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Investigating Sex, Masculinity and Femininity in Relation to Impulsive Driving and Driving
Anger Expression

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22

Abstract

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

44 **Keywords:** *gender roles, masculinity, femininity, impulsive driver behaviours, driving anger*
45 *expression*

46

72 tend to make more accurate decisions when they have to do so in a very short time (Dickman
73 & Meyer, 1988).

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

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

94 As Bıçaksız and Özkan (2016a) point out, such general conceptualisations of impulsivity have
95 been used in studies examining the relations between this construct and different driving-related
96 constructs and outcomes. However, to meet the need for a driving-specific conceptualisation of

97 impulsivity, Bıçaksız (2015) defined driving-specific impulsivity or traffic impulsivity as the
98 tendency to act quickly while driving, whether inaccurately or accurately, without considering
99 the future consequences of those actions. Bıçaksız and Özkan (2016b) developed the Impulsive
100 Driver Behaviour Scale (IDBS) to measure driving-specific impulsive behaviours under four
101 factors, namely driver functional impulsivity, driver urgency, driver lack of premeditation and
102 driver lack of perseverance.

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

113 Furthermore, researchers have found that driving- or traffic-specific impulsivity contributes
114 more and explains a higher amount of variance than general impulsivity (Bıçaksız, 2015;
115 Bıçaksız & Özkan, 2016b). In terms of driver behaviours, drivers high in driver urgency, driver
116 lack of premeditation and driver lack of perseverance reported higher levels of violations, errors
117 and lapses, while driver functional impulsivity was negatively related to errors and lapses.
118 Additionally, lack of premeditation was negatively related to positive driver behaviours, while
119 driver functional impulsivity was positively related to positive driver behaviours (Bıçaksız,
120 2015; Bıçaksız & Özkan, 2016b).

121 Certain demographic variables such as age, exposure to traffic and sex are associated with
122 differences in impulsivity. Berdoulat et al. (2013) found that age was negatively correlated with
123 lack of premeditation and lack of perseverance. In another study, Kováčsová et al. (2016) found
124 a negative correlation between age and dysfunctional impulsivity, while Bıçaksız and Özkan
125 (2016b) found a positive correlation between age and driver functional impulsivity, and
126 negative correlations between age and driver lack of premeditation, lack of perseverance and
127 urgency.

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

139 In the literature, different studies have examined the relationship between impulsivity and road
140 safety with various driving-related outcomes, such as risky driving (Monteiro et al. 2018) or
141 driving anger and anger expression (Bıçaksız & Özkan, 2016a; Dahlen et al., 2005; Mirón-
142 Juárez et al., 2020; Deffenbacher et al., 2003b); and have employed a variety of methods, such
143 as self-reports (Bıçaksız & Özkan, 2016b) or driving simulators (Bıçaksız et al., 2019).
144 Individuals with higher impulsivity have less self-control to abstain from engaging in risky
145 behaviours (Barratt, 1994). High level of impulsivity has been related to drunk driving, reduced

146 seatbelt-use (Stanford et al., 1996) and aggressive driving (Dahlen et al., 2005). Impulsivity
147 was also significantly related to driving anger (Dahlen et al., 2005; DePasquale et al., 2001).
148 Different forms of aggressive driving anger expression, namely physically aggressive
149 expression, verbally aggressive expression, and use of a vehicle to express anger, were related
150 to impulsivity. Unsurprisingly, drivers with higher levels of impulsivity tend to be more
151 aggressive when expressing their anger (Dahlen et al., 2005; Deffenbacher et al., 2003b).

152 **1.2. Driving Anger Expression**

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

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

171 Besides, anger also decreases the performance of drivers in a driving simulator, resulting in
172 higher speed and more acceleration (Roidl et al., 2013). High-anger drivers also express their
173 anger more aggressively and experience more negative outcomes such as risky behaviours in
174 different situations (Deffenbacher et al., 2002; 2003a; Nesbit & Conger, 2012). Additionally,
175 they show their anger more frequently in both verbal and physical ways (Deffenbacher et al.,
176 2003a). Considering the relationship with driving outcomes, when aggressive driving increases,
177 the severity of injuries also increases (Paleti et al., 2010). Moreover, drivers who use their
178 vehicle to express anger reported higher levels of fines. The adaptive expression is negatively
179 correlated with risky driving behaviours (Ge et al., 2015).

180 Drivers' levels of anger and anger expression are influenced by various driver characteristics
181 (Berdoulat et al., 2013; Lajunen & Parker, 2001). For instance, Lajunen and Parker (2001) and
182 Li et al. (2014) found that younger drivers are more likely to experience and report higher levels
183 of anger while driving. Additionally, younger drivers in different countries also express their
184 anger more aggressively (Eşiyok et al., 2007; Herrero-Fernández, 2011; Paleti et al., 2010;
185 Sarbescu, 2012; Sullman, 2015). One possible explanation for this age difference is that older,
186 more experienced drivers might be more tolerant of anger-provoking traffic situations than
187 younger drivers (Lajunen et al., 1998). However, contradictory findings indicated no difference
188 between young and old drivers (Bachoo et al., 2013). Similarly, researchers have also found
189 that drivers with high and low exposure to traffic do not differ in terms of their level of anger
190 (Deffenbacher et al., 2003a; Deffenbacher et al., 2001). However, Sullman (2015) reported that,
191 as the mileage and frequency of driving increase, drivers report higher levels of aggressive
192 behaviours.

