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"You are the company you keep": A study of peer pressure on driving

Alev Aktaş [a], İbrahim Öztürk [b,*]

[a] Department of Psychology, Sivas Cumhuriyet Üniversitesi, Sivas, Türkiye
[b] Institute for Transport Studies, University of Leeds, Leeds, United Kingdom

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ABSTRACT

Peers play an important role in shaping the behaviours of their counterparts at different stages of life. Studies have shown that peer influence/pressure has a significant role in the traffic environment as well as in many other social settings, especially for risky behaviours. Therefore, the aim of this study was to examine age and sex differences in respect of peer pressure and the role of peer pressure on driver behaviour in Türkiye. A total of 405 drivers with a mean age of 23.84 (SD=4.82) years completed an online survey consisting of the Peer Pressure on Risky Driving Scale (PPRDS), the Brief Sensation-Seeking Scale (BSSS) and the Short Driver Behaviour Questionnaire (S-DBQ, measuring aberrant and positive driver behaviour). First, the psychometric structure of the PPRDS, used for the first time in Turkish, was found to support the original structure, addressing direct pressure in the form of risk-encouraging or risk-discouraging and indirect pressure. Indirect pressure was seen to decrease with age for both males and females, whereas risk-discouraging direct pressure increased with age only for males. Sensation-seeking was positively related to aberrant behaviours. Risk-encouraging direct peer pressure and indirect pressure were positively associated with aberrant (risky) driver behaviour, whereas indirect peer pressure was associated with decreased aberrant driving behaviour and increased positive (helpful, polite) driving behaviour. The findings suggested that drivers feel strong peer pressure in traffic, but it varies by age and sex, and this pressure is stronger for young males. These findings have important implications for road safety and intervention studies.

1. Introduction

It is well known that there are many social psychological theories supporting the view that people in many different contexts change their own attitudes and behaviours through the influence of the attitudes and behaviours of others and that these are transformed over time into some cultural and normative values that are passed on to the next generations (Myers, 2010). Peers, as one of the individuals and groups with whom individuals frequently interact, are among the topics that are given importance and studied in many different sub-disciplines of psychology. For example, involvement in various problematic behaviours (such as gambling, substance use, risk-taking or voting) is often linked to peer pressure (e.g., Loke et al., 2016; Santor et al., 2000; Twisk & Senserrick, 2021; Van Hoorn et al., 2017). Similarly, peer socialisation is one of the factors that can influence attitudes and behaviour. Peer encouragement may lead an individual to engage in risky behaviours such as speeding, drinking, or other activities that are considered illegal (Arnett, 1995;

* Corresponding author at: Institute for Transport Studies, University of Leeds, LS2 9JT Leeds, United Kingdom.
E-mail address: i.ozturk@leeds.ac.uk (İ. Öztürk).

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Reed & Rountree, 1997).

1.1. Peer pressure in driving

Peer influence or pressure plays an important role in understanding why young drivers are more likely to engage in risky driving behaviours and are more likely to be involved in road traffic crashes (e.g., Banz et al., 2019; Bingham et al., 2016; Ouimet et al., 2015; Sutherland et al., 2022; Williams et al., 2007). The accepted social discourse of peers influences young people's behaviours and attitudes, including driving (Banz et al., 2019; Curry et al., 2012; Horvath et al., 2012; Guggenheim & Taubman – Ben-Ari, 2018). For example, a study by Weston (2016) revealed a connection between a high susceptibility to peer influence (including seeking social prestige and peers playing a role in decision-making) and an increase in self-reported risky driving behaviour.

Although the terms "*peer influence*" and "*peer pressure*" share some similarities and have been used interchangeably, the concepts differ in scope. According to Allen & Brown (2008), the behaviours of young drivers can be influenced by peers in both proximal and distal ways. Proximal effects involve active verbal or physical intervention in a driver's operation of the vehicle. These effects occur while the vehicle is in motion, and the group most commonly studied in this regard are passengers in the company of young drivers. Negative peer influences that are proximal to the driving context can occur through different types of behaviour, such as passengers distracting the driver by talking when the teenage driver needs to concentrate on the task of driving (Allen & Brown, 2008). In contrast, distal effects involve discussions and negotiations about driver behaviour outside the driving context, including acceptable patterns or norms. Therefore, assuming distal norm negotiation, peer risk-taking relies on a more subtle form of influence and often depends on the salience of the risk-taking norm but not necessarily on its negotiation. (Allen & Brown, 2008).

Within the scope of peer influence, peer pressure can take two forms: direct pressure (i.e., active pressure), such as explicitly encouraging (or discouraging) drinking, and indirect pressure (i.e., passive pressure), such as socialising with peers who drink and feeling pressured to drink in these social situations (Morris et al., 2020). Indirect pressure operates on the premise that the perceived norms originating from a group with which a driver identifies can strongly impact their behaviour (Cestac et al., 2014). Peer pressure, whether directly or indirectly, arising from peer influence has an impact on the driver and their behaviour. For example, the presence of peers can often lead to driver distraction by increasing cognitive workload if a driver has to divide their attention between driving tasks and interacting with the passenger(s) (Curry et al., 2012; Pradhan et al., 2014). Consequently, young drivers may be more likely to make slip-type errors (Reason et al., 1990).

