



# Masculinity, femininity, and angry drivers: Masculinity and femininity as moderators between driver anger and anger expression style among young drivers

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## ABSTRACT

Driver anger and its expression are among the most studied topics in traffic safety literature. However, the function of gender roles, i.e., masculinity and femininity, in driving anger experience and expression has remained mainly unexplored. The present study investigates the association between driving anger and gender roles on the expression of anger among young drivers. Three hundred seventy-nine young drivers filled a questionnaire including the Driving Anger Scale, Bem Sex Roles Inventory, Driving Anger Expression Inventory, and demographic information. Moderated regression analyses showed that masculine gender role and anger provoked by other road users' discourtesy were positively and femininity negatively related to verbal aggression while driving. Anger related to police presence, slow driving, and masculine gender role were positively related to gesture-based and vehicle-based expression of driver aggression. Hostility and feminine gender role were negatively related to the gesture-based expression of driver aggression, while anger related to witnessing illegal driving and feminine gender role were negatively related to the vehicle-based expression of aggression. The interaction effects between masculinity and hostility, masculinity and slow driving, and femininity and illegal driving were also found on the gesture-based expression of driver aggression. The effects of interaction between masculinity and slow driving and femininity and illegal driving were also found on the vehicle-based expression of driver aggression. Slow driving and femininity had a positive relationship to the adaptive expression of anger in driving. The results suggest that masculinity and femininity moderate the relationship between driving anger and the expression of driving anger among young drivers.

## 1. Introduction

Road safety is an essential contributing factor to public health. It has been estimated that 1.35 million people are killed, and 50 million are injured each year in road accidents worldwide (WHO, 2018). In Turkey, 5,473 people died, and 283,234 people were injured in road traffic accidents in 2019. According to Turkish statistics, a driver error was the main factor in 88% of accidents (TÜİK, 2020). Therefore, studies aimed at identifying and investigating driver behaviours and characteristics contributing to accidents have a great potential for improving traffic safety. One of the driver characteristics contributing to risk-taking in traffic is the emotion of anger. Although anger is an adaptive and functional emotion, it may result in undesirable outcomes. For example,

many car crashes are result of aggressive driving and anger-related actions (AAA, 2009; TÜİK, 2020).

Among the basic emotions, anger is categorized as harmful and dangerous. It is considered dangerous because it may provoke more anger and lead one to harm the target (Ekman, 2003a). Although Ekman (2003b) acknowledges that the causes of anger may vary based on the life history of the person, he specifies main sources for anger to be elicited, such as frustration, physical threat, psychological hurt (e.g., insult or rejection by a loved one), violation of moral values, failure to meet one's expectations, and another person's anger.

One of the theoretical frameworks regarding anger applied to traffic context is Spielberger's (1988) state-trait anger model. According to this theory, a tendency to have frequent and intense anger is known as trait

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anger, whereas a temporal condition in which both physiological sensations and emotions - from annoyance to rage - occurs is described as state anger. Deffenbacher et al. (2003) adapted these concepts to anger while driving. According to Deffenbacher et al. (2003), trait driving anger indicates “the propensity or tendency to become angry when driving” and state driving anger signifies “angry feelings and physiological arousal in response to a specific driving event.” In addition to these, the expression of anger is equally essential. Spielberger (1988) identifies three forms of anger expression: anger-out, anger-in, and anger-control. Anger-out is the tendency to express the anger feeling, usually in negative and aggressive ways, whereas anger-in is the tendency to suppress the angry feelings. Lastly, anger-out refers to the calming and relaxing activities of an angry individual. Anger may manifest itself in the driving environment in aggressive ways. According to National Highway Traffic Safety Administration, aggressive driving is defined as “driving actions that markedly exceed the norms of safe driving behaviour and that directly affect other road users by placing them in unnecessary danger” (Richard et al., 2018). According to Tasca (2000), “driving behaviour is aggressive if it is deliberate, likely to increase the risk of collision and is motivated by impatience, annoyance, hostility, and/or an attempt to save time.” The conceptualization of driver aggression by Lajunen et al. (1998) draws attention to the driver's intentions with regards to whether the driver intends to “injure or harm other road users physically or psychologically”. Dula and Ballard (2003) summarize three aspects of aggressive driving in the literature: intentional acts of physical, verbal, or gestured aggression, negative emotions (e.g., anger) while driving, and risk-taking.

Deffenbacher et al. (1996) draw attention to the lack of a positive form of anger expression. Their definition of positive anger expression includes active expression of one's thoughts, feelings, and desires as well as active participation in the problem-solving process by listening to others' thoughts and feelings, negotiating, and compromising. They identified two forms of non-aggressive anger expression (assertive, problem-oriented communication and appropriate leave-taking and disengagement). As in the experience of anger, driving as a unique environment has its own ways of anger expression. Four primary forms of expressing anger are aggressive verbal expression (e.g. expressing displeasure, yelling, cursing), personal physical, aggressive expression (e.g. getting out of the car to fight and score off somebody, giving others finger and other hostile gestures), using the vehicle to express anger (e.g. speeding up, or slowing down purposely, flashing lights, cutting in front of the other driver) and adaptive/constructive expression (e.g. paying attention to being a safe driver, engaging in alleviative and calming activities), former three of which constitute the aggressive forms (Deffenbacher et al., 2002).

It has been reported that high-anger drivers are more aggressive on roads, experience anger more intense and more frequently, engage in more risky behaviours and use less adaptive ways for anger expression together with increased use of anger expression in maladaptive ways as compared to low-anger drivers (Deffenbacher et al., 2001; Deffenbacher et al., 2003; Deffenbacher et al., 2003; Herrero-Fernandez, 2013), which, in turn, may lead to crash-related situations, such as loss of vehicle control, loss of concentration, and near-misses (Sullman et al., 2013). Anger can also play a role in further affectivity in that angry violations may be associated with positive affective outcomes (e.g., the thrill and excitement of speeding) (Lawton et al., 1997), especially in those drivers who score high on sensation-seeking (Schwebel et al., 2006). Thus, as an easily burst out and a rewarding emotion, anger should be examined in detail to identify the conditions that lead to bursts of anger and develop therapeutically preventive ways for anger management behind the wheel.

Anger and anger expression are found to be influenced by several dispositional and situational factors, such as age (Berdoulat et al., 2013), exposure, driving skills (Özkan and Lajunen, 2006), lifestyle, personality (Schwebel et al., 2006; Dahlen et al., 2012) and anonymity (Ellison-Potter et al., 2001). It has also consistently been found that aggressive

and risk-taking behaviour was observed more frequently among younger (Wickens et al., 2012; Lajunen and Parker, 2001; Lawton et al., 1997; Deffenbacher et al., 2007), impulsive (Berdoulat et al.; Navas et al., 2019; Öztürk et al., 2021), emotionally unstable, inflexible, uncooperative, and irresponsible people (Dahlen et al., 2012). In Turkey, drivers between the ages of 15 and 25 constituted approximately 23% of the drivers involved in accidents (TÜİK, 2020). The over-involvement of young male drivers in traffic road accidents is a widespread problem. Thus, young drivers seem to be a vulnerable group of drivers due to several age-related factors such as low-hazard perception (Summala, 1987), low-risk perception (Brown and Copeman, 1975), and over-confidence in driving skills (Brown, 1982).

Another prevalent finding has been the relationship between sex and anger and aggressive driving. However, sex is much more complicated in terms of the consistency of the findings. Some studies have found males having more aggressive and risky behaviours than females (Ellison-Potter et al., 2001; Deffenbacher et al., 2003b; Deffenbacher et al., 2007; Rhodes and Pivik, 2011). In a recent cross-cultural survey study including 32 countries grouped to eight cultural clusters, comprising 25,459 car drivers, it was reported that men valued crash-risk behaviours more than women in all cultural clusters observed. Interestingly, gender differences were larger in Western countries than in the Global South (Granié et al., 2021). On the other hand, some studies reported no differences between males and females (Deffenbacher et al., 2004; Deffenbacher et al., 2004). In a study Deffenbacher et al. (2004), in which potential sex differences were explored, males and females showed different trends. Males reported more aggressive and risky behaviours, more revengeful/retaliatory and physically aggressive thinking, and more physical and vehicular anger expression and less adaptive/constructive behaviours than females (Deffenbacher et al., 2004b). Similar results about using a vehicle for expressing anger have been reported in other studies too (Öztürk et al., 2021; Sullman, 2015; Sullman et al., 2017). Öztürk et al. (2021) investigated the effects of biological sex (defined as male or female) and gender-role using Bem Sex-Role Inventory and found that masculinity was positively associated with aggressive anger expression while femininity was positively associated with constructive anger expression. In a study by González-Iglesias et al. (2012) males displayed more anger towards traffic obstructions and police presence. In addition, physical, aggressive expression was observed more frequently among males as compared to females. It was also found that sex interacted with income level, psychological distress, and driving exposure (Wickens et al., 2012).