193 In addition to the effects of age and traffic exposure, sex differences in driving anger and driving
194 anger expression have also been reported in various studies. Male drivers more frequently
195 express their anger in aggressive ways (González-Iglesias et al., 2012) and by using their

196 vehicle to express anger, whereas female drivers tend to show more adaptive and constructive
197 anger expression (Eşiyok et al., 2007). Additionally, while male drivers tend to show higher
198 frequencies of aggressive behaviours while driving, female drivers become angrier than males
199 when there are traffic obstructions that cause roadblocks (González-Iglesias et al., 2012). In
200 another study with Romanian and Serbian samples, Sârbescu et al. (2014) investigated sex
201 differences in driving anger expression after controlling the statistical effects of kilometres
202 driven. In the Romanian sample, sex difference was found only in the use of the vehicle to
203 express anger, with male drivers expressing anger in this way more than females. In the Serbian
204 sample, male drivers also used their vehicle to express anger more frequently, while female
205 drivers reported to display more adaptive/constructive anger expression. This pattern of anger
206 expression was also reported by Gras et al. (2016) who found that male drivers exhibited more
207 physically aggressive expressions and used vehicle more frequently to express anger, whereas
208 female drivers displayed more adaptive/constructive anger expression.

209 **1.3. Gender Roles in Driving**

210 As discussed by Sümer (2003) in the contextual mediated model, different forms of behaviours
211 (driving anger expression and impulsive driver behaviours in the present study) were affected
212 by various distal context variables such as demographic variables and relatively stable
213 personality characteristics. Two of those distal context factors that are also addressed in the
214 present study are sex and gender roles. Briefly, people learn how to behave or how to interact
215 based on conceptions of masculinity and femininity. It is essential to clarify the significance of
216 gender roles because masculinity and femininity are closely related to a person's self-concept.
217 Femininity refers to the attributions, behaviours and roles which are more typical and desirable
218 for a woman than for a man, whereas masculinity refers to the attributions, behaviours and roles
219 that are typical for men (Bem, 1974).

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

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

243 **1.4. The Current Study**

244 As highlighted earlier, sex differences and gender roles have also been found to affect various
245 driver behaviours and driving outcomes. Moreover, the previous literature showed that both
246 impulsive driver behaviours and driving anger expression have been associated with various
247 driving outcomes and have substantial effects on road safety. As stated earlier, drivers with high
248 impulsivity are more prone to exhibit driving anger and aberrant driver behaviour. Ball et al.
249 (2018) also discussed that impulsivity could be a predisposition to become aggressive and show
250 aggressive behaviours while driving. Similarly, Pérez-Moreno et al. (2015) found
251 impulsiveness was positively associated with aggressiveness while driving.

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

264 Accordingly, the two main objectives of the study were:

- 265 (1) to examine the sex differences in impulsive driver behaviours and driving anger
266 expression;

267 (2) to examine the relations of sex and gender roles with impulsive driver behaviours and
268 driving anger expression.

269 **2. Method**

270 **2.1. Participants and Procedure**

271 In the present study, 425 participants between the ages of 18 and 56 ($M = 25.46$, $SD = 7.58$,
272 $Median = 23.00$) were recruited. The average lifetime kilometres driven was 39397.04 ($SD =$
273 70809.37). In terms of the sex distribution, 44.5% of the participants were females ($n = 189$),
274 and 55.5% were males ($n = 236$).

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

289 **2.2. Measures**

290 **2.2.1. Bem Sex-Role Inventory**

291 The short version of the Bem Sex-Role Inventory, which consists of three subscales: masculine,
292 feminine and neutral, was used to measure gender stereotypes. In the present study, 20 items
293 representing masculine and feminine characteristics were used and rated on a 7-point Likert-
294 type scale ranging from 1 (almost never true) to 7 (almost always true). The short version of
295 the scale was adapted into Turkish by Özkan and Lajunen (2005b). In this adaptation, the
296 masculinity subscale includes 10 items measuring male characteristics in society, such as being
297 dominant, and the femininity dimension includes ten items focusing on female characteristics
298 in society, such as being emotional. The Cronbach's alpha reliabilities of masculinity and
299 femininity were .74 and .80, respectively.

300 **2.2.2. Impulsive Driver Behaviours Questionnaire**

301 The Impulsive Driver Behaviour Scale was developed to measure the impulsive behaviours of
302 drivers in traffic (Bıçaksız & Özkan, 2016b). This is a four-factor scale consisting of 42 items
303 rated on a 5-point Likert-type scale ranging from 1 (does not reflect me at all) to 5 (completely
304 reflects me). The first factor, driver functional impulsivity, is assessed with 13 items. A sample
305 item for this subscale is "I can make up my mind very quickly in an emergency". The second
306 factor, driver urgency, is measured via 11 items, such as "Although I am not in a hurry, I am
307 impatient while driving". The third factor is driver lack of premeditation, which is assessed with
308 10 items, an example of which is "I avoid behaviours that may generate potential risks while I
309 am driving". The final factor, driver lack of perseverance, was measured using 8 items. A
310 sample item for this subscale is "I may not act appropriately in an emergency because of
311 absence of mind". The Cronbach's alpha reliabilities of the subscales were .89 for driver
312 functional impulsivity, .85 for driver urgency, .75 for driver lack of premeditation and .79 for
313 driver lack of perseverance.

314 **2.2.3. Driving Anger Expression Inventory**

315 The Driving Anger Expression Inventory (DAX) was used to measure how drivers express their
316 driving anger in traffic situations. This is a four-factor scale consisting of 49 items scored on a
317 4-point Likert-type from 1 (almost never) to 4 (almost always). In previous studies, the
318 Cronbach's alpha reliabilities of the subscales have been between .80 and .90 (Deffenbacher et
319 al., 2002). In the present study, the Turkish adaptation was used (Eşiyok et al., 2007). The first
320 factor, "verbally aggressive expression" was measured via 12 items, such as "I make negative
321 comments about the other driver". The second factor, "physically aggressive expression" was
322 assessed with 11 items, e.g., "I try to get out of the car and tell the other driver off". The third
323 DAX factor is "using the vehicle for aggressive expression", which was measured via 11 items.
324 The sample item for this factor is "I try to cut in front of other drivers". The final factor,
325 "adaptive/constructive expression", was assessed via 15 items, such as "I think things through
326 before I respond". The Cronbach's alpha reliabilities of the subscales were .90 for verbally
327 aggressive expression, .88 for physically aggressive expression, .88 for use of the vehicle for
328 aggressive expression and .89 for adaptive/constructive anger expression.