Studies have suggested that having peers in the vehicle increases variability in the behaviours of drivers (e.g., Ehsani et al., 2015; Sutherland et al., 2022) and may be a factor that increases risk-taking behaviours (e.g., Guggenheim et al., 2020) and the risk of crash involvement (Lambert-Bélanger et al., 2012; Lee & Abdel-Aty, 2008; Preusser et al., 1998). For example, the presence of a passenger has been reported to be correlated with a higher proportion of at-fault fatal crashes for drivers aged 24 years and younger. For drivers aged 25–29 years, passengers had a neutral effect, and for drivers aged 30 years and older, the presence of passengers was associated with fewer at-fault crash involvements (Preusser et al., 1998).

In addition to the effect of peer pressure on the risk of being involved in road traffic crashes, many studies have also shown the effect of peer pressure on various aberrant driver behaviours (e.g., Padilla et al., 2023; Stavrinos et al., 2020; Trivedi et al., 2017). Such pressure from friends is associated with more maladaptive risky driving, such as reckless and angry driving (Padilla et al., 2023). For example, in a driving simulator study with teenage male drivers, Bingham et al. (2016) found that the presence of a peer passenger affected the behaviour of young male drivers. Specifically, passengers with a risk-acceptance attitude led to more risky behaviours in comparison to risk-averse passengers or driving alone. Similarly, Ross et al. (2016) found that the presence of a peer as a passenger was associated with increased violations such as red light running and speeding. Drivers who experience higher peer pressure have also been found to be at risk of driving or riding motorcycles under the influence of alcohol (Markkula et al., 2020).

Behaviours that are regarded as socially acceptable, such as speeding (Møller & Haustein, 2014), may be a subject for direct or indirect peer pressure. Gheorghiu et al. (2015) conducted a study using a hypothetical driving scenario involving a fictional young male driver who was encouraged by close friends to exceed the speed limit, and it was observed that direct peer pressure had a positive effect on speeding behaviour. Another study by Guggenheim et al. (2020) found that the effect of peers, particularly pressure from friends, was positive over and above demographic variables and factors such as attitudes, subjective norms and perceived behavioural control on risk behaviour.

Furthermore, demographic variables such as age and sex also play a role in consideration of peer pressure (e.g., Bonino et al., 2005; Ouimet et al., 2010; Shepherd et al., 2011; Scott-Parker et al., 2015). Guggenheim and Taubman-Ben-Ari (2018) found that males experience greater pressure from friends than females, and that pressure from friends increases with driving experience. In another study, Padilla et al. (2023) found no difference in terms of driving experience, but males experienced more pressure from friends than females, and females communicated more with friends about the driving experience and were more committed to safety than males.

1.2. Sensation-seeking in driving

In consideration of the behaviours of young drivers, previous research has consistently highlighted the importance of sensation-seeking as an important precursor to risky behaviours (e.g., af Wåhlberg, 2010; Arnett, 1990; Horvath & Zuckerman, 1993; Rosenbloom, 2003). A person with a high level of sensation-seeking trait is described as someone who "has a heightened need for different experiences, actively seeks out excitement and adventure, is unbounded and easily bored" (Thombs et al., 1994, p. 73). In addition to differences in genetic and biological traits, sensation-seeking individuals show differences in their habits, preferences, and emotional and cognitive styles compared to those who tend to avoid sensation (Shoham et al., 1998; Zuckerman, 1983).

Sensation seekers actively engage in activities such as adventurous driving (McMillen et al., 1989). Those with high levels of sensation-seeking are more daring and commit more traffic offences than their counterparts with lower levels of sensation-seeking (Furnham & Saipe, 1993; Jonah, 1997). In the context of driver behaviours, sensation-seeking has been found to be positively associated with different forms of offences (Bates et al., 2024), speeding (Paschalidis et al., 2020; Linkov et al., 2019), violations and errors (Qu et al., 2020; Lee et al., 2016; Li et al., 2023; Song et al., 2021), off-road glances (Lee et al., 2016), and psychoactive substance use (Jamt et al., 2020). Therefore, in this study, sensation-seeking was considered a control variable when focusing on driver behaviours.

1.3. Aim of the present study

As stated above, although studies in the literature have indicated that peer pressure is important for road safety (especially for younger drivers), it has not been systematically addressed in Türkiye, where the average number of fatalities and injuries has recently increased, and more than 5,000 people have lost their lives in road traffic crashes (WHO, 2023). Therefore, examination of the susceptibility to peer pressure on risky driving among drivers in Türkiye would provide valuable information to facilitate the design of training and intervention programmes on road safety. Accordingly, the main objectives of this study were to:

1) adapt the newly developed Peer Pressure on Risky Driving Scale (Trógolo et al., 2022) to the Turkish language with a sample of young adults from Türkiye,
2) examine the relationship between age and sex in three factors of peer pressure, and
3) investigate the relationship between peer pressure and self-reported driving behaviour.

2. Method

2.1. Participants

The final sample consisted of 405 drivers aged between 18 and 35 years (M=23.84, SD=4.82). Of the 405 drivers, 220 were female, 180 were male, and 5 participants did not indicate their sex. All participants confirmed that they had a valid driving licence (type B licence required to drive passenger cars and light commercial vehicles in Türkiye).