As a multifaceted activity, driving includes not only individual factors such as physical health or personality characteristics but also environmental, cultural, contextual, and situational factors. It can be claimed that, for instance, gender role expectations in society represent one of these contextual factors. The importance of contextual and cultural factors was clearly demonstrated by Granié et al. (2021) in their 32-country study, which showed that the regional culture seemed to interact with gender, forming a complex network of interactions on risky driving. The differences in national traffic cultures as well as the differences in gender roles in the society may explain the variety of results about sex differences on the road. Thus, one way to discuss gender and sex differences in driving is to determine the differences in gender role identification, i.e., masculinity and femininity. Bem defines masculinity as “an instrumental orientation, a cognitive focus on ‘getting the job done’ and femininity as “an expressive orientation, an affective concern for the welfare of others” (Bem, 1974, p.156).

A driver's gender role is associated with accidents, violations, errors, and his/her self-concept as a driver. In their study with a driving simulator, Mast et al. (2008) found that masculinity-related words lead to an increase in driving speed. Moreover, masculinity predicts an increased number of offences and violations, and femininity predicts a reduced number of accidents, offences, and violations (Özkan and Lajunen, 2005a). Lajunen et al. (1998) found that safety orientation mediated the relationship between driver anger and violations and that

having an emphasis on safety skills makes drivers less prone to violations and aggressive acts. Regarding the self-conception as a driver, those who score higher on masculinity are found to emphasize more their perceptual-motor skills than safety skills and those who score higher on femininity put higher emphasis on safety skills (Özkan and Lajunen, 2006). Another study emphasising femininity and masculinity as independent dimensions of a person's self-concept regarding his/her gender shows that femininity has an attenuating effect on aggressive behaviours on the road independently of masculinity (Krahé, 2005). A more recent study by Krahé (2018) shows that the relationship between gender roles and risky, aggressive driving is far more complex than simply masculinity being a risk factor and femininity being a buffering or protective factor. Krahé (2018) analysed responses of 417 German drivers on the Positive-Negative Sex Role Inventory (PN-SRI), which differentiates masculinity and femininity into positive and negative components, i.e., negative/positive masculinity/femininity. According to the results, aggressive expression of driving anger was unrelated to gender but differed concerning gendered self-concept. Negative masculinity was related to higher aggressive and lower adaptive anger expression, while the link between negative masculinity and aggressive anger expression was buffered by positive femininity (Krahé, 2018).

According to a model proposed by Sibley and Harré (2009), the tendency to enhance and emphasize one's own driving skills is a result of different socialization processes through which boys and girls become men and women. These authors suggest that having more masculine traits appears to influence individuals not just on an explicit level but on an automatic and non-conscious level. Accordingly, the relationship between masculine gender role identification and driving ability self-enhancement goes beyond the conscious process of reaching the ideal self. Similarly, Ulleberg (2001) cites the research of Simon and Corbett (1996), which suggested differences between men and women underlay the gender roles in societies. Accordingly, male drivers' tendency to take more risks than female drivers' may be related to women's traditional non-competitive gender role.

Even though several variables have been recognized as associates of driving anger and aggression, gender roles seem to need more exploration still. Thus, the primary aims of the present study were to investigate in what ways men and women differ in relation to anger and anger expression on the road, to explore the association between driving anger and gender-role on the expression of anger in driving and to test the interaction effects of the different types of driving anger, masculinity, and femininity on the expression of anger during driving among young drivers. In particular, the following hypotheses were explored in the current study:

Hypotheses 1: Male drivers report adopting:

- maladaptive ways of verbal anger expression more frequently than females.
- physical anger expression more frequently than females.
- using the vehicle to express anger more frequently than females.
- adaptive/constructive expression less frequently than females.

Hypothesis 2: Drivers with high driving anger report adopting:

- verbal anger expression more frequently than drivers with low driving anger.
- physical anger expression more frequently than drivers with low driving anger.
- using the vehicle to express anger more frequently than drivers with low driving anger.
- constructive and adaptive ways to express driving anger less frequently than drivers with low driving anger.

Hypothesis 3: Drivers with high masculinity report adopting:

- verbal anger expression more frequently than drivers with high femininity.
- physical anger expression more frequently than drivers with high femininity.
- using the vehicle to express anger more frequently than drivers with high femininity.
- constructive and adaptive ways to express driving anger less frequently than drivers with high femininity.

Hypothesis 4: Masculinity is associated with a higher tendency to adopt verbal and physical expression and using the vehicle to express driving anger, whereas femininity buffers driving anger and strengthen constructive and adaptive ways to express driving anger in driving.

## 2. Method

### 2.1. Participants

The data reported in this study were collected from 379 undergraduate students (239 males and 138 females) from general psychology classes. A preliminary analysis was conducted for missing values and outliers via SPSS version 23. This analysis included total accident, annual mileage, and lifetime mileage of the participants. Due to the outlier scores (unrealistically high mileage or accident count indicating that the respondent did not respond to the questions truthfully or did not understand the question) on these variables, ten cases were dropped. In addition, the data was restricted to the 18 – 25 age range following the aim of searching young drivers. As a result, 350 cases left for the main analysis. All the participants had a driving license. Of the participants, 20.3% drive almost every day; 15.7% drive three or four times in a week; 12% drive once or twice in a week; 20.9% drive a few times in a month; and 31.1% drive rarely. Characteristics for the whole sample as well as male and female drivers separately are presented in Table 1.

### 2.2. Measures

*Demographic form.* Participants completed a demographic

**Table 1**  
Sample characteristics.

|                                            | Total    | Female  | Male     |
|--------------------------------------------|----------|---------|----------|
| <i>N</i>                                   | 350      | 132     | 217      |
| <i>Age</i>                                 |          |         |          |
| Mean                                       | 21.59    | 21.14   | 21.86    |
| SD                                         | 1.43     | 1.27    | 1.46     |
| <i>Driving license held (years)</i>        |          |         |          |
| Mean                                       | 2.64     | 2.09    | 2.97     |
| SD                                         | 1.33     | 1.03    | 1.39     |
| <i>Annual Mileage</i>                      |          |         |          |
| Mean                                       | 3057.27  | 1546.49 | 3962.13  |
| SD                                         | 5286.52  | 3687.33 | 5878.57  |
| <i>Lifetime mileage</i>                    |          |         |          |
| Mean                                       | 9035.76  | 2891.84 | 12702.12 |
| SD                                         | 18154.95 | 6565.33 | 21594.90 |
| <i>Number of active accidents</i>          |          |         |          |
| Mean                                       | 0.66     | 0.49    | 0.76     |
| SD                                         | 1.04     | 0.99    | 1.06     |
| <i>Number of passive accidents</i>         |          |         |          |
| Mean                                       | 0.39     | 0.30    | 0.45     |
| SD                                         | 0.80     | 0.79    | 0.80     |
| <i>Number of tickets for wrong parking</i> |          |         |          |
| Mean                                       | 0.23     | 0.11    | 0.30     |
| SD                                         | 0.71     | 0.36    | 0.85     |
| <i>Number of tickets for overtaking</i>    |          |         |          |
| Mean                                       | 0.11     | 0.09    | 0.13     |
| SD                                         | 0.73     | 0.55    | 0.82     |
| <i>Number of tickets for speeding</i>      |          |         |          |
| Mean                                       | 0.36     | 0.13    | 0.49     |
| SD                                         | 1.85     | 0.56    | 2.29     |

information form including questions on age, gender, education status and accident and driving history.

**Driving Anger Scale.** The Driving Anger Scale (DAS; Deffenbacher et al., 1994) is a self-report measure of drivers' level of anger when encountered the given situations. This scale consists of 33 items, each of which is rated on a 5-point Likert type scale ranging from '1 = *not at all*' to '5 = *very much*'. DAS in original form is internally reliable ( $\alpha = 0.90$ ). DAS has six subscales: hostile gestures, illegal driving, police presence, slow driving, discourtesy, and traffic obstructions. The Turkish adaptation of DAS was found to be reliable and similar to the original DAS in terms of factor structure (Yasak and Esiyok, 2009).

**Driving Anger Expression Inventory.** Participants' expression of driving anger was measured with the Turkish version of the Driving Anger Expression Inventory (DAX; Esiyok et al., 2007), which is initially developed by Deffenbacher et al. (2002). DAX has 49 items rated on a 4-point Likert type scale (from 1 = *almost never* to 4 = *almost never*). The scale consists of four factors whose internal reliability score ranges from 0.80 to 0.90; namely, verbal aggressive expressive, personal physical aggressive expression, use of the vehicle to express anger, and adaptive/constructive anger expression. In the Turkish version of DAX, two items (18 and 33) were removed from the scale since they were not assessed in any of the four factors.