329 **2.2.4. Demographic Information Form**

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

332 **2.3. Analyses**

333 A total of 664 responses was collected for the study. Participants with partial responses and
334 those with outlier scores (z-scores of 3.5) in terms of lifetime kilometres and age ($N = 239$)
335 were removed from the data and not included into the further analyses. In the first phase of
336 analysis, descriptive statistics and bivariate correlations were computed and are presented in
337 Table 1. Eight ANCOVA analyses were then conducted to test sex differences in impulsive
338 driver behaviours and driving anger expression after controlling the statistical effects of age
339 and lifetime kilometres driven. In line with the second objective, i.e., investigating main and

340 interaction effects of sex (male and female) and gender roles (masculinity and femininity) on
341 impulsive driver behaviours and driving anger expression, eight hierarchical regression
342 analyses were performed to test the effects of sex and gender roles on impulsive driver
343 behaviours and driving anger expression. In the regression analyses, age and lifetime kilometres
344 driven were entered in the first step as initial control variables. The variance inflation factor
345 values indicated there were no problems of multicollinearity regarding age and lifetime
346 kilometres. In the second step, sex, masculinity and femininity were entered, and then, the
347 interaction terms were entered in the model. Masculinity and femininity were centred, and then
348 interaction terms were calculated by following the procedure outlined by Aiken and West
349 (1991). In the second and third steps, the centred version of the gender roles and interaction
350 terms were used. Analyses were conducted using SPSS v.24. To avoid repetition, dimensions
351 of impulsive driver behaviours were written without “driver” (e.g. “urgency” rather than “driver
352 urgency”).

353 **3. Results**

354 **3.1. Descriptive Statistics and Correlations**

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

365 lack of premeditation and lack of perseverance. The dimensions of aggressive expression were
366 positively related to each other and negatively associated with adaptive/constructive expression.
367 Higher adaptive/constructive expression associated with higher functional impulsivity and
368 lower dysfunctional impulsivity. Aggressive expression was positively related to all impulsivity
369 dimensions, except functional impulsivity and verbally and physically aggressive expressions.

370 **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	.575**	1										
3. Masculinity	.006	.067	1									
4. Femininity	.137**	.107*	.244**	1								
5. Functional	.058	.158**	.314**	.178**	1							
6. Urgency	-.156**	-.063	.132**	-.243**	.079	1						
7. Premeditation	-.081	.069	-.098*	-.388**	-.282**	.411**	1					
8. Perseverance	-.076	-.095	-.087	-.216**	-.407**	.367**	.448**	1				
9. Verbally agg.	-.058	-.038	.059	-.176**	.089	.495**	.141**	.212**	1			
10. Physically agg.	-.007	-.004	.094	-.226**	-.016	.379**	.351**	.359**	.501**	1		
11. Use of vehicle	-.028	.069	.160**	-.182**	.177**	.577**	.397**	.283**	.520**	.634**	1	
12. Adaptive exp.	.111*	.041	.103*	.283**	.129**	-.388**	-.323**	-.148**	-.207**	-.125**	-.283**	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	.75	.75	.60	.72	.46	.66	.65	.40	.54	.58

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

374

375 3.2. Sex Differences among Impulsive Behaviours and Anger Expression

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

383 **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	.57	15.43	.000	.04
	Female	3.64	.61			
Urgency	Male	2.72	.69	1.57	.210	.00
	Female	2.61	.76			
Premeditation	Male	1.87	.47	6.54	.011	.02
	Female	1.73	.44			
Perseverance	Male	2.29	.64	1.73	.189	.00
	Female	2.38	.68			
Verbally agg.	Male	2.27	.66	.234	.629	.00
	Female	2.30	.65			
Physically agg.	Male	1.26	.41	.534	.465	.00
	Female	1.23	.40			
Use of vehicle	Male	1.72	.55	12.53	.000	.03
	Female	1.51	.52			
Adaptive exp.	Male	2.56	.60	2.38	.124	.01
	Female	2.66	.56			

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

388 3.3. Sex, Gender Roles and Impulsive Driver Behaviours

389 To test the relations of sex and gender roles with impulsive driver behaviours, four different
 390 hierarchical regression analyses were conducted. In the first step, demographic variables age
 391 and lifetime kilometres were entered to the model as control variables. In the second step, sex

392 and gender roles (femininity and masculinity) were entered. Finally, the interactions (sex *
393 femininity, sex * masculinity, femininity * masculinity) were entered. For functional
394 impulsivity, the model was significant, $F(8, 405) = 9.56, p < .001$, and explained 15.9% of the
395 variance ($R^2 = .159$). From the demographic variables, lifetime kilometres driven (95% CI [.00,
396 .00]) was positively related to functional impulsivity. Sex (95% CI [-.34, -.11]) was negatively
397 related to functional impulsivity, and both masculinity (95% CI [.11, .26]) and femininity (95%
398 CI [.04, .19]) were positively related to functional impulsivity. After controlling the statistical
399 effects of demographic variables, being male, higher masculinity and higher femininity were
400 associated with higher functional impulsivity. For urgency, the model was significant, $F(8, 405)$
401 $= 6.92, p < .001$, and explained 12% of the variance ($R^2 = .12$). From the demographic
402 variables, age (95% CI [-.03, -.01]) was negatively related to urgency. Moreover, masculinity
403 (95% CI [.10, .29]) was positively related to urgency, while femininity (95% CI [-.35, -.17])
404 was negatively related to this dimension of dysfunctional impulsivity. After controlling the
405 statistical effects of demographic variables, higher masculinity and lower femininity were
406 associated with higher urgency.