2.2. Materials

2.2.1. Peer pressure on risky driving scale

The Peer Pressure on Risky Driving Scale (PPRDS) was developed by Trógolo et al. (2022) to measure drivers' perceived peer pressure on risky driving. The scale consists of 23 items in two sections and three factors: risk-encouraging direct pressure (REDP), risk-discouraging direct pressure (RDDP), and indirect pressure (InPr). The REDP and RDDP consist of 11 items rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), measuring encouraging/discouraging peer pressure for risky behaviours. The InPr consists of 12 items measuring perceived peer norms on a 5-point Likert scale from 1 (definitely would not approve) to 5 (definitely would approve). The factorial structure was examined in this study with a sample from Türkiye and is presented in section 3.1. For both RDDP and REDP, the higher the score, the greater the direct peer pressure to discourage risky behaviours (encourage safe behaviours) or encourage risky behaviours. For the InPr, the higher the score, the greater the risk acceptance of the peer norm.

2.2.2. Brief Sensation-Seeking scale

The Brief Sensation-Seeking Scale (BSSS) was developed by Hoyle et al. (2002) to measure the perceived level of sensation-seeking. The scale consists of eight items rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The Cronbach's alpha reliability was 0.79 for eight items.

2.2.3. Short driver behaviour questionnaire

Self-reported aberrant and positive driver behaviour were measured using the 19-item Short Driver Behaviour Questionnaire (S-DBQ). The items were derived from the DBQ (Reason et al., 1990) and the Positive Driver Behaviour Scale (Özkan & Lajunen, 2005a). The most representative and common items later formed the short DBQ (Ersan et al., 2020), which was the version used in the present study. The questionnaire measures three factors: errors, violations, and positive behaviours. Errors are behaviours defined as "*the failure of planned actions to achieve their intended consequence*" (p. 1315). Violations represent the "*deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system*" (Reason et al., 1990, p. 1316). Positive behaviours were conceptualised as "*taking care of smooth traffic flow or paying attention to other road users*" (Özkan & Lajunen, 2005a, p.359). The participants were asked to rate themselves on a 6-point Likert scale from 1 (never) to 6 (always). Cronbach's alpha reliabilities were found to be 0.84 for errors with eight items, 0.84 for violations with seven items, and 0.89 for positive behaviours with four items.

2.2.4. Demographic form

Age and sex information were collected in the demographic form.

2.3. Procedure

The study was approved by the Social Sciences Scientific Research Proposal Ethical Evaluation Board of Sivas Cumhuriyet University (Protocol no: E-99711239-050.04.01-348619). In the first stage, the Peer Pressure on Risky Driving Scale (PPRDS) was translated into Turkish by two independent researchers fluent in English and working in the field of traffic psychology and another professional translator whose native language is Turkish. After the initial translations, two authors reviewed each translation, check item clarity, and produced the final version. The final version was then back-translated into English and checked for errors during the translation process. The translation and reporting process is in line with the guidelines of the International Test Commission (2017).

Following the translation process and ethical approval, the online questionnaire was distributed using Jisc Online Survey (a GDPR-compliant survey platform-OnlineSurveys). Snowball sampling was used to reach participants. A total of 512 participants completed the online questionnaire. All participants provided informed consent and were assured of the anonymity and confidentiality of their responses.

2.4. Analyses

Before starting the analyses, the data were cleaned. Participants with incomplete responses (>10 %) and outliers ($z > 3.29$) in terms of age were excluded. From the total of 512 people who completed the survey, 56 participants were excluded because they did not complete at least one of the questionnaires completely (>10 % of the total questions), 30 were excluded due to incomplete demographic data, and 21 were excluded because of being outliers in terms of age ($z > 3.29$). Thus analysis was made of a total sample of 405 individuals aged between 18 and 35 years (in line with previous studies focusing on young adulthood – e.g., Doroudgar et al., 2016). Using 3.29 as the outlier cut-off value enabled the determination of extreme cases (Tabachnick & Fidell, 2013). Although eliminating extreme values in the age variable, which is included in different ways in the objectives of the study, reduced the generalisability of the findings, this is important to consider due to age being investigated as an interaction and control variable. Therefore, extreme age values were not included in the following analyses.

To address the first aim of the study, the factorial structure of the PPRDS, which was employed for the first time in the Turkish context, was examined and reported by following the suggestions for analysis and reporting of Ledesma et al. (2021). The psychometric properties of the PPRDS were analysed by performing confirmatory factor analysis (CFA) using Jamovi (The jamovi project, 2023; R Core Team, 2022; Rosseel et al., 2023). Model fit was assessed using the $\chi 2$ test for goodness of fit ($\chi 2$/degrees of freedom ratio between 2:1 and 5:1), the comparative fit index (CFI, > 0.90), the standardised root mean square residual (SRMR, < 0.10), the root mean square error of approximation (RMSEA, < 0.10) in a 90 % confidence interval (CI) (Russell, 2002; Schermelleh-Engel et al., 2003).

Following the CFA (see section 3.1), descriptive and bivariate correlations were analysed (see section 3.2). For the second aim, a multivariate analysis of covariance (MANCOVA) where age and license year were controlled to examine sex differences (binary coded

Table 1
Standardised factor loadings, mean and standard deviation values, and reliability coefficients of the PPRDS.