**Bem Sex-Role Inventory.** Bem Sex-Role Inventory (BSRI) was designed to determine the femininity, masculinity, and androgynous characteristics of individuals. The short version of BSRI was used in the current study, which contains ten items for feminine (perceived as female characteristics in society) subscale, ten items for masculine (perceived as male characteristics in society) scale, and ten items for neutral (perceived neither female nor male) scale. Participants respond to each personality item on a seven-point scale (1 = *almost never true*, 7 = *almost always true*) to determine how well each item describe themselves. The reliability coefficients range from 0.75 to 0.90 (Bem, 1981). The short version of BSRI was also found to be reliable (Özkan and Lajunen, 2005b).

### 2.3. Procedure

After obtaining ethical approval from Middle East Technical University, the study was announced to one of the general psychology classes at the Middle East Technical University Psychology department, and the participants were recruited from this class via snowball sampling. All the students in these classes were given the questionnaires together with an informed consent form, and they received course credit for their participation. All of them were assured of anonymity and confidentiality.

## 3. Results

The data were analysed using reliability analyses, correlation analyses, and hierarchical regression analyses for testing moderation effects of gender roles on anger expression at the wheel.

### 3.1. Reliabilities of scales

Reliability analyses of DAS indicated that Cronbach alpha reliability coefficients for the six subscales were 0.74, 0.75, 0.69, 0.77, 0.81, and 0.78 for hostile gestures, illegal driving, police presence, slow driving, discourtesy, and traffic obstructions, respectively. Reliability analyses for BSRI revealed that the Cronbach alpha reliabilities for the masculinity and femininity subscales were 0.75 and 0.81, respectively. Reliability analyses for DAX indicated that the Cronbach alpha reliabilities for aggressive verbal expression, physical aggressive expression, use of the vehicle to express anger, and adaptive/constructive expression subscales were 0.86, 0.87, 0.88, and 0.90, respectively.

### 3.2. Correlates of DAS, BEM, and DAX subscales

Table 2 shows the correlations between background variables, the DAS, BSRI, and DAX subscale scores. Age, male gender, annual mileage, anger towards police presence, and anger expression by using the vehicle correlated positively with the number of accidents.

Being male was associated with increased physical expression of anger and use of the vehicle to express anger and decreased adaptive/constructive expression of anger. In addition, masculinity was positively correlated with anger towards police presence, slow driving, discourtesy, verbal and physical expression of anger, anger expression by using the vehicle and negatively correlated with adaptive/constructive expression of anger. In contrast, femininity was negatively associated with the physical expression of anger and anger expression by using the vehicle but positively with adaptive/constructive anger expression.

### 3.3. Hierarchical regression analyses

To examine the effect and interaction of masculinity and femininity and driving anger on driving anger expression, four separate hierarchical regression analyses were performed on each of the dependent variables (aggressive verbal expression, physical aggressive expression, use of vehicle to express anger, adaptive/constructive expression). In each of the analyses, age, sex, and annual mileage were entered in the first step to control their effects. The centred subscales of DAS and BSRI were entered in the second step, and their interactions with each other were entered in the third step. Lastly, the interaction of masculinity, femininity, and subscales of DAS was entered in the third step to investigate three-way interactions.

### 3.4. The main effects of the background variables, gender roles and DAS variables on DAX

As presented in Table 3, sex predicted aggressive physical expression, use of the vehicle to express anger, adaptive/constructive expression. Males displayed their anger more frequently physically and with their vehicle, and they used less often adaptive and constructive ways of their anger. Annual mileage predicted only the use of the vehicle to express anger. The variance accounted for by these variables was 2% for verbal expression, 4% for physical expression, 9% for the use of vehicle, and 9% for adaptive/constructive expression.

After controlling the annual mileage, age, and sex, the regression analysis results in the second step showed that hostility predicted physical expression and discourtesy predicted verbal expression of anger. While police presence predicted physical expression of anger and vehicle use to express anger, illegal driving and slow driving predicted physical expression, use of vehicle, and adaptive/constructive expression. Moreover, masculinity predicted verbal expression, physical expression, and use of vehicle positively and adaptive/constructive expression negatively. It seems that masculine drivers reported aggressive behaviours more often and constructive ways less frequently. In contrast, femininity revealed a reverse pattern; that is, feminine drivers reported less aggressive behaviours and more constructive ways to express anger. The proportion of variance accounted for by DAS subscales, masculinity, and femininity was 17% for verbal expression, 22% for physical expression, 25% use of vehicle, and 19% for adaptive expression.

### 3.5. The interaction effects of gender roles and DAS variables on DAX

The regression analysis in the third step in which the interaction of masculinity and femininity with DAS subscales were entered yielded that the interaction between masculinity and hostility and masculinity and slow driving predicted significantly physical expression. Interaction between masculinity and slow driving also predicted significantly verbal expression and use of the vehicle to express anger. Besides, the

**Table 2**  
Correlations among DAS, DAX and BEM scales, Demographic Variables, Number of Accidents, and the Annual Mileage.

| Variables                     | 1.      | 2.     | 3.      | 4.     | 5.      | 6.     | 7.     | 8.     | 9.     | 10.    | 11.    | 12.    | 13.    | 14.     | 15.     | 16. |
|-------------------------------|---------|--------|---------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|-----|
| 1. Age                        |         |        |         |        |         |        |        |        |        |        |        |        |        |         |         |     |
| 2. Annual mileage             | 0.09    |        |         |        |         |        |        |        |        |        |        |        |        |         |         |     |
| 3. Sex (1 = male, 2 = female) | -0.22** |        |         |        |         |        |        |        |        |        |        |        |        |         |         |     |
| 4. Number of accidents        | -0.13*  | 0.29** |         |        |         |        |        |        |        |        |        |        |        |         |         |     |
| 5. Femininity                 | 0.16**  | 0.12*  | 0.03    | 0.06   |         |        |        |        |        |        |        |        |        |         |         |     |
| 6. Masculinity                | 0.06    | 0.07   | -0.10   | 0.03   | 0.28**  |        |        |        |        |        |        |        |        |         |         |     |
| 7. Hostile gestures           | 0.09    | 0.10   | 0.05    | -0.01  | 0.11*   | 0.09   |        |        |        |        |        |        |        |         |         |     |
| 8. Illegal driving            | -0.08   | -0.07  | 0.10    | 0.01   | 0.04    | -0.06  | 0.41** |        |        |        |        |        |        |         |         |     |
| 9. Police presence            | 0.08    | 0.05   | 0.07    | 0.12*  | -0.06   | 0.13*  | 0.23** | 0.18** |        |        |        |        |        |         |         |     |
| 10. Slow driving              | 0.07    | 0.13*  | -0.02   | -0.01  | -0.08   | 0.13*  | 0.32** | 0.27** | 0.46** |        |        |        |        |         |         |     |
| 11. Discourtesy               | -0.04   | 0.11*  | 0.04    | -0.02  | 0.12*   | 0.12*  | 0.53** | 0.47** | 0.28** | 0.60** |        |        |        |         |         |     |
| 12. Traffic obstruction       | -0.06   | -0.03  | 0.15**  | -0.01  | 0.03    | 0.03   | 0.50** | 0.39** | 0.48** | 0.57** | 0.61** |        |        |         |         |     |
| 13. Verbal expression         | 0.03    | 0.08   | -0.09   | -0.00  | -0.06   | 0.21** | 0.20** | 0.12*  | 0.17** | 0.26** | 0.33** | 0.23** |        |         |         |     |
| 14. Physical expression       | 0.09    | 0.00   | -0.18** | 0.01   | -0.15** | 0.22** | -0.04  | 0.04   | 0.29** | 0.27** | 0.08   | 0.13*  | 0.50** |         |         |     |
| 15. Use of vehicle            | 0.10    | 0.19** | -0.26** | 0.16** | -0.13*  | 0.22** | 0.01   | -0.11* | 0.23** | 0.29** | 0.13*  | 0.11*  | 0.49** | 0.67**  |         |     |
| 16. Adaptive expression       | -0.23** | -0.12* | 0.20**  | 0.01   | 0.18**  | -0.11* | 0.08   | 0.20*  | -0.06  | -0.15* | 0.03   | 0.01   | -0.09  | -0.16** | -0.25** |     |

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

interaction between femininity and illegal driving predicted negatively both physical expression and use of the vehicle to express anger. The use of the vehicle for anger expression was also predicted negatively by the interaction between femininity and police presence. Lastly, the interaction between femininity and slow driving predicted adaptive/constructive expression positively.

According to the three-way interactions in the fourth step, the interaction of masculinity and femininity interacted significantly with three subscales of DAS: namely, illegal driving, police presence, and discourtesy. While the interaction of masculinity, femininity, and discourtesy positively predicted the use of the vehicle to express anger, the interaction of masculinity and femininity with illegal driving and police presence negatively predicted the use of the vehicle to express anger.

### 3.6. The plots of the significant interaction effects of gender roles and DAS variables on DAX

Eight different interactions were found between subscales of driving anger and gender roles on the ways of expression of anger. The interactions were plotted by using simple syntax program developed by O'Connor (1998).