407 For lack of premeditation, the model was significant, $F(8, 405) = 11.10, p < .001$, and explained
408 18% of the variance ($R^2 = .18$). From the demographic variables, lifetime kilometres driven
409 (95% CI [.00, .00]) was positively related to lack of premeditation, while age (95% CI [-.02, -
410 .00]) was negatively related to lack of premeditation. Moreover, femininity (95% CI [-.28, -
411 .16]) was negatively related to lack of premeditation. After controlling the statistical effects of
412 demographic variables, higher femininity was related to lower impulsive driver behaviours
413 associated with lack of premeditation. For lack of perseverance, the model was significant, $F(8,$
414 $405) = 3.71, p < .001$, and explained 6.8% of the variance ($R^2 = .068$). Sex (95% CI [.00, .26])
415 was positively related to lack of perseverance, while femininity (95% CI [-.28, -.11]) was
416 negatively related to lack of perseverance. After controlling the statistical effects of

417 demographic variables, being male and lower femininity were associated with more impulsive
418 driver behaviours related to lack of perseverance.

419 Overall, femininity was positively associated with functional impulsivity and negatively
420 associated with the three dimensions of dysfunctional impulsivity: urgency, lack of
421 premeditation and lack of perseverance. Additionally, masculinity positively predicted
422 functional impulsivity and urgency. The results also showed that being male is significantly
423 positively associated with lack of perseverance and negatively associated with functional
424 impulsivity. None of the interaction effects were significant.

425 **3.4. Sex-Roles and Driving Anger Expression**

426 To test the relations of sex and gender roles with driving anger expression, four different
427 hierarchical analyses were conducted. In the first step, demographic variables age and lifetime
428 kilometres were entered to the model as control variables. In the second step, sex and gender
429 roles (femininity and masculinity) were entered. Finally, the interactions (sex * femininity, sex
430 * masculinity, femininity * masculinity) were entered in the third step. In terms of verbally
431 aggressive expression, the model was significant, $F(8, 405) = 2.76, p = .006$, and explained
432 5.2% of the variance ($R^2 = .052$). Masculinity (95% CI [.03, .20]) was positively associated
433 with verbally aggressive expression, while femininity (95% CI [-.27, -.10]) was negatively
434 associated with verbally aggressive expression. After controlling the statistical effects of
435 demographic variables, higher masculinity and lower femininity were associated with higher
436 rates of verbally aggressive expression. For physically aggressive expression, the model was
437 significant, $F(8, 405) = 4.40, p < .001$, and explained 8% of the variance ($R^2 = .08$). Masculinity
438 (95% CI [.04, .14]) was positively associated with physically aggressive expression, and
439 femininity (95% CI [-.20, -.09]) was negatively associated with physically aggressive

440 expression. After controlling the statistical effects of demographic variables, higher masculinity
441 and lower femininity were associated with higher rates of physically aggressive expression.

442 In terms of use of the vehicle to express anger, the model was significant, $F(8, 405) = 6.03, p <$
443 $.001$), and explained 10.7% of the variance ($R^2 = .107$). Masculinity (95% CI [.07, .21]) was
444 positively associated with physically aggressive expression, while both sex (-.24, -.02]) and
445 femininity (95% CI [-.22, -.08]) were negatively associated with physically aggressive
446 expression. After controlling the statistical effects of demographic variables, males, higher
447 masculinity and lower femininity were positively related to higher use of the vehicle for anger
448 expression. For adaptive/constructive expression, the model was significant, $F(8, 405) = 5.03,$
449 $p < .001$), and explained 9% of the variance ($R^2 = .09$). Age (95% CI [.00, .02]) and femininity
450 (95% CI [.12, .27]) were positively associated with adaptive/constructive expression. After
451 controlling the statistical effects of demographic variables, age and femininity were positively
452 associated with adaptive/constructive expression.

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

458

459

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	FΔ	β	p
1. Demographic Variables	.028	.028**	5.82		.003	.028	.028**	5.97		.003	.029	.029**	6.08		.002	.009	.009	1.83		.162
Age				-.064	.280				-.193	.001				-.189	.002				-.022	.719
Lifetime km				.194	.001				.053	.374				.178	.003				-.080	.185
2. Sex and gender roles	.154	.127***	20.37		.000	.115	.087***	13.35		.000	.179	.150***	24.80		.000	.061	.052***	7.54		.000
Sex (1=male, 2=female)				-.187	.000				.004	.929				-.072	.125				.101	.044
Femininity				.142	.003				-.275	.000				-.364	.000				-.224	.000
Masculinity				.236	.000				.203	.000				-.036	.444				.000	.999
3. Interactions	.159	.005	.73		.532	.120	.005	.79		.502	.180	.001	.22		.885	.068	.007	1.08		.355
Sex * Femininity				.186	.203				.065	.662				-.108	.455				-.269	.081
Sex * Masculinity				-.157	.310				-.058	.711				-.012	.936				.020	.900
Femininity * Masculinity				-.003	.942				-.064	.180				.000	.993				.002	.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.