Items	Std. Estimate	M (SD)
Risk-encouraging direct peer pressure		
When I'm driving, my friends …		
… incite me to engage in dangerous manoeuvres.	0.842	1.70 (1.24)
… sometimes encourage me to race with another vehicle.	0.835	1.92 (1.33)
… sometimes encourage me to race with them.	0.788	1.92 (1.33)
… urge me to go faster.	0.786	1.87 (1.25)
… reproach me for driving too slowly.	0.438	2.10 (1.29)
… pressure me to drink alcohol.	0.403	1.63 (1.28)
Risk-discouraging direct peer pressure		
When I'm driving, my friends …		
… insist that I fasten my seatbelt if I don't have it on.	0.696	3.65 (1.48)
… tell me to be more attentive if I'm distracted.	0.682	3.90 (1.37)
… show disapproval if I violate traffic regulations.	0.637	3.59 (1.43)
… discourage me from using my mobile phone.	0.629	3.49 (1.48)
… say things like don't go so fast.	0.464	3.16 (1.48)
Indirect pressure		
To what extent do you believe your friends would approve of …		
… making illegal turns	0.813	1.92 (1.15)
… zig-zagging between vehicles	0.803	1.76 (1.17)
… racing with another vehicle	0.794	1.89 (1.24)
… checking or sending messages while driving	0.772	2.06 (1.29)
… crossing a red traffic light	0.772	1.71 (1.10)
… driving after drinking alcohol	0.732	1.56 (1.07)
… exceeding the speed limit	0.723	2.17 (1.28)
… driving under the influence of substances (e.g., marijuana)	0.657	1.47 (1.04)
… not wearing a seatbelt	0.633	2.06 (1.30)
… overtaking a vehicle across a double yellow line	0.625	2.36 (1.33)
… driving while fatigued	0.547	2.06 (1.24)
… not stopping at a STOP sign	0.522	2.24 (1.43)

0: Male and 1: Female) and three simple moderation analyses (Hayes PROCESS macro model 1; Hayes, 2022) were conducted to examine the role of age across sex (binary coded 0: Male and 1: Female) on the three factors of peer pressure on risky driving separately (see section 3.3) when controlling for the statistical effect of licensing year. The reason for analysing the effects of sociodemographic factors with simple moderation (Model 1 with 5000 bootstrapping) was to allow for an interaction between the two factors (age by sex).

In the final step, for the third aim, three separate hierarchical linear regressions were run to examine the impact of peer pressure on risky driving (section 3.4). In the regression model, age, sex, and licensing year were entered in the first step, sensation-seeking in the second step, and the three factors of peer pressure on risky driving in the last step. As demographic variables were correlated with both other independent variables and the dependent variables (see Table 2), these variables were included in the model first as control variables (see McCartt et al., 2009 for further discussion). Sensation seeking was then added to the model as a trait-like covariate, as it has been shown to be an important predictor of driver behaviour (Dahlen et al., 2005; Stephens & Sullman, 2015; Taubman – Ben-Ari et al., 2016). Finally, the components of peer pressure were added to the model after introducing both the demographic variables and the trait-like variable. The analysis was repeated for errors, violations, and positive behaviours. Analyses for the second and third aims were performed using IBM SPSS version 28.0.1.0 (142) software and PROCESS version 4.2 dialogue box (Hayes, 2022).

3. Results

3.1. Confirmatory factor analysis

The confirmatory factor analysis results for the PPRDS are presented in Table 1. The fit indices of the scale showed acceptable values ($\chi 2(227) = 816$, $p < 0.001$, CFI=0.88, SRMS=0.06, RMSEA=0.08, 90 % CI: 0.07, 0.09).

3.2. Correlations

Descriptive statistics and Pearson's correlation coefficient values are presented in Table 2. Age was significantly positively correlated with positive behaviours but was significantly negatively correlated with sensation-seeking, violations, risk-encouraging direct pressure and indirect pressure. Licensing year was correlated positively with age and negatively with sensation seeking, risk-encouraging direct pressure, and indirect pressure. Sensation-seeking was significantly positively correlated with risk-encouraging direct pressure and indirect pressure. Significant negative correlations were also observed between risk-discouraging direct pressure and risk-encouraging direct pressure and indirect pressure. Risk-encouraging direct pressure was significantly negatively correlated with positive behaviours. Risk-discouraging direct pressure was significantly negatively correlated with indirect pressure, errors and violations but was significantly positively correlated with positive behaviours. Indirect pressure was significantly positively correlated with errors and violations but was significantly negatively correlated with positive behaviours.

3.3. Relationships between sociodemographic factors and peer pressure

The MANCOVA analysis showed significant differences for the three aspects of peer pressure: risk-encouraging direct pressure ($F(1, 391) = 21.09$, $p < 0.001$, $\eta_p^2 = 0.05$), risk-discouraging direct pressure ($F(1, 391) = 4.90$, $p = 0.027$, $\eta_p^2 = 0.01$), and indirect pressure ($F(1, 391) = 13.88$, $p < 0.001$, $\eta_p^2 = 0.05$). Males reported higher risk-encouraging direct pressure (Males: M=2.11, SD=1.05; Female: M=1.64, SD=0.80) and indirect pressure (Males: M=2.18, SD=1.00; Female: M=1.73, SD=0.72) and lower risk-discouraging direct pressure (Males: M=3.38, SD=1.11; Female: M=3.70, SD=0.97).