Figs. 1–3 clearly indicates that drivers with high levels of masculinity and high levels of anger towards slow driving reported more tendency to express their anger verbally, physically, and by using their vehicles. For verbal expression of anger, the simple slope for drivers with high masculinity was significant ( $t(346) = 5.02, p < .001$ ). The simple slope was also significant for drivers with moderate masculinity scores ( $t(346) = 4.87, p < .001$ ), but not for low level of masculinity ( $t = 1.96$ ). For the physical expression of anger, the simple slope for drivers with high masculinity was significant ( $t(346) = 5.42, p < .001$ ). The simple slope was also significant for drivers with moderate masculinity scores ( $t(346) = 4.98, p < .001$ ), but not for low level of masculinity ( $t = 1.70$ ). As for the use of the vehicle to express anger, the simple slope for drivers with high masculinity was significant ( $t(346) = 5.67, p < .001$ ). The simple slope was also significant for drivers with moderate masculinity scores ( $t(346) = 5.50, p < .001$ ), as well as for drivers with low masculinity ( $t(346) = 2.22, p < .05$ ).

Fig. 4 depicts the relationship between anger towards illegal driving and the use of the vehicle to express anger on varied levels of femininity. Accordingly, femininity buffered the effects of higher levels of anger towards illegal driving on the aggressive use of the vehicle. Drivers with high scores on femininity reported less frequent use of the vehicle to express anger despite high levels of anger towards illegal driving ( $t(346) = -2.21, p < .05$ ). The simple slope was not significant for those with moderate and low levels of femininity ( $t = -1.89$  and  $t = -2.21$ , respectively).

Fig. 5 shows that drivers with low femininity and high anger towards police presence reported the highest levels of anger expression by using the vehicle. The simple slope was significant for those with low femininity scores ( $t(346) = 4.18, p < .001$ ). The simple slope was also significant for drivers with a moderate level of femininity ( $t(346) = 4.09, p < .001$ ), but not for the high level of femininity ( $t = 1.77$ ). Overall, femininity decreased aggressive use of vehicle despite high levels of anger towards illegal driving.

In addition, femininity had an interactive effect on the relationship between anger towards slow driving and adaptive/constructive expression of anger on the road (Fig. 6). As anger towards slow driving increases, adaptive/constructive expression of anger on the road decreases, especially as the femininity level decreases. The simple slope was significant for low and moderate levels of femininity ( $t(345) = -3.71, p < .001$  and  $t(345) = -2.58, p < .05$ , respectively), but not for high levels ( $t = -0.10$ ).

Lastly, gender roles also have an interactive effect on the relationship between hostility, illegal driving, and physical expression of anger. Overall, results indicate that masculinity had a reverse effect on the

**Table 3**  
Hierarchical Regression Analyses on DAS, BSRI, and DAX subscales.

| Variables                                      | 1. Verbal expression |         |         | 2. Physical expression |         |         | 3. Use of vehicle |          |          | 4. Adaptive expression |          |          | 5. Overall     |         |         |
|------------------------------------------------|----------------------|---------|---------|------------------------|---------|---------|-------------------|----------|----------|------------------------|----------|----------|----------------|---------|---------|
|                                                | R <sup>2</sup>       | FΔ      | Beta    | R <sup>2</sup>         | FΔ      | Beta    | R <sup>2</sup>    | FΔ       | Beta     | R <sup>2</sup>         | FΔ       | Beta     | R <sup>2</sup> | FΔ      | Beta    |
| 1. Demographic variables                       | 0.02                 | 1.75    |         | 0.04                   | 4.32**  |         | 0.09              | 10.98*** |          | 0.09                   | 10.79*** |          | 0.02           | 1.78    |         |
| Age                                            |                      |         | 0.02    |                        |         | 0.05    |                   |          | 0.04     |                        |          | −0.20*** |                |         | −0.06   |
| Sex                                            |                      |         | −0.09   |                        |         | −0.18** |                   |          | −0.22*** |                        |          | 0.14**   |                |         | −0.11   |
| Annual mileage                                 |                      |         | 0.06    |                        |         | −0.04   |                   |          | 0.14**   |                        |          | −0.07    |                |         | 0.04    |
| 2. Driving anger and Gender roles              | 0.17                 | 8.04*** |         | 0.22                   | 9.84*** |         | 0.22              | 8.88***  |          | 0.19                   | 5.54***  |          | 0.13           | 5.66*** |         |
| Hostility                                      |                      |         | 0.02    |                        |         | −0.16*  |                   |          | −0.06    |                        |          | 0.09     |                |         | −0.04   |
| Illegal driving                                |                      |         | −0.03   |                        |         | 0.06    |                   |          | −0.15**  |                        |          | 0.18**   |                |         | 0.06    |
| Police presence                                |                      |         | 0.03    |                        |         | 0.19*** |                   |          | 0.13*    |                        |          | 0.02     |                |         | 0.15*   |
| Slow driving                                   |                      |         | 0.01    |                        |         | 0.17*   |                   |          | 0.18**   |                        |          | −0.14    |                |         | 0.08    |
| Discourtesy                                    |                      |         | 0.27*** |                        |         | −0.06   |                   |          | 0.06     |                        |          | 0.03     |                |         | 0.12    |
| Traffic obstructions                           |                      |         | 0.06    |                        |         | 0.06    |                   |          | 0.02     |                        |          | −0.09    |                |         | 0.01    |
| Masculinity                                    |                      |         | 0.20*** |                        |         | 0.23*** |                   |          | 0.19***  |                        |          | −0.12*   |                |         | 0.17**  |
| Femininity                                     |                      |         | −0.16** |                        |         | −0.17** |                   |          | −0.17*** |                        |          | 0.20***  |                |         | −0.07   |
| 3. Two-Way Interactions                        | 0.21                 | 1.33    |         | 0.30                   | 2.92*** |         | 0.26              | 2.52**   |          | 0.24                   | 1.69     |          | 0.21           | 2.70**  |         |
| Masculinity × Hostility                        |                      |         | −0.08   |                        |         | −0.16*  |                   |          | −0.07    |                        |          | 0.05     |                |         | −0.09   |
| Masculinity × Illegal driving                  |                      |         | 0.04    |                        |         | −0.01   |                   |          | −0.02    |                        |          | 0.07     |                |         | 0.05    |
| Masculinity × Police presence                  |                      |         | 0.02    |                        |         | −0.01   |                   |          | 0.03     |                        |          | 0.09     |                |         | 0.06    |
| Masculinity × Slow driving                     |                      |         | 0.19**  |                        |         | 0.21**  |                   |          | 0.18*    |                        |          | −0.03    |                |         | 0.20**  |
| Masculinity × Discourtesy                      |                      |         | −0.02   |                        |         | −0.06   |                   |          | −0.08    |                        |          | 0.03     |                |         | −0.04   |
| Masculinity × Traffic obstruction              |                      |         | −0.00   |                        |         | 0.11    |                   |          | 0.07     |                        |          | 0.03     |                |         | 0.08    |
| Femininity × Hostility                         |                      |         | 0.00    |                        |         | 0.02    |                   |          | 0.04     |                        |          | 0.06     |                |         | 0.04    |
| Femininity × Illegal driving                   |                      |         | −0.09   |                        |         | −0.18** |                   |          | −0.20**  |                        |          | −0.03    |                |         | −0.20** |
| Femininity × Police presence                   |                      |         | 0.00    |                        |         | −0.11   |                   |          | −0.16**  |                        |          | −0.03    |                |         | −0.11   |
| Femininity × Slow driving                      |                      |         | −0.09   |                        |         | −0.09   |                   |          | −0.01    |                        |          | 0.17*    |                |         | 0.03    |
| Femininity × Discourtesy                       |                      |         | 0.01    |                        |         | 0.11    |                   |          | 0.11     |                        |          | 0.02     |                |         | 0.08    |
| Femininity × Traffic obstruction               |                      |         | 0.13    |                        |         | 0.10    |                   |          | 0.05     |                        |          | −0.10    |                |         | 0.06    |
| 4. Three-Way Interactions                      | 0.22                 | 0.30    |         | 0.31                   | 1.11    |         | 0.30              | 3.89***  |          | 0.26                   | 0.89     |          | 0.23           | 0.98    |         |
| Masculinity × Femininity × Hostility           |                      |         | −0.02   |                        |         | 0.09    |                   |          | 0.07     |                        |          | 0.08     |                |         | 0.08    |
| Masculinity × Femininity × Illegal driving     |                      |         | −0.09   |                        |         | −0.002  |                   |          | −0.21**  |                        |          | 0.05     |                |         | −0.10   |
| Masculinity × Femininity × Police presence     |                      |         | −0.04   |                        |         | −0.08   |                   |          | −0.18*   |                        |          | 0.12     |                |         | −0.05   |
| Masculinity × Femininity × Slow driving        |                      |         | 0.001   |                        |         | −0.03   |                   |          | 0.09     |                        |          | −0.10    |                |         | −0.03   |
| Masculinity × Femininity × Discourtesy         |                      |         | 0.003   |                        |         | 0.14    |                   |          | 0.16**   |                        |          | −0.05    |                |         | 0.08    |
| Masculinity × Femininity × Traffic obstruction |                      |         | 0.06    |                        |         | −0.14   |                   |          | −0.15    |                        |          | −0.05    |                |         | −0.10   |
| Total R <sup>2</sup>                           | 0.62                 |         |         | 0.87                   |         |         | 0.87              |          |          | 0.78                   |          |          | 0.59           |         |         |

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

*dfs* for F-tests: 1. step = 3,341; 2. step = 8,333; 3. step = 12,321; 4. step = 6,315 for DV 1, DV 2, DV 3.