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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	.003	.003	.70		.499	.000	.000	.02		.979	.014	.014	2.95		.053	.013	.013	2.63		.073
Age				-.058	.334				-.012	.840				-.114	.058				.131	.029
Lifetime km				.000	.999				.005	.929				.140	.020				-.041	.495
2. Sex and gender roles	.050	.046***	6.64		.000	.076	.076***	11.20		.000	.102	.088***	13.28		.000	.088	.076***	11.27		.000
Sex (1=male, 2=female)				.073	.148				.025	.609				-.118	.016				.043	.387
Femininity				-.214	.000				-.274	.000				-.214	.000				.251	.000
Masculinity				.131	.010				.166	.001				.193	.000				.052	.293
3. Interactions	.052	.002	.29		.832	.080	.004	.56		.645	.107	.005	.70		.551	.090	.002	.32		.809
Sex * Femininity				.104	.500				-.102	.505				.164	.274				.015	.922
Sex * Masculinity				.044	.788				.185	.251				.056	.725				-.137	.393
Femininity * Masculinity				-.020	.685				.012	.800				-.029	.547				.028	.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.

461

462

4. Discussion

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

467 Together with the first objective of the study, significant sex differences were found in three
468 types of driver behaviours (i.e. functional impulsivity, lack of premeditation and use of the
469 vehicle to express anger). Similar to the findings of Bıçaksız (2016), after controlling the
470 statistical effects of age and lifetime kilometres driven, male drivers showed higher frequencies
471 of functional impulsive behaviours and stronger lack of premeditation than female drivers.
472 Besides, as stated in different studies, males also showed more aggressive behaviours through
473 the use of their vehicles than female drivers (Gras et al., 2016; Sârbescu et al., 2014; Stephens
474 & Sullman, 2014). As discussed by Stephens and Sullman (2014), using vehicle to express
475 anger enables male drivers to express their anger more directly and in different ways, such as
476 speeding and tailgating.

477 In general, the evidence that male drivers show a wider variety of violations than female drivers
478 (Martinussen et al., 2014; Reason et al., 1990; Rowe et al., 2015; Stephens & Fitzharris, 2016)
479 was also partially supported by the findings of the current study. However, no significant
480 difference was found between male and female drivers with regards to urgency, lack of
481 perseverance, verbally aggressive expression, physically aggressive expression and
482 adaptive/constructive anger expression. Additionally, it should also be highlighted that the
483 differences observed had rather small effect sizes. This may indicate that individual differences,
484 in terms of impulsive driver behaviours and the expression of driving anger, might be related
485 to factors other than sex. Similarly, Özkan and Lajunen (2005a) and Sullman et al. (2017a) also

486 found that gender roles have a more essential role in relations to aggressive driver behaviours
487 than sex.

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

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

510 positively associated with road safety by being negatively associated with dangerous
511 behaviours and positively related to positive behaviours.

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

522 In addition to the effects of gender roles, sex was significantly associated with just three forms
523 of driver behaviour (two impulsive driver behaviours and one form of driving anger
524 expression). The hierarchical regression analyses showed that, after controlling the statistical
525 effects of age and lifetime kilometres, sex was only significantly associated with functional
526 impulsivity, lack of perseverance and use of the vehicle to express anger. When the effects of
527 sex and gender roles were compared, gender roles were found to have stronger effects on both
528 impulsive driver behaviours and driver anger expression than sex. Similar to the findings of the
529 present study, Krahe (2018), Oppenheim et al. (2016) and Sullman et al. (2017a, 2017b) also
530 highlighted the predictive power of gender roles over that of sex. Krahe (2018) and Sullman et
531 al. (2017a) also found that gender roles, and not sex, significantly predicted different forms of
532 driving anger expression. Similarly, Oppenheim et al. (2016) also found that gender roles, as
533 opposed to sex, was a stronger predictor of violation tendency. Considering the effects of sex
534 and gender roles and previous research (Sullman et al., 2017a; Oppenheim et al., 2016), it can

535 be asserted that gender roles have stronger relationship with impulsive driver behaviours and
536 driving anger expression compared to sex.

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

549 Lastly, it can be concluded that gender roles play a crucial role in safety, such that a negative
550 solo effect of masculinity and a positive solo effect of femininity on road safety can be expected.
551 It might be asserted that femininity has positive effects on road safety through more
552 adaptive/constructive anger expression, higher functional impulsive behaviours, and less
553 aggressive driving anger expression and dysfunctional impulsivity. These characteristics of
554 femininity might be used to promote a more positive and safety-oriented traffic system. Traits
555 associated with the gender roles provide important focus points for road safety. According to
556 the Turkish adaptation study of the Bem Sex-Role Inventory (Özkan & Lajunen, 2005b), being
557 dominant, assertive, having leader abilities and being more willing to take risks were four items
558 with the highest loadings for masculinity. On the other hand, being compassionate, affectionate,
559 gentle, and understanding were the four most strongly loaded items for femininity. Considering

560 the content of these items, possible behavioural outcomes in traffic and correlational findings
561 of the present study, it can be claimed that masculine characteristics may be associated with
562 possible risky outcomes with dysfunctional impulsive behaviours, and aggressive anger
563 expression. Nonetheless, the traits of femininity could have a positive role in road safety, acting
564 as protective factors. Driver education programs and some other safety related training
565 programs for drivers may focus positively on traits of femininity and the possible negative
566 consequences of demonstrating masculine traits in traffic.

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

578 In summary, the present study investigated sex and gender roles in relation to impulsive driver
579 behaviours and driving anger expression. In addition to the replication of the previous research
580 findings evidencing the relationship between sex, gender roles and driving anger expression,
581 the present study provided original insight into the association between sex, gender roles and
582 impulsive driver behaviours. Additionally, the results showed that masculinity and femininity
583 are related to dysfunctional impulsive driver behaviours and driving anger expression in
584 opposite ways. In particular, drivers with higher levels of femininity also reported high

585 frequencies of driver functional impulsivity and adaptive/constructive anger expressions.
586 Besides, they also showed low frequencies of dysfunctional impulsive driver behaviours and
587 aggressive ways of anger expression. On the other hand, higher masculinity was positively
588 associated with higher driver functional impulsivity, driver urgency and three forms of
589 aggressive anger expression.