As seen in Table 3, the models testing the moderating role of sex on the relationship between age and risk-encouraging direct pressure ($R^2 = 0.12$, $F(4, 390) = 13.57$, $p < 0.001$), age and risk-discouraging direct pressure ($R^2 = 0.06$, $F(4, 390) = 6.28$, $p < 0.001$), and age and indirect pressure ($R^2 = 0.13$, $F(4, 390) = 15.09$, $p < 0.001$) were statistically significant when controlled for licensing year.

Table 2
Correlations between variables.

Variables	1	2	3	4	5	6	7	8	9
1. Age	–								
2. LYear	0.795***	–							
3. SS	−0.389**	−0.267***	–						
4. REDP	−0.259**	−0.186***	0.403**	–					
5. RDDP	0.083	−0.034	−0.085	−0.211**	–				
6. InPr	−0.254**	−0.148**	0.369**	0.720**	−0.244**	–			
7. Errors	−0.087	−0.039	0.119*	0.359**	−0.204**	0.394**	–		
8. Violations	−0.174**	−0.065	0.346**	0.502**	−0.293**	0.516**	0.583**	–	
9. Positive	0.109*	0.096	0.023	−0.189**	0.222**	−0.222**	−0.167**	0.035	–
M	23.84	3.76	2.99	1.86	3.56	1.94	1.54	1.98	4.48
SD	4.82	3.73	0.90	0.96	1.04	0.89	0.63	0.86	1.59

Note. * $p < 0.05$; ** $p < 0.01$; **LYear:** License year, **SS:** Sensation-seeking, **REDP:** Risk-encouraging direct pressure, **RDDP:** Risk-discouraging direct pressure **InPr:** Indirect pressure

Table 3
The moderation model of sociodemographic factors on the PPRDS.

Variable	*b*	*SE*	*t*	*p*	95 % CI
DV1: Risk-encouraging direct pressure					
Age	−0.08	0.03	−2.28	0.023	−0.15, −0.01
Sex (0: Male, 1: Female)	−0.93	0.46	−2.02	0.044	−1.83, −0.03
Interaction	0.02	0.02	1.11	0.266	−0.02, 0.06
License year	−0.00	0.02	−0.09	0.929	−0.04, 0.04
DV2: Risk-discouraging direct pressure					
Age	0.14	0.04	3.44	0.001	0.06, 0.21
Sex (0: Male, 1: Female)	1.38	0.52	2.64	0.009	0.35, 2.41
Interaction	−0.05	0.02	−2.24	0.026	−0.09, 0.01
License year	−0.07	0.02	−3.09	0.002	−0.12, −0.03
DV3: Indirect pressure					
Age	−0.13	0.03	−3.96	< 0.001	−0.19, −0.06
Sex (0: Male, 1: Female)	−1.45	0.43	−3.41	< 0.001	−2.29, −0.62
Interaction	0.04	0.02	2.55	0.011	0.01, 0.08
License year	0.02	0.02	1.28	0.203	−0.01, 0.06

The age-by-sex interactions were statistically significant for risk-discouraging direct pressure and indirect pressure. In the case of risk-discouraging direct pressure (Fig. 1), risk-discouraging direct pressure increased with age only for males ($t(390) = 3.88$, $b = 0.09$, $p < 0.001$), whereas indirect pressure decreased with age for both males ($t(390) = -4.48$, $b = -0.08$, $p < 0.001$) and females ($t(390) = -2.29$, $b = -0.04$, $p = 0.022$), but the decrease was far greater for males (Fig. 2).

3.4. The role of sociodemographic, sensation-seeking, and peer pressure factors on driver behaviours

To examine the effects of sociodemographic, sensation-seeking and peer pressure factors, three separate hierarchical regression analyses were conducted for errors (Table 4), violations (Table 5), and positive behaviours (Table 6). After controlling for the effects of sociodemographic factors and sensation-seeking, aberrant behaviours (errors and violations) were determined to increase with risk-encouraging direct peer pressure and indirect pressure, and to decrease with risk-discouraging direct peer pressure. Positive behaviour was positively associated with risk- discouraging direct peer pressure and negatively associated with indirect pressure.

4. Discussion

The present study had three aims: adaptation of the newly developed Peer Pressure on Risky Driving Scale to the Turkish language with a sample of young adults from Türkiye, examination of the relationship between age and sex in three factors of peer pressure, and investigation of the relationship between peer pressure and self-reported driving behaviour. In respect of the first aim, the factorial structure showed that the original factorial structure of the PPRDS (Trógolo et al., 2022) was replicated with the sample of young adults from Türkiye. Therefore, it can be suggested that the existing measure can be used reliably.

Concerning the second aim, the results showed that with increasing age, risk-discouraging direct pressure increased, and risk-encouraging direct pressure and indirect pressure decreased. Similarly, in the study conducted by Trógolo et al. (2022), younger drivers (18–24 years) reported more direct and indirect peer pressure for risky driving. In addition, direct peer pressure towards risky driving was found to be highest in young drivers aged 18–24 years, especially in male drivers. In contrast, the lowest direct peer

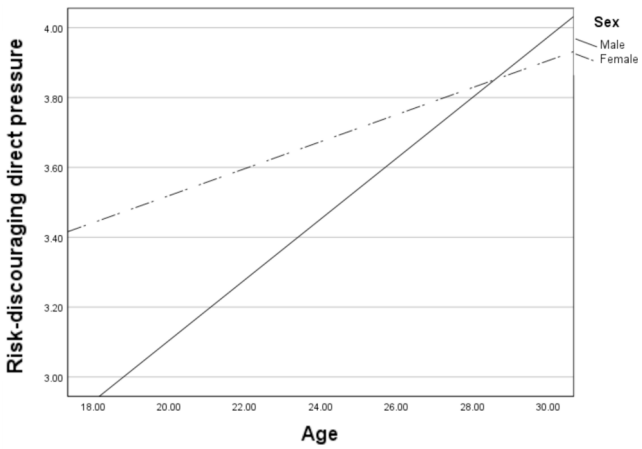

Fig. 1. Age by sex interaction on risk-discouraging direct pressure.