*dfs* for F-tests: 1. step = 3,340; 2. step = 8,332; 3. step = 12,320; 4. step = 6,314 for DV 4, DV 5.

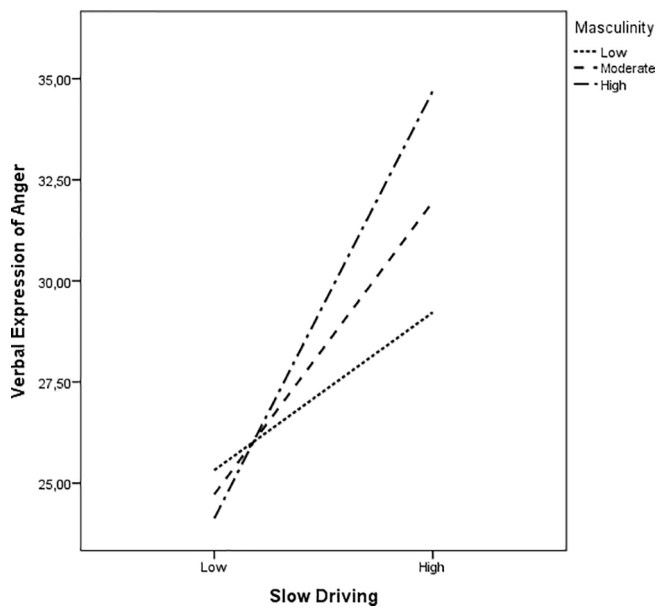


Fig. 1. The interaction between slow driving and masculinity on verbal expression of anger.

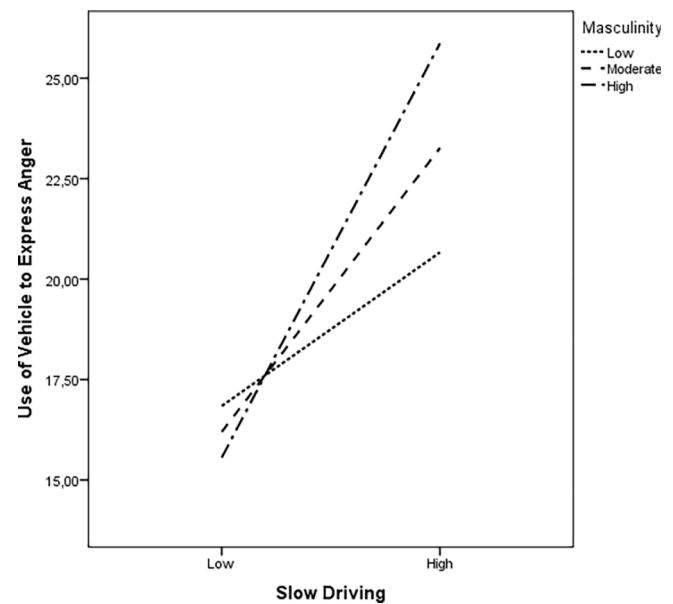


Fig. 3. The interaction between slow driving and masculinity on the use of vehicle to express anger.

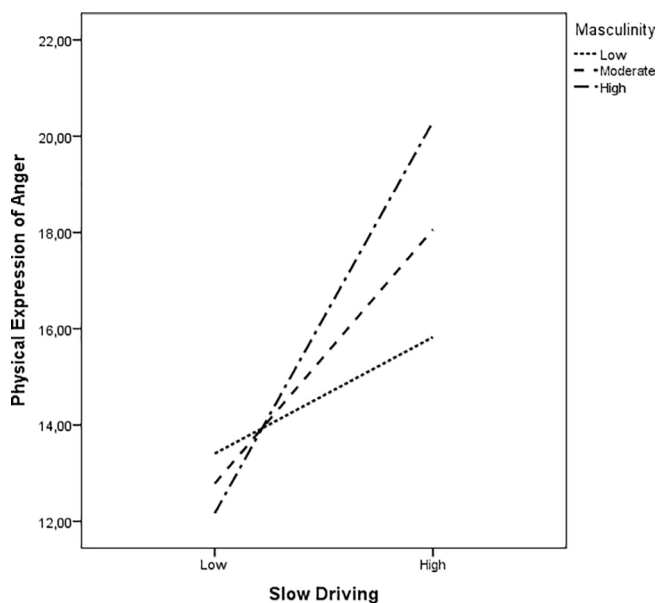


Fig. 2. The interaction between slow driving and masculinity on physical expression of anger.

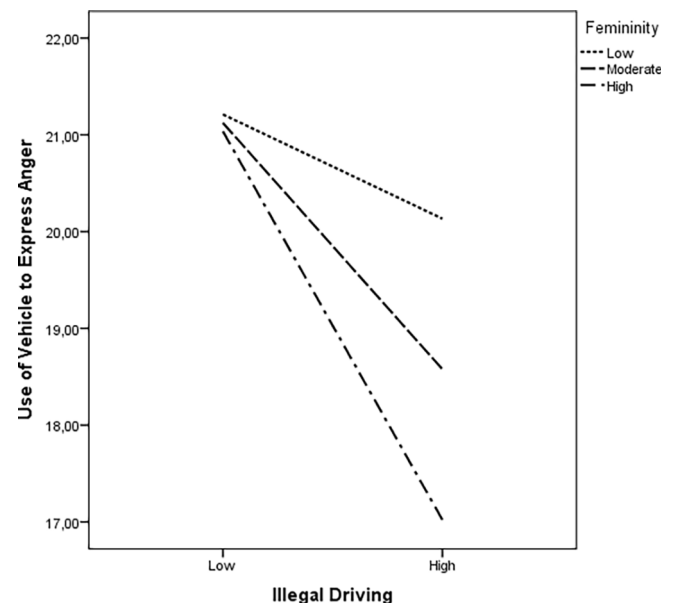


Fig. 4. The interaction between illegal driving and femininity on the use of vehicle to express anger.

relationship between anger towards hostility and physical anger expression. However, varying levels of masculinity did not differ from each other ( $t = 0.32$  for low masculinity,  $t = -1.03$  for moderate masculinity, and  $t = -1.88$  for high masculinity). In low femininity levels, the effect of increased anger towards illegal driving on physical anger expression got more pronounced. When the levels of femininity were high, such an effect is less observable ( $t = 1.13$  for low femininity,  $t = 0.95$  for moderate femininity, and  $t = 0.27$  for high femininity).

### 3.7. Three-Way interactions

Three different interactions were found between masculinity, femininity, and illegal driving, police presence, and discourtesy on anger expression by using the vehicle. The interactions were plotted by

O'Conner's simple syntax program (1998). Statistically significant three-way interactions were found between masculinity, femininity, and "illegal driving" ( $F(1,342) = 8.91$ ,  $p < .01$ ) and between masculinity, femininity, and "police presence" ( $F(1,342) = 5.19$ ,  $p < .05$ ). However, masculinity, femininity, and "discourtesy" did not interact significantly with each other.

Fig. 7 shows how the relationship between femininity and illegal driving varied as a function of high masculinity on anger expression using the vehicle. For high levels of masculinity, the simple slope for drivers with high femininity ( $t(342) = -3.77$ ,  $p < .001$ ) was significant on anger expression by using the vehicle, but not for drivers with low femininity ( $t = 0.39$ ) (Fig. 8). The simple slope coefficients were not significant for low levels of masculinity for drivers with low femininity or drivers with high femininity.

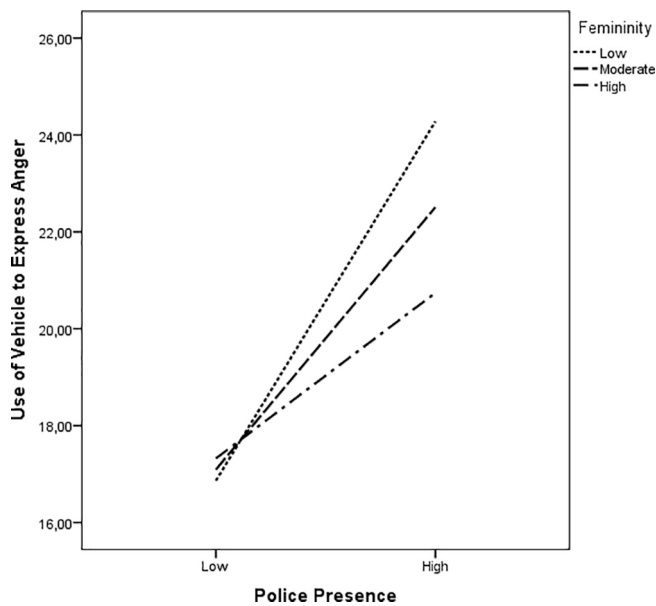


Fig. 5. The interaction between police presence and femininity on the use of vehicle to express anger.