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

599 **Conflict of Interest**

600 The authors do not have any conflict of interest to declare.

601

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References

- 603 Albentosa, J., Stephens, A. N., & Sullman, M. J. M. (2018). Driver anger in France: The
604 relationships between sex, gender roles, trait and state driving anger and appraisals made
605 while driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, *52*,
606 127–137. doi:10.1016/j.trf.2017.11.019
- 607 Bachoo, S., Bhagwanjee, A., & Govender, K. (2013). The influence of anger, impulsivity,
608 sensation seeking and driver attitudes on risky driving behaviour among post-graduate
609 university students in Durban, South Africa. *Accident Analysis and Prevention*, *55*, 67–
610 76. doi:10.1016/j.aap.2013.02.021
- 611 Ball, L., Tully, R., & Egan, V. (2018). The influence of impulsivity and the Dark Triad on self-
612 reported aggressive driving behaviours. *Accident Analysis & Prevention*, *120*, 130-138.
613 <https://doi.org/10.1016/j.aap.2018.08.010>
- 614 Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and*
615 *Clinical Psychology*, *42*(2), 155–162. doi:10.1037/h0036215
- 616 Berdoulat, E., Vavassori, D., & Sastre, M. T. M. (2013). Driver anger, emotional and
617 instrumental aggressiveness, and impulsiveness in the prediction of aggressive and
618 transgressive driving. *Accident Analysis and Prevention*, *50*, 758–767.
619 doi:10.1016/j.aap.2012.06.029
- 620 Bıçaksız, P. (2015). *The differential associations of functional and dysfunctional impulsivity*
621 *with driver behaviors and skills, accidents and offences*. (Unpublished doctoral
622 dissertation). Middle East Technical University, Ankara, Turkey.
- 623 Bıçaksız, P., & Özkan, T. (2016a). Impulsivity and driver behaviors, offences and accident
624 involvement: A systematic review. *Transportation Research Part F: Traffic Psychology*
625 *and Behaviour*, *38*, 194–223. doi:10.1016/j.trf.2015.06.001
- 626 Bıçaksız, P., & Özkan, T. (2016b). Developing the Impulsive Driver Behavior Scale.
627 *Transportation Research Part F: Traffic Psychology and Behaviour*, *43*, 339–356.
628 doi:10.1016/j.trf.2016.09.005

- 629 Bıçaksız, P., Öztürk, İ., & Özkan, T. (2019). The differential associations of functional and
630 dysfunctional impulsivity with driving style: A simulator study. *Transportation*
631 *Research Part F: Traffic Psychology and Behaviour*, *63*, 1-11.
632 doi:10.1016/j.trf.2019.02.011
- 633 Dahlen, E. R., & White, R. P. (2006). The Big Five factors, sensation seeking, and driving anger
634 in the prediction of unsafe driving. *Personality and Individual Differences*, *41*(5), 903–
635 915. doi:10.1016/j.paid.2006.03.016
- 636 de Wit, H. (2009). Impulsivity as a determinant and consequence of drug use: a review of
637 underlying processes. *Addiction Biology*, *14*(1), 22–31.
- 638 Deffenbacher, J. L. (2009). Angry drivers: Characteristics and clinical interventions. *Revista*
639 *Mexicana de Psicología*, *26*(1), 5–16.
- 640 Deffenbacher, J. L., Deffenbacher, D. M., Lynch, R. S., & Richards, T. L. (2003a). Anger,
641 aggression, and risky behavior: A comparison of high and low anger drivers. *Behaviour*
642 *Research and Therapy*, *41*(6), 701–718. doi:10.1016/S0005-7967(02)00046-3
- 643 Deffenbacher, J. L., Filetti, L. B., Richards, T. L., Lynch, R. S., & Oetting, E. R. (2003b).
644 Characteristics of two groups of angry drivers. *Journal of Counseling Psychology*,
645 *50*(2), 123–132. doi:10.1037/0022-0167.50.2.123
- 646 Deffenbacher, J. L., Lynch, R. S., Filetti, L. B., Dahlen, E. R., & Oetting, E. R. (2003c). Anger,
647 aggression, risky behavior, and crash-related outcomes in three groups of drivers.
648 *Behaviour Research and Therapy*, *41*(3), 333–349. doi:10.1016/S0005-7967(02)00014-
649 1
- 650 Deffenbacher, J. L., Lynch, R. S., Oetting, E. R., & Swaim, R. C. (2002). The Driving Anger
651 Expression Inventory: A measure of how people express their anger on the road.
652 *Behaviour Research and Therapy*, *40*(6), 717–737. doi:10.1016/S0005-
653 7967(01)00063-8
- 654 Deffenbacher, J. L., Lynch, R. S., Oetting, E. R., & Yingling, D. A. (2001). Driving anger:
655 Correlates and a test of state-trait theory. *Personality and Individual Differences*, *31*(8),
656 1321–1331. doi:10.1016/S0191-8869(00)00226-9