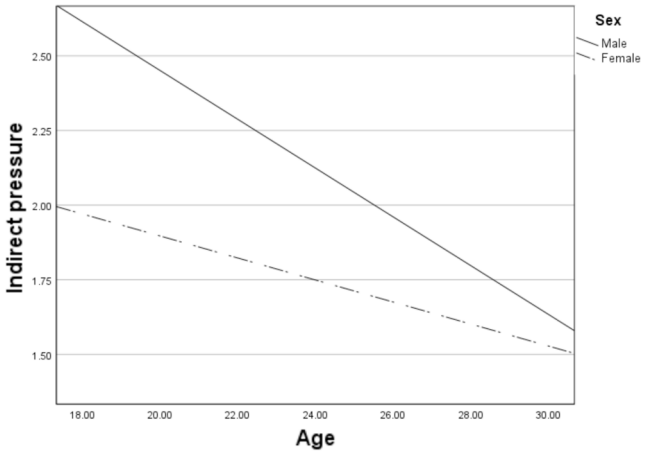

Fig. 2. Age by sex interaction on indirect pressure.

Table 4
Regression coefficients of sociodemographic factors, sensation-seeking, and peer pressure factors on errors.

	Errors		
	β	*p*	95 % CI
Step 1	$R^2 = 0.01$, $F(3, 391) = 1.14$, $p = 0.333$, $F\triangle(3, 391) = 1.14$, $p = 0.333$		
Age	−0.14	0.094	−0.04, 0.00
Sex (0: Male, 1: Female)	−0.00	0.958	−0.13, 0.12
License year	0.08	0.330	−0.01, 0.04
Step 2	$R^2 = 0.02$, $F(4, 390) = 1.82$, $p = 0.124$, $F\triangle(1, 390) = 3.84$, $p = 0.051$		
Sensation-seeking	0.11	0.051	0.00, 0.14
Step 3	$R^2 = 0.18$, $F(7, 387) = 11.95$, $p < 0.001$, $F\triangle(3, 387) = 25.02$, $p < 0.001$		
Risk-encouraging DP	0.15	0.028	0.01, 0.18
Risk-discouraging DP	−0.13	0.009	−0.13, −0.02
Indirect pressure	0.28	< 0.001	0.10, 0.28

Table 5
Regression coefficients of sociodemographic factors, sensation-seeking, and peer pressure factors on violations.

	Violation		
	β	*p*	95 % CI
Step 1	$R^2 = 0.12$, $F(3, 391) = 17.35$, $p < 0.001$, $F\triangle(3, 391) = 17.35$, $p < 0.001$		
Age	−0.23	0.005	−0.07, −0.01
Sex (0: Male, 1: Female)	−0.28	< 0.001	−0.63, −0.30
License year	0.10	0.199	−0.01, 0.06
Step 2	$R^2 = 0.19$, $F(4, 390) = 23.29$, $p < 0.001$, $F\triangle(1, 390) = 36.39$, $p < 0.001$		
Sensation-seeking	0.30	< 0.001	0.19, 0.37
Step 3	$R^2 = 0.36$, $F(7, 387) = 31.39$, $p < 0.001$, $F\triangle(3, 387) = 34.25$, $p < 0.001$		
Risk-encouraging DP	0.18	0.004	0.05, 0.26
Risk-discouraging DP	−0.16	< 0.001	−0.20, −0.06
Indirect pressure	0.25	< 0.001	0.13, 0.35

pressure was reported in drivers aged 25–29 years, especially in female drivers (Trógolo et al., 2022). Similarly, in the current study, risk-discouraging peer pressure was at the lowest point among the youngest male drivers and increased with age (reaching a similar level reported by female drivers), whereas indirect pressure was at the highest value among the youngest group of male drivers and decreased with age. From another perspective, the peer pressure towards risky behaviour highlighted for male drivers may also be part of the perception of masculinity in Turkish culture (Özkan & Lajunen, 2005b). In particular, while masculinity is positively correlated with violations (Özkan & Lajunen, 2005b), young male drivers' perceptions of peer pressure towards these behaviours may also be an example of social norms for this group. Furthermore, considering sex stereotypes against male and female drivers (Pravossoudovitch et al., 2015), a recent study conducted in Türkiye found that female drivers were perceived as safer, rule-abiding, and risk-avoiding drivers compared to male drivers (Öztürk & Öz, in-press), which may explain the high risk-discouraging peer pressure perceived by female drivers.

In respect of risk-discouraging direct pressure, there were some noteworthy findings, primarily that this variable appears to

Table 6
Regression coefficients of sociodemographic factors, sensation-seeking, and peer pressure factors on positive behaviours.