Fig. 7. Three-way interaction between high masculinity, femininity, and illegal driving on the use of vehicle to express anger.

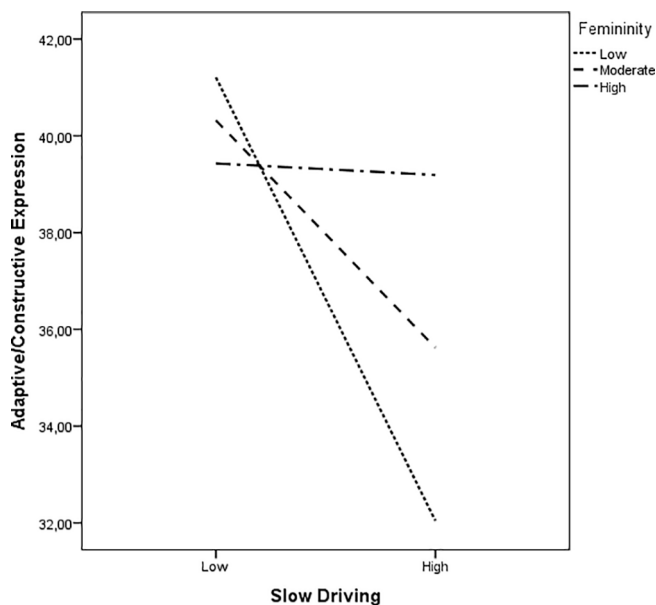


Fig. 6. The interaction between slow driving and femininity on the adaptive/constructive expression.

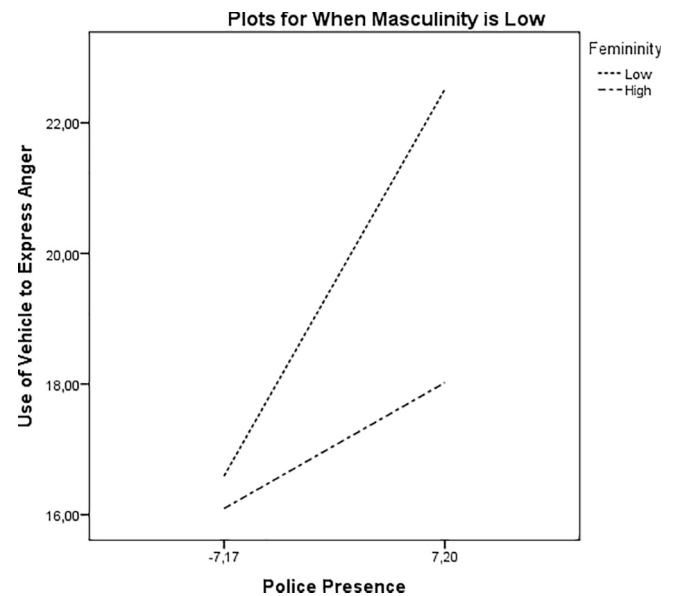


Fig. 8. Three-way interaction between low masculinity, femininity, and police presence on the use of vehicle to express anger.

Figs. 8 and 9 depict the relationship between femininity and police presence on two levels of masculinity. Accordingly, drivers with low femininity displayed more anger towards police presence and anger expression by using vehicle at low levels ( $t(342) = 2.84, p < .01$ ) (Fig. 8) and high levels ( $t(342) = 4.92, p < .001$ ) of masculinity (Fig. 9).

#### 4. Discussion

The present study investigated in a sample of young drivers how driving anger and anger expression on the road were related as well as the influence of social gender roles on these variables. This research addressed mainly whether the relationship between driving anger and anger expression change as a function of masculinity and femininity.

First, the results obtained here show several sex differences in anger expression. Accordingly, males adopted more verbal and vehicular ways

to express their anger, whereas females used adaptive and constructive ways more frequently. These findings supported Hypothesis 1. Second, some of the domains of driving anger were found to be significantly related to the modes of anger expression on the road. For instance, verbal expression of anger increased when individuals encountered discourtesy. Likewise, expression of anger by using physical expressions and vehicle increased when drivers felt angrier towards police presence and slow driving. On the contrary, physical anger expression decreased as the anger towards hostility increased and use of the vehicle to express anger decreased as the anger towards illegal driving increased. These findings supported Hypothesis 2. In addition to these findings, this study showed that anger towards illegal driving enhanced the adoption of adaptive and constructive ways to express anger. Findings regarding gender roles confirm Hypothesis 3, as well. Accordingly, maladaptive ways for expression of anger were reported more often if the masculinity

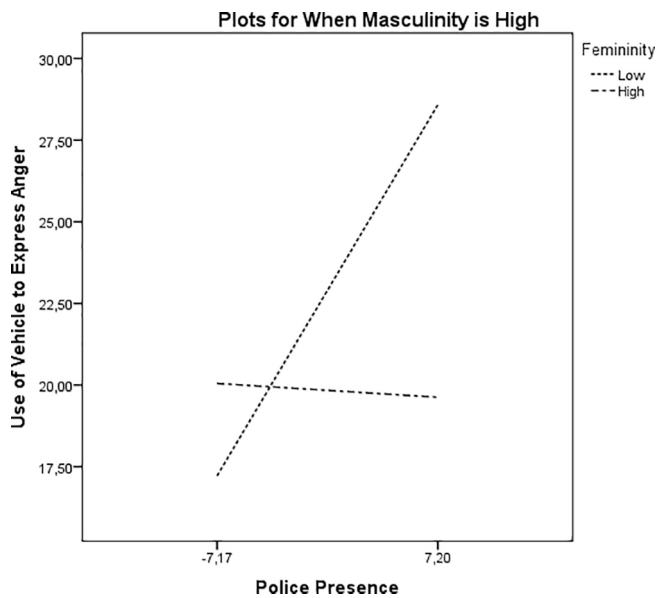


Fig. 9. Three-way interaction between high masculinity, femininity, and police presence on the use of vehicle to express anger.

level increased and femininity level decreased and vice versa for the adaptive and constructive ways of anger expression.

The study also provided a partial confirmation for Hypothesis 4. Masculinity was found to interact with anger towards slow driving on verbal, physical, and vehicular anger expression. In addition, femininity interacted with anger towards illegal driving and police presence on the use of the vehicle to express anger and with slow driving on the adaptive and constructive expression of anger. In general, this finding corroborates previous evidence of women's higher ability to regulate their adverse affects as compared to men (McRae, Ochsner, Mauss, Gabrieli and Gross, 2008). Findings of the current study regarding gender roles were found to be in parallel with the study of Krahé (2005, 2018), who postulated that femininity had alleviative effects on aggressive feelings on the road independently from masculinity. Another study (Özkan & Lajunen, 2005a) standing in parallel with the present study states that high masculinity and low femininity is related to high rates of accidents, offences, violations, and errors. All in all, these studies present an important finding concerning examining and dealing with aggression and anger from a standpoint beyond the sex of the driver.

Interestingly, the frequency of using the vehicle to express anger decreased when drivers were angered by illegal driving. One possible explanation for this finding is that The Driving Anger Scale, which included the subscale of Illegal Driving, is based on the behaviours of other drivers on the road, and regarding this, people may choose to be more careful and alert when they encounter a driver violating the rules. A similar finding was found by Delhomme, Chaurand, and Paran (2012). According to these findings, the more people were angered by illegal driving, the less they engaged in speeding. Regarding this finding, they suggested that illegal driving led to less anger because it was seen as acceptable and included in drivers' personal norm.

According to the moderation results, masculinity interacted only with anger by slow driving. This finding can be explained by the frustration-aggression model proposed by Dollard et al. (1939). Based upon this model, Shinar (1998) proposed that aggressive driving occurs as a result of "frustration-driven instrumental behaviours" which reveal itself in inconsiderateness towards or annoyance of other drivers and deliberate dangerous driving to save time at the expense of others. Thus, it may be possible that those masculine drivers who give particular importance to skilfulness rather than safety (Özkan & Lajunen, 2006) engage in aggressive manoeuvres and verbal assaults to reach their planned objectives.

The present study was conducted among young Turkish drivers. Very similar findings have been reported in a diverse group of countries such as France (Albentosa et al., 2018; Sullman et al., 2017), Germany (Krahé, 2005, 2018), Israel (Oppenheim et al., 2016), Ukraine (Sullman et al., 2017) and Turkey (Öztürk et al., 2021). The general findings that the gender role is a more important predictor of driver anger and aggression than biological sex seems to have some cross-cultural generalizability. Moreover, the masculine gender role appears to escalate, and the feminine gender role to buffer aggressive driver behaviours regardless of the culture. However, it should be noted that the definitions of gender roles are culture-dependent to a high degree since the cultural norms and socialisation processes vary among cultures. These cultural differences are very likely reflected in how gender roles are related to driver motions and behaviours, including anger and aggressive driving (Granié et al., 2021). A much more representative sample of countries and cultures is needed to answer the question about the relationship between different gender roles (e.g., masculine, feminine, unidentified, negative, positive) and driver emotions and related behaviours. Future research could investigate, for example, how a nation's location in the femininity-masculinity continuum is reflected in gender roles and, finally, in driver behaviour. It could be assumed that cultures emphasising feminine values also value less aggressive and more collaborative driver behaviour instead of risk-taking and competition.