- 657 Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a Driving Anger
658 Scale. *Psychological Reports, 74*, 83–91.
- 659 DePasquale, J. P., Geller, E. S., Clarke, S. W., & Littleton, L. C. (2001). Measuring road rage:
660 development of the Propensity for Angry Driving Scale. *Journal of Safety Research,*
661 *32*(1), 1-16. doi:10.1016/S0022-4375(00)00050-5
- 662 Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine,
663 facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences,*
664 *22*(03), 491–517
- 665 Dickman, S. J. (1990). Functional and dysfunctional impulsivity: personality and cognitive
666 correlates. *Journal of Personality and Social Psychology, 58*(1), 95–102.
- 667 Dickman, S. J., & Meyer, D. E. (1988). Impulsivity and speed-accuracy tradeoffs in information
668 processing. *Journal of Personality and Social Psychology, 54*(2), 274–290.
- 669 Esiyok, B., Yasak, Y., & Korkusuz, İ. (2007). Trafikte öfke ifadesi: Sürücü Öfke İfadesi
670 Envanteri'nin geçerlik ve güvenilirliği. *Türk Psikiyatri Dergisi, 18*(3), 231–243.
- 671 Evenden, J. L. (1999). Varieties of impulsivity. *Psychopharmacology, 146*(4), 348–361.
- 672 Eysenck, S. B., & Eysenck, H. J. (1977). The place of impulsiveness in a dimensional system
673 of personality description. *British Journal of Social and Clinical Psychology, 16*(1), 57–
674 68.
- 675 Ge, Y., Qu, W., Zhang, Q., Zhao, W., & Zhang, K. (2015). Psychometric adaptation of the
676 driving anger expression inventory in a Chinese sample. *Transportation Research Part*
677 *F: Traffic Psychology and Behaviour, 33*, 75–86. doi:10.1016/j.trf.2015.07.008
- 678 González-Iglesias, B., Gómez-Graguela, J. A., & Luengo-Martín M. A. (2012). Driving anger
679 and traffic violations: Gender differences. *Transportation Research Part F: Traffic*
680 *Psychology and Behaviour, 15*(4), 404–412. doi:10.1016/j.trf.2012.03.002
- 681 Gras, M.-E., Font-Mayolas, S., Patiño, J., Baltasar, A., Planes, M., & Sullman, M. J. M. (2016).
682 Resilience and the expression of driving anger. *Transportation Research Part F: Traffic*
683 *Psychology and Behaviour, 42*, 307–316. doi:10.1016/j.trf.2015.09.005

- 684 Hennessy, D. (2011). Social, personality, and affective constructs in driving. In B. E. Porter
685 (Ed.), *Handbook of Traffic Psychology* (pp.149–163). San Diego, CA: Elsevier.
- 686 Herrero-Fernández, D. (2011). Psychometric adaptation of the Driving Anger Expression
687 Inventory in a Spanish sample: Differences by age and gender. *Transportation Research*
688 *Part F: Traffic Psychology and Behaviour*, 14(4), 324–329.
689 doi:10.1016/j.trf.2011.03.001
- 690 Iversen, H., & Rundmo, T. (2002). Personality, risky driving and accident involvement among
691 Norwegian drivers. *Personality and Individual Differences*, 33(8), 1251–1263.
692 doi:10.1016/S0191-8869(02)00010-7
- 693 Kováčsová, N., Lajunen, T., & Rošková, E. (2016). Aggression on the road: Relationships
694 between dysfunctional impulsivity, forgiveness, negative emotions, and aggressive
695 driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, 42(2),
696 286–298. doi:10.1016/j.trf.2016.02.010
- 697 Krahé, B. (2018). Gendered Self-Concept and the Aggressive Expression of Driving Anger:
698 Positive Femininity Buffers Negative Masculinity. *Sex Roles*, 79, 98–108.
699 doi:10.1007/s11199-017-0853-9
- 700 Lajunen, T., & Parker, D. (2001). Are aggressive people aggressive drivers? A study of the
701 relationship between self-reported general aggressiveness, driver anger and aggressive
702 driving. *Accident Analysis and Prevention*, 33(2), 243–255. doi:10.1016/S0001-
703 4575(00)00039-7
- 704 Lajunen, T., Parker, D., & Stradling, S. G. (1998). Dimensions of driver anger, aggressive and
705 highway code violations and their mediation by safety orientation in UK drivers.
706 *Transportation Research Part F: Traffic Psychology and Behaviour*, 1(2), 107–121.
707 doi:10.1016/S1369-8478(98)00009-6
- 708 Lewin, I. (1982). Driver training: a perceptual-motor skill approach. *Ergonomics*, 25, 917–924.
709 doi:10.1080/00140138208925051
- 710 Li, F., Yao, X., Jiang, L., & Li, Y. (2014). Driving anger in China: Psychometric properties of
711 the Driving Anger Scale (DAS) and its relationship with aggressive driving. *Personality*
712 *and Individual Differences*, 68, 130–135. doi:10.1016/j.paid.2014.04.018

- 713 Martinussen, L. M., Møller, M., & Prato, C. G. (2014). Assessing the relationship between the
714 Driver Behavior Questionnaire and the Driver Skill Inventory: Revealing sub-groups of
715 drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, 26, 82–
716 91. doi: 10.1016/j.trf.2014.06.008
- 717 Mirón-Juárez, C. A., García-Hernández, C., Ochoa-Ávila, E., & Díaz-Grijalva, G. R. (2020).
718 Approaching to a structural model of impulsivity and driving anger as predictors of risk
719 behaviors in young drivers. *Transportation Research Part F: Traffic Psychology and*
720 *Behaviour*, 72, 71-80
- 721 Monteiro, R. P., Coelho, G. L. d. H., Hanel, P. H. P., Pimentel, C. E., & Gouveia, V. V. (2018).
722 Personality, dangerous driving, and involvement in accidents: Testing a contextual
723 mediated model. *Transportation Research Part F: Traffic Psychology and Behaviour*,
724 58, 106–114. doi:10.1016/j.trf.2018.06.009
- 725 Navas, J. F., Martín-Pérez, C., Petrova, D., Verdejo-García, A., Cano, M., Sagripanti-
726 Mazuquín, O., ...Vilar-López, R. (2019). Sex differences in the association between
727 impulsivity and driving under the influence of alcohol in young adults: The specific role
728 of sensation seeking. *Transportation Research Part F: Traffic Psychology and*
729 *Behaviour*, 124, 174–179. doi:10.1016/j.aap.2018.12.024
- 730 Nesbit, S. M., & Conger, J. C. (2012). Predicting aggressive driving behavior from anger and
731 negative cognition. *Transportation Research Part F: Traffic Psychology and*
732 *Behaviour*, 15(6), 710–718. doi:10.1016/j.trf.2012.07.003
- 733 Oppenheim, I., Oron-Gilad, T., Parmet, Y., & Shinar, D. (2016). Can traffic violations be traced
734 to gender-role, sensation seeking, demographics and driving exposure?. *Transportation*
735 *Research Part F: Traffic Psychology and Behaviour*, 43, 387–395.
736 doi:10.1016/j.trf.2016.06.027
- 737 Özkan, T., & Lajunen, T. (2005a). Why are there sex differences in risky driving? The
738 relationship between sex and gender-role on aggressive driving, traffic offences, and
739 accident involvement among young Turkish drivers. *Aggressive Behavior*, 31(6), 547–
740 558. doi:10.1002/ab.20062
- 741 Özkan, T., & Lajunen, T. (2005b). Masculinity, femininity, and the Bem Sex Role Inventory in
742 Turkey. *Sex Roles*, 52(1-2), 103–110. doi:10.1007/s11199-005-1197-4