	Positive behaviours		
	β	p	95 % CI
Step 1	$R^2 = 0.01$, $F(3, 391) = 1.34$, $p = 0.262$, $F\triangle(3, 391) = 1.34$, $p = 0.262$		
Age	0.09	0.288	−0.03, 0.08
Sex (0: Male, 1: Female)	−0.02	0.726	−0.38, 0.26
License year	0.01	0.883	−0.07, 0.08
Step 2	$R^2 = 0.01$, $F(4, 390) = 1.41$, $p = 0.228$, $F\triangle(1, 390) = 1.64$, $p = 0.201$		
Sensation-seeking	0.08	0.201	−0.07, 0.31
Step 3	$R^2 = 0.12$, $F(7, 387) = 7.34$, $p < 0.001$, $F\triangle(3, 387) = 15.03$, $p < 0.001$		
Risk-encouraging DP	−0.12	0.094	−0.43, 0.03
Risk-discouraging DP	0.19	< 0.001	0.13, 0.43
Indirect pressure	−0.16	0.021	−0.53, −0.04

increase with age. This may be a reflection of the negative effect of peer pressure, which is generally associated with younger males and a higher tendency to show risky behaviours among young male drivers. It is well known that young people often engage in risky behaviour to gain social approval (Bonino et al., 2005), indicating a mechanism for a psychological reward for a young driver (Scott-Parker et al., 2015). Some studies (Ouimet et al., 2010; Shepherd et al., 2011) have reported that peers may have different effects on risky driving depending on the age and sex of young drivers. The presence of a young passenger increases the likelihood of risky driving for both young female and male drivers. This likelihood has been shown to be even higher when both the passenger and the driver are young males (Ouimet et al., 2010; Shepherd et al., 2011). Interestingly, young female drivers expressing an intention to speed believe that their male friends would support this behaviour while anticipating disapproval from their female friends. Males stating an intention to speed also believe that their male friends would be supportive, in contrast to the expectation of disapproval from their male friends (Horvath et al., 2012). Perhaps more interesting is the finding that this significant linear increase for males only catches up to the level that female drivers already perceive. This suggests that even for risk-discouraging direct pressure, a norm may be present.

In the evaluation of the third aim of the study, peer pressure was observed as an important determinant of aberrant behaviours, in line with the literature on peer influence on driving (Ehsani et al., 2015; Gheorghiu et al., 2015; Muñoz Centifanti et al., 2016). After controlling for crucial demographic variables and sensation-seeking, risk-encouraging direct peer pressure and indirect pressure were positively and risk-discouraging direct peer pressure was negatively related to both errors and violations. Although drivers are aware of the influence of peers on their behaviours (Ehsani et al., 2015), direct and indirect pressure from peers and pressure to make the journey "more enjoyable" (Regan & Mitsopoulos, 2001) seem to be quite strong in affecting young adult driver behaviours. As a result of these pressures, drivers may feel uncomfortable if they refuse to obey their peers (Suls & Green, 2003). Either directly or indirectly, being encouraged or believing that risky behaviour is approved by peers increases the likelihood of aberrant behaviours.

Furthermore, the potential positive impact of peer pressure on the transport system cannot be ignored. In addition to the relationship between peer influence and aberrant behaviours, the association between peer pressure and positive behaviours, which is examined for the first time in the literature, adds another dimension to the predominantly discussed negative view of peer pressure. As seen from the findings of this study, increased risk-discouraging direct peer pressure or decreased indirect pressure were associated with more positive driver behaviour. This may also support the peer pressure difference arising from peer characteristics (Ehsani et al., 2015). For example, Vollrath et al. (2002) and Rueda-Domingo et al. (2004) reported that the presence of a passenger in the car can reduce the risk of being involved in a crash by exerting a protective role. By actively discouraging risky behaviours (and encouraging safe behaviours), peer influence might result in increased positive behaviours.

5. Limitations and suggestions for future research and practice

While this study provides valuable insights, it is important to acknowledge the associated limitations. In line with the discussion pointed out by Trógolo et al. (2022), some, if not all, of the self-reported measures in the study may be subject to socially desirable responses (af Wåhlberg, 2010; Yılmaz et al., 2021), while some studies have reported no effect of social desirability on risk behaviour measures (Sullman & Taylor, 2010; Wickens et al., 2008). Another important issue is the age distribution of the sample. As can be seen from the sample characteristics, the study focuses on young adults. This age group shows similar characteristics in terms of resistance to peer influence, and this resistance does not change significantly with age (Steinberg & Monahan, 2007). However, future studies with larger sample sizes and comparisons across different stages of adulthood may provide a richer understanding of peer influence on road user behaviour.

This study discussed the effects of peer pressure on driver behaviour in general and found a significant peer pressure effect that varied by age and sex. Although the methodology of the current study is able to answer the research questions on which it was focused, further more experimental studies and the examination of more specific driver behaviours such as speed, lateral position or reaction time may be useful in investigating the effectiveness of intervention studies. The visual narrowing in male drivers when driving with male peers observed in the Pradhan et al. (2014) study may be a good example of this. Although this visual narrowing is not an example of direct and indirect peer pressure behaviours, it may have been observed as an implicit outcome of peer pressure.