Like any research, this study is not free from limitations. First, the present study specifically focused on the young drivers, and the findings, therefore, may not apply to other age groups. Thus, the present findings should be interpreted considering the fact that androgynous traits may become more prominent in the later phases of adulthood (Strough et al., 2007). Second, the study was carried out based on self-report measures, which may inhibit the genuine answers related to their real driving behaviours and, in turn, may lead to social desirability bias. However, anonymity and confidentiality were emphasized during the data collection phase in order to reduce the influence of this limitation.

The present study highlights two important implications: First, this study is one of the few that point out the factors beyond the sex of the driver, namely, social gender roles of the individuals with driving anger. Öztürk et al. (2021) study found that femininity was positively associated with constructive anger expression and negatively associated with aggressive anger expression. In contrast, masculinity was associated with aggressive anger expression. These findings are in line with the findings of the present study. In addition to anger expression, we investigated the moderator effects of gender roles on the relationship between driver anger and anger expression. This is especially interesting, because the gender role might not only determine how the driver expresses his/her anger but also what elicits that anger and in which degree. Our study highlights the importance of gender roles for driver anger, driver anger expression and the relationship between anger and aggressive behaviour. Additionally, driving as a social activity has its own idiosyncratic communication styles and background. Concerning this, the second implication of this study lies behind the intervention strategies for high-danger drivers. The findings give some clues for the content of possible prevention and intervention programs. Accordingly, these programs may include the above-mentioned factors in addition to safety-related perceptual processes or driving skills. Moreover, prevention campaigns emphasizing the femininity aspect of personality could be designed. Considering the fact that macho men were found to report more driving aggression more often (Krahé and Fenske, 2002), a prevention campaign that breaks such a match-up could sow the seeds of a new socialization process "through identification with being a safe person" (Sibley and Harré, 2009). In conclusion, the results presented here suggested that masculinity and femininity and driving anger had an additive effect on the expression of driving anger in young drivers. The relationship between driving anger and verbal, physical, and vehicular anger expression were moderated by masculinity. Moreover, it was the interaction of illegal driving and police presence with femininity that decreases the frequency of using vehicles to express anger on the road.