- 743 Öztürk, İ., Fındık, G., & Özkan, T. (2019). Trafik ortamında cinsiyet rollerinin sürücü
744 davranışları ve sürüş becerileriyle ilişkisi. *Trafik ve Ulaşım Araştırmaları Dergisi*, 2(2),
745 78-92.
- 746 Paleti, R., Eluru, N., & Bhat, C. R. (2010). Examining the influence of aggressive driving
747 behavior on driver injury severity in traffic crashes. *Accident Analysis and Prevention*,
748 42(6), 1839–1854. doi:10.1016/j.aap.2010.05.005
- 749 Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt
750 Impulsiveness Scale. *Journal of Clinical Psychology*, 51(6), 768–774.
- 751 Reason, J. T., Manstead, A., Stradling, S. G., Baxter, J., & Campbell, K. (1990). Errors and
752 violations on the road – A real distinction. *Ergonomics*, 33(10/11), 1315–1332.
- 753 Roidl, E., Siebert, F. W., Oehl, M., & Höger, R. (2013). Introducing a multivariate model for
754 predicting driving performance: The role of driving anger and personality
755 characteristics. *Journal of Safety Research*, 47, 47–56. doi:10.1016/j.jsr.2013.08.002
- 756 Rowe, R., Roman, G. D., McKenna, F. P., Barker, E., & Poulter, D. (2015). Measuring errors
757 and violations on the road: A bifactor modeling approach to the Driver Behavior
758 Questionnaire. *Accident Analysis and Prevention*, 74, 118–125. doi:
759 10.1016/j.aap.2014.10.012
- 760 Sârbescu, P., Stanojević P., & Jovanović, D. (2014). A cross-cultural analysis of aggressive
761 driving: Evidence from Serbia and Romania. *Transportation Research Part F: Traffic
762 Psychology and Behaviour*, 24, 210–217. doi:10.1016/j.trf.2014.04.002
- 763 Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & Brumbelow, J. L. (1996).
764 Impulsiveness and risk-taking behavior: Comparison of high-school and college
765 students using the Barratt Impulsiveness Scale. *Personality and Individual Differences*,
766 21(6), 1073-1075.
- 767 Stephens, A. N., & Fitzharris, M. (2016). Validation of the Driver Behaviour Questionnaire in
768 a presentative sample of drivers in Australia. *Accident Analysis and Prevention*, 86,
769 186–198. doi: 10.1016/j.aap.2015.10.030

- 770 Stephens, A. N., & Sullman, M. J. (2014). Development of a short form of the driving anger
771 expression inventory. *Accident Analysis & Prevention*, *72*, 169-176.
- 772 Sullman, M. J. M. (2015). The expression of anger on the road. *Safety Science*, *72*, 153-159.
773 doi:10.1016/j.ssci.2014.08.013
- 774 Sullman, M. J. M., Paxion, J., & Stephens, A. N. (2017a). Gender roles, sex and the expression
775 of driving anger. *Accident Analysis and Prevention*, *106*, 23-30.
776 doi:10.1016/j.aap.2017.05.016
- 777 Sullman, M. J. M., Stephens, A. N., & Hill, T. (2017b). Gender roles and the expression of
778 driving anger among Ukrainian drivers. *Risk Analysis*, *37*(1), 52-64.
779 doi:10.1111/risa.12592
- 780 Sullman, M. J. M., Stephens, A. N., & Yong, M. (2014). Driving anger in Malaysia. *Accident*
781 *Analysis and Prevention*, *71*, 1-9. doi:10.1016/j.aap.2014.04.019
- 782 Sümer, N. (2003). Personality and behavioral predictors of traffic accidents: testing a contextual
783 mediated model. *Accident Analysis & Prevention*, *35*(6), 949-964.
- 784 Taylor, J. E. (2011). Mental health and driving. In *Handbook of traffic psychology* In B. E.
785 Porter (Ed.), *Handbook of Traffic Psychology* (pp. 165-178). San Diego, CA: Elsevier.
- 786 World Health Organization (2018). Global status report on road safety 2018. Retrieved from:
787 https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/
- 788 Zuckerman, M., Kuhlman, D. M., & Camac, C. (1988). What lies beyond E and N? Factor
789 analyses of scales believed to measure basic dimensions of personality. *Journal of*
790 *Personality and Social Psychology*, *54*(1), 96-107. doi:10.1037/0022-3514.54.1.96
- 791 Zuckerman, M., Kuhlman, D. M., Thornquist, M., & Kiers, H. (1991). Five (or three) robust
792 questionnaire scale factors of personality without culture. *Personality and Individual*
793 *Differences*, *12*(9), 929-941. doi:10.1016/0191-8869(91)90182-B
- 794