form of driving anger expression). The hierarchical regression analyses showed that, after controlling the statistical effects of age and lifetime kilometres, sex was only significantly associated with functional impulsivity, lack of perseverance and use of the vehicle to express anger. When the effects of sex and gender roles were compared, gender roles were found to have stronger effects on both impulsive driver behaviours and driver anger expression than sex. Similar to the findings of the present study, [Krahé, 2018](#); [Oppenheim, Oron-Gilad, Parmet, & Shinar, 2016](#); [Sullman et al., 2017a](#); [Sullman et al., 2017b](#) also highlighted the predictive power of gender roles over that of sex. [Krahé \(2018\)](#) and [Sullman et al. \(2017a\)](#) also found that gender roles, and not sex, significantly predicted different forms of driving anger expression. Similarly, [Oppenheim et al. \(2016\)](#) also found that gender roles, as opposed to sex, was a stronger predictor of violation tendency. Considering the effects of sex and gender roles and previous research ([Sullman et al., 2017a](#); [Oppenheim et al., 2016](#)), it can be asserted that gender roles have stronger relationship with impulsive driver behaviours and driving anger expression compared to sex.

As discussed in different studies, masculinity has a significant positive effect on perceptual-motor skills, and femininity on safety skills ([Özkan & Lajunen, 2006](#); [Öztürk et al., 2019](#)). Even though driving skills have two dimensions, namely perceptual-motor and safety skills, the definition of a good driver does not mention safety skills, which are significantly related to femininity ([Özkan & Lajunen, 2006](#)). In addition, [Öztürk et al., 2019](#) also found safety skills were only associated with femininity but not with masculinity. Furthermore, masculinity and femininity also show asymmetric relationships with aggressive and ordinary violations in traffic. In other words, masculinity was positively related to violations, while femininity was negatively related to violations ([Özkan & Lajunen, 2005a](#)). Similar asymmetric relationships were also observed between gender roles and driver urgency and forms of aggressive anger expression. As masculinity increased and femininity decreased, driver urgency and aggressive anger expression also increased.

Lastly, it can be concluded that gender roles play a crucial role in safety, such that a negative solo effect of masculinity and a positive solo effect of femininity on road safety can be expected. It might be asserted that femininity has positive effects on road safety

through more adaptive/constructive anger expression, higher functional impulsive behaviours, and less aggressive driving anger expression and dysfunctional impulsivity. These characteristics of femininity might be used to promote a more positive and safety-oriented traffic system. Traits associated with the gender roles provide important focus points for road safety. According to the Turkish adaptation study of the Bem Sex-Role Inventory (Özkan & Lajunen, 2005b), being dominant, assertive, having leader abilities and being more willing to take risks were four items with the highest loadings for masculinity. On the other hand, being compassionate, affectionate, gentle, and understanding were the four most strongly loaded items for femininity. Considering the content of these items, possible behavioural outcomes in traffic and correlational findings of the present study, it can be claimed that masculine characteristics may be associated with possible risky outcomes with dysfunctional impulsive behaviours, and aggressive anger expression. Nonetheless, the traits of femininity could have a positive role in road safety, acting as protective factors. Driver education programs and some other safety related training programs for drivers may focus positively on traits of femininity and the possible negative consequences of demonstrating masculine traits in traffic.

There are some critical remarks that need to be considered when interpreting the results of the current study. First of all, the study is based on self-report measures which are prone to socially desirable responding and common method bias. However, following the suggestions of Lajunen and Summala (2003), in an attempt to cope with the possibility of socially desirable responding, participants were informed about the general aim of the study and assured of their anonymity and confidentiality at the beginning of the study. Additionally, common method variance may be responsible for a portion of the significant relations observed since all measures used in the present study were based on self-reports. Moreover, even though the sample covers a wide age range, the majority of participants were young drivers. Future studies can benefit from collecting data from a more representative sample and comparing different age groups such as young vs. old drivers.

In summary, the present study investigated sex and gender roles in relation to impulsive driver behaviours and driving anger expression. In addition to the replication of the previous research findings evidencing the relationship between sex, gender roles and driving anger expression, the present study provided original insight into the association between sex, gender roles and impulsive driver behaviours. Additionally, the results showed that masculinity and femininity are related to dysfunctional impulsive driver behaviours and driving anger expression in opposite ways. In particular, drivers with higher levels of femininity also reported high frequencies of driver functional impulsivity and adaptive/constructive anger expressions. Besides, they also showed low frequencies of dysfunctional impulsive driver behaviours and aggressive ways of anger expression. On the other hand, higher masculinity was positively associated with higher driver functional impulsivity, driver urgency and three forms of aggressive anger expression.

In conclusion, the present study is the first study in which sex and gender roles were investigated in relations to impulsive driving together with driving anger expression. The results of the study provided the literature with a detailed understanding of the basic variables which are related to impulsive and risky driving in addition to anger expression in traffic settings. In light of the findings of the present study, future studies may also investigate further possible relationships with complex models including interactions of different additional trait and state characteristics of individuals. By this way, the relationship model being studied in the present study could be extended and more understanding could be gained on the variables critical to risky driving and related factors.

CRedit authorship contribution statement

İbrahim Öztürk: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Özgün Özkan:** Conceptualization, Writing - original draft, Writing - review & editing. **Bahar Öz:** Conceptualization, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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