## 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.

## References

- AAA Foundation for Traffic Safety, 2009. Aggressive Driving: Research Update. AAA Foundation for Traffic Safety, Washington, DC.
- Albentosa, J., Stephens, A.N., Sullman, M.J.M., 2018. Driver anger in France: The relationships between sex, gender roles, trait and state driving anger and appraisals made while driving. *Transp. Res. F: Traffic Psychol. Behav.* 52, 127–137. <https://doi.org/10.1016/j.trf.2017.11.019>.
- Bem, S.L., 1974. The measurement of psychological androgyny. *J. Consult. Clin. Psychol.* 42 (2), 155–162.
- Bem, S.L., 1981. Bem Sex Role Inventory: Professional Manual. Consulting Psychologists Press, Palo Alto, CA.
- Berdoulat, E., Vavassori, D., Munoz Sastre, M.T., 2013. Driving anger, emotional and instrumental aggressiveness, and impulsiveness in the prediction of aggressive and transgressive driving. *Accid. Anal. Prev.* 50, 758–767. <https://doi.org/10.1016/j.aap.2012.06.029>.
- Brown, I.D., 1982. Exposure and experience are a confounded nuisance in research on driver behaviour. *Accid. Anal. Prev.* 14 (5), 345–352.
- Brown, I.D., Copeman, A.K., 1975. Drivers' attitudes to the seriousness of traffic offences considered in relation to the design of sanctions. *Accid. Anal. Prev.* 7, 15–26.
- Dahlen, E.R., Edwards, B.D., Tubré, T., Zypur, M.J., Warren, C.R., 2012. Taking a look behind the wheel: An investigation into the personality predictors of aggressive driving. *Accid. Anal. Prev.* 45, 1–9. <https://doi.org/10.1016/j.aap.2011.11.012>.
- Deffenbacher, J.L., Deffenbacher, D.M., Lynch, R.S., Richards, T.L., 2003a. Anger, aggression, and risky behaviour: a comparison of high and low anger drivers. *Behav. Res. Ther.* 41, 701–718. [https://doi.org/10.1016/S0005-7967\(02\)00046-3](https://doi.org/10.1016/S0005-7967(02)00046-3).
- Deffenbacher, J.L., Filetti, L.B., Richards, T.L., Lynch, R.S., Oetting, E.R., 2003b. Characteristics of two groups of angry drivers. *J. Couns. Psychol.* 50 (2), 123–132.
- Deffenbacher, J.L., Kemper, C.C., Richards, T.L., 2007. The Driving Anger Expression Inventory: A validity study with community college student drivers. *J. Psychopathol. Behav. Assess* 29 (4), 220–230.
- Deffenbacher, J.L., Lynch, R.S., Filetti, L.B., Dahlen, E.R., Oetting, E.R., 2003c. Anger, aggression, risky behaviour, and crash-related outcomes in three groups of drivers. *Behav. Res. Ther.* 41, 333–349. [https://doi.org/10.1016/S0005-7967\(02\)00014-1](https://doi.org/10.1016/S0005-7967(02)00014-1).
- Deffenbacher, J.L., Lynch, R.S., Oetting, E.R., Swaim, R.C., 2002. The Driving Anger Expression Inventory: A measure of how people express their anger on the road. *Behav. Res. Ther.* 40 (6), 717–737.
- Deffenbacher, J.L., Lynch, R.S., Oetting, E.R., Yingling, D.A., 2001. Driving anger: correlates and a test of state-trait theory. *Personal. Individ. Differ.* 31 (8), 1321–1331.
- Deffenbacher, J.L., Oetting, E.R., Lynch, R.S., 1994. Development of a driving anger scale. *Psychol. Rep.* 74 (1), 83–91.
- Deffenbacher, J.L., Oetting, E.R., Lynch, R.S., Morris, C.D., 1996. The expression of anger and its consequences. *Behav. Res. Ther.* 34 (7), 575–590.
- Deffenbacher, J.L., Richards, T.L., Lynch, R.S., 2004a. Anger, aggression, and risky behaviour in high anger drivers. In: Morgan, J.P. (Ed.), *Focus on aggression research*. Nova Science Publishers, Hauppauge, NY, pp. 115–156.
- Deffenbacher, J.L., White, G.S., Lynch, R.S., 2004b. Evaluation of two new scales assessing driving anger: The Driving Anger Expression Inventory and the Driver's Angry Thoughts Questionnaire. *J. Psychopathol. Behav. Assess* 26 (2), 87–99.
- Delhomme, P., Chaurand, N., Paran, F., 2012. Personality predictors of speeding in younger drivers: Anger vs. sensation seeking. *Transp. Res. Part F* 15, 654–666. <https://doi.org/10.1016/j.trf.2012.06.006>.
- Dollard, J., Doob, L., Miller, N., Mowrer, O., Sears, R., 1939. *Frustration and Aggression*. Yale University Press, New Haven, CN.
- Dula, C.S., Ballard, M.E., 2003. Development and evaluation of a measure of dangerous, aggressive, negative emotional, and risky driving. *J. Appl. Soc. Psychol.* 33 (2), 263–282.
- Ellison-Potter, P., Bell, P., Deffenbacher, J., 2001. The effects of trait driving anger, anonymity, and aggressive stimuli on aggressive driving behaviour. *J. Appl. Soc. Psychol.* 31 (2), 431–443.
- Ekman, P., 2003a. Emotions revealed: Recognizing faces and feelings to improve communication and emotional life. Times Books, New York.
- Ekman, P., 2003b. Unmasking the face: A guide to recognizing emotions from facial cues. Malor Books, Cambridge, MA.
- Eşiyok, B., Yasak, Y., Korkusuz, I., 2007. Trafikte öfke ifadesi: Sürücü Öfke İfadesi Envanteri'nin geçerlik ve güvenilirliği. *Türk Psikiyatri Dergisi* 18 (3), 231–243.
- González-Iglesias, B., Gómez-Fraguela, J.A., Luengo-Martín, M.A., 2012. Driving anger and traffic violations: Gender differences. *Transp. Res. Part F* 15 (4), 404–412. <https://doi.org/10.1016/j.trf.2012.03.002>.
- Granié, M.-A., Thévenet, C., Varet, F., Evnennou, M., Oulid-Azouz, N., Lyon, C., Meesmann, U., Robertson, R., Torfs, K., Vanlaar, W., Woods-Fry, H., Van den Bergh, W., 2021. Effect of Culture on Gender Differences in Risky Driver Behavior through Comparative Analysis of 32 Countries. *Transp. Res. Rec.* 2675 (3), 274–287. <https://doi.org/10.1177/0361198120970525>.
- Herrero-Fernandez, D., 2013. Do people change behind the wheel? A comparison of anger and aggression on and off the road. *Transp. Res. Part F* 21, 66–74. <https://doi.org/10.1016/j.trf.2013.09.008>.
- Krahé, B., 2005. Predictors of women's aggressive driving behaviour. *Aggressive Behavior* 31, 537–546. <https://doi.org/10.1002/ab.20010>.
- Krahé, B., 2018. Gendered Self-Concept and the Aggressive Expression of Driving Anger: Positive Femininity Buffers Negative Masculinity. *Sex Roles* 79 (1–2), 98–108. <https://doi.org/10.1007/s11199-017-0853-9>.
- Krahé, B., Fenske, I., 2002. Predicting aggressive driving behaviour: The role of macho personality, age, and power of the car. *Aggressive Behavior* 28, 21–29.
- Lajunen, T., Parker, D., 2001. Are aggressive people aggressive drivers? A study of the relationship between self-reported general aggressiveness, driver anger and aggressive driving. *Accid. Anal. Prev.* 33 (2), 243–255.
- Lajunen, T., Parker, D., Stradling, S.G., 1998. Dimensions of driver anger, aggressive and highway code violations and their mediation by safety orientation in UK drivers. *Transp. Res. Part F* 1 (2), 107–121.
- Lawton, R., Parker, D., Manstead, A.S.R., Stradling, S.G., 1997. The role of affect in predicting social behaviours: The case of road traffic violations. *J. Appl. Soc. Psychol.* 27 (14), 1258–1276.
- Mast, M.S., Sieverding, M., Esslen, M., Graber, K., Jancke, L., 2008. Masculinity causes speeding in young men. *Accid. Anal. Prev.* 40 (2), 840–842. <https://doi.org/10.1016/j.aap.2007.09.028>.
- McRae, K., Ochsner, K.N., Mauss, I.B., Gabrieli, J.J.D., Gross, J.J., 2008. Gender differences in emotion regulation: An fMRI study of cognitive reappraisal. *Group Proc. Intergroup Relations* 11 (2), 143–162. <https://doi.org/10.1177/1368430207088035>.
- Navas, J.F., Martín-Pérez, C., Petrova, D., Verdejo-García, A., Cano, M., Sagripanti-Mazuquín, O., Perandrés-Gómez, A., López-Martín, Á., Cordovilla-Guardia, S., Megías, A., Perales, J.C., Vilar-López, R., 2019. Sex differences in the association between impulsivity and driving under the influence of alcohol in young adults: The specific role of sensation seeking. *Accid. Anal. Prev.* 124, 174–179. <https://doi.org/10.1016/j.aap.2018.12.024>.
- O'Connor, B.P., 1998. All-in-one programs for exploring interactions in moderated multiple regression. *Educ. Psychol. Measur.* 58, 833–837.
- Oppenheim, I., Oron-Gilad, T., Parmet, Y., Shinar, D., 2016. Can traffic violations be traced to gender-role, sensation seeking, demographics and driving exposure? *Transp. Res. F: Traffic Psychol. Behav.* 43, 387–395. <https://doi.org/10.1016/j.trf.2016.06.027>.
- Özkan, T., Lajunen, T., 2005a. Why are there sex differences in risky driving? The relationship between sex and gender-role on aggressive driving, traffic offences, and accident involvement among young Turkish drivers. *Aggressive Behavior* 31 (6), 547–558. [https://doi.org/10.1002/\(ISSN\)1098-233710.1002/ab.v31:610.1002/ab.20062](https://doi.org/10.1002/(ISSN)1098-233710.1002/ab.v31:610.1002/ab.20062).
- Özkan, T., Lajunen, T., 2005b. Masculinity, femininity, and the Bem ex Role Inventory in Turkey. *Sex Roles* 52, 103–110. <https://doi.org/10.1007/s11199-005-1197-4>.
- Özkan, T., Lajunen, T., 2006. What causes the differences in driving between young men and women? The effects of gender roles and sex on young drivers' driving behaviour and self-assessment of skills. *Transp. Res. Part F* 9 (4), 269–277. <https://doi.org/10.1016/j.trf.2006.01.005>.
- Öztürk, İ., Özkan, Ö., Öz, B., 2021. Investigating sex, masculinity and femininity in relation to impulsive driving and driving anger expression. *Transp. Res. F: Traffic Psychol. Behav.* 81, 14–26. <https://doi.org/10.1016/j.trf.2021.05.009>.
- Richard, C.M., Magee, K., Bacon-Abdelmoteleb, P., Brown, J.L., 2018. Countermeasures that work: A highway safety countermeasure guide for State Highway Safety Offices, Ninth edition (Report No. National Highway Traffic Safety Administration, Washington, DC).
- Rhodes, N., Pivik, K., 2011. Age and gender differences in risky driving: The roles of positive affect and risk perception. *Accid. Anal. Prev.* 43 (3), 923–931. <https://doi.org/10.1016/j.aap.2010.11.015>.
- Schwebel, D.C., Severson, J., Ball, K.K., Rizzo, M., 2006. Individual difference factors in risky driving: The roles of anger/hostility, conscientiousness, and sensation-seeking. *Accid. Anal. Prev.* 38 (4), 801–810. <https://doi.org/10.1016/j.aap.2006.02.004>.
- Shinar, D., 1998. Aggressive driving: The contribution of the drivers and situation. *Transp. Res. Part F* 1, 137–160.
- Sibley, C.G., Harré, N., 2009. A gender role socialization model of explicit and implicit biases in driving self-enhancement. *Transp. Res. Part F* 12 (6), 452–461. <https://doi.org/10.1016/j.trf.2009.08.006>.
- Simon, F., Corbett, C., 1996. Road traffic offending, stress, age, and accident history among male and female drivers. *Ergonomics* 39 (5), 757–780. <https://doi.org/10.1080/00140139608964497>.
- Spielberger, C.D., 1988. State-trait anger expression inventory, 1st ed. Psychological Assessment Resources, Odessa, FL.
- Strough, J., Leszczynski, J.P., Neely, T.L., Flinn, J.A., Margrett, J., 2007. From adolescence to later adulthood: femininity, masculinity, and androgyny in six age groups. *Sex Roles* 57 (5–6), 385–396. <https://doi.org/10.1007/s11199-007-9282-5>.
- Sullman, M.J.M., 2015. The expression of anger on the road. *Saf. Sci.* 72, 153–159. <https://doi.org/10.1016/j.ssci.2014.08.013>.
- Sullman, M.J.M., Paxion, J., Stephens, A.N., 2017a. Gender roles, sex and the expression of driving anger. *Accid. Anal. Prev.* 106, 23–30. <https://doi.org/10.1016/j.aap.2017.05.016>.
- Sullman, M.J.M., Stephens, A.N., Hill, T., 2017b. Gender roles and the expression of driving anger among Ukrainian drivers. *Risk Anal.* 37 (1), 52–64. <https://doi.org/10.1111/risa.2017.37.issue-110.1111/risa.12592>.
- Sullman, M.J.M., Stephens, A.N., Kuzu, D., 2013. The expression of anger amongst Turkish taxi drivers. *Accid. Anal. Prev.* 56, 42–50. <https://doi.org/10.1016/j.aap.2013.03.013>.
- Summala, H., 1987. Young driver accidents: Risk taking or failure of skill. *Alcohol, Drugs and Driving* 3 (3–4), 79–91.

- Tasca, L., 2000. A Review of the Literature on Aggressive Driving Research. Technical Report. Ontario Advisory Group on Safe Driving Secretariat, Road User Safety Branch, Ontario Ministry of Transportation, Ontario, ON.
- TÜİK (Turkish Statistical Institute) (2020). Traffic Accident Statistics (Karayolu Trafik Kaza İstatistikleri,) 2019. Retrieved from <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=33628>.
- WHO, 2018. Global status report on road safety 2018. World Health Organization, Geneva.
- Wickens, C.M., Mann, R.E., Stoduto, G., Butters, J.E., Ialomiteanu, A., Smart, R.G., 2012. Does gender moderate the relationship between driver aggression and its risk factors? *Accid. Anal. Prev.* 45, 10–18. <https://doi.org/10.1016/j.aap.2011.11.013>.
- Ulleberg, P., 2001. Personality subtypes of young drivers. Relationship to risk-taking preferences, accident involvement, and response to a traffic safety campaign. *Transp. Res. Part F* 4 (4), 279–297.
- Yasak, Y., Esiyok, B., 2009. Anger amongst Turkish drivers: Driving anger scale and its adapted, long and short version. *Saf. Sci.* 47 (1), 138–144. <https://doi.org/10.1016/j.ssci.2008.02.003>.