Although the present study focused on peer pressure and its influence on the drivers' own behaviour, future studies could extend

the factors within this sociotechnical system and examine the role of the family (e.g., Bianchi & Summala, 2004; Taubman - Ben-Ari et al., 2005) and resistance to peer influence (e.g., Mirman & Curry, 2016) in this interaction when investigating the influence of drivers and their social environment. Although the current results showed a negative effect of peer pressure, for younger drivers, their families may act as a buffer (or the opposite) against this negative effect in the early stages of driving.

In addition to the findings of the present study, recent literature has shown that peer influence is a factor to be considered not only for drivers but also for other road users such as pedestrians (Wang et al., 2024) and digital channels such as social media networks are also instrumental in spreading an influence (Vingilis et al., 2018). Therefore, addressing this issue in a broader scope and designing intervention studies in this way may have an important impact on effective prevention efforts.

In general, peers seem to be an important element in the traffic system, especially for young novice drivers. Evidence suggests that peer influence has a negative and risky effect, particularly for young males, and is therefore associated with more aberrant behaviours. Therefore, greater consideration of peer influence in traffic safety culture and intervention studies will play an important role in reducing risky behaviours and shaping norms accordingly. Given that all road users and other stakeholders have a role to play in building a more positive traffic safety culture, peers could play an important role in road safety.

CRediT authorship contribution statement

Alev Aktaş: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **İbrahim Öztürk:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Data availability

Data will be made available on request.

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The authors have no conflict of interests to declare. For the purpose of open access, the author has applied a Creative Commons Attribution (CC BY) licence to the author-accepted manuscript version arising from this submission.

Data access statement

The data that support the findings of this study are available on request from the corresponding author.

Appendices.

A: Turkish items of the direct peer pressure.

Aşağıda araç kullanırken karşılaşabileceğiniz bazı durumlar ve bu durumlarda arkadaşlarınızın verebileceği olası tepkiler belirtilmiştir. Bu bölümde sizden, siz araç kullanırken araç içindeki arkadaşlarınızın bu durumlara verebileceği tepkileri değerlendirmeniz beklenmektedir.

Ölçeğin bu bölümünde, arkadaşlarınızın belirtilen durumlara verebileceği tepkileri değerlendiriniz.

	Kesinlikle katılmıyorum.	**Kısmen katılmıyorum.**	**Ne katılıyorum ne katılmıyorum.**	**Kısmen katılıyorum.**	**Kesinlikle katılıyorum.**
Araç kullanırken, eğer dikkatsizsem arkadaşlarım bana daha dikkatli olmamı söyler.					
Araç kullanırken, emniyet kemerim takılı değilse, arkadaşlarım emniyet kemerimi takmam için ısrar eder.					
Araç kullanırken, arkadaşlarım bazen beni başka bir araçla yarışmaya teşvik eder.					
Araç kullanırken, arkadaşlarım beni tehlikeli manevralar yapmaya teşvik eder.					
Araç kullanırken, arkadaşlarım beni daha hızlı sürmeye teşvik eder.					
Araç kullanırken, eğer trafik kurallarını ihlal edersem, arkadaşlarım bunu onaylamadıklarını ifade eder.					

(*continued on next page*)

(*continued*)

	Kesinlikle katılmıyorum.	Kısmen katılmıyorum.	Ne katılıyorum ne katılmıyorum.	Kısmen katılıyorum.	Kesinlikle katılıyorum.
Araç kullanırken, arkadaşlarım bazen beni onlarla yarışmaya teşvik eder.					
Araç kullanırken, arkadaşlarım bana "çok hızlı gitme" gibi şeyler söyler.					
Araç kullanırken, arkadaşlarım beni telefon kullanmaktan vazgeçirir.					
Araç kullanırken, arkadaşlarım bana alkol almam için baskı yapar.					
Araç kullanırken, arkadaşlarım bana yavaş sürdüğüm için sitem eder.					

B: Turkish items of the indirect peer pressure.

Ölçeğin bu bölümünde, arkadaşlarınızın aşağıdaki davranışları ne ölçüde onaylayacağını belirtiniz.

	Kesinlikle onaylamazlar.	Kısmen onaylamazlar.	Ne onaylar ne onaylamazlar.	Kısmen onaylarlar.	Kesinlikle onaylarlar.
Arkadaşlarınızın, yorgunken araç kullanmayı ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, yan yana iki devamlı yol çizgisinde bir aracı sollamayı ne ölçüde onaylayacağını düşünüyorsunuz?					
Arkadaşlarınızın, DUR işaretine uymamayı ne ölçüde onaylayacağına inanıyorsunuz?					
Araç kullanırken, mesajlarınızı kontrol etmeyi veya mesaj göndermeyi arkadaşlarınızın ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, hız sınırını aşmayı ne ölçüde onaylayacağını düşünüyorsunuz?					
Arkadaşlarınızın, kuraldışı dönüşler yapmayı ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, kırmızı ışıkta geçmeyi ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, başka bir araçla yarışmayı ne ölçüde onaylayacağına inanıyorsunuz?					
Alkol aldıktan sonra araç kullanmayı arkadaşlarınızın ne ölçüde onaylayacağını düşünüyorsunuz?					
Arkadaşlarınızın, madde etkisi altında (örneğin uyuşturucu veya uyarıcı maddeler) araç kullanmayı ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, araçlar arasında zig-zag yapmayı (makas atmayı) ne ölçüde onaylayacağına inanıyorsunuz?					
Arkadaşlarınızın, emniyet kemeri takmamayı ne ölçüde onaylayacağını düşünüyorsunuz?					

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