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Research Article

# Traffic climate scale: Comparing samples from Turkey and Sweden

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ABSTRACT

Traffic climate is a recent and one of the essential topics in traffic and transportation research. Various studies have examined the relations of traffic climate with driving outcomes such as accidents by using different versions of the Traffic Climate Scale (TCS). In a recent attempt, 16-items and 38-items versions of the TCS were examined in different countries. With respect to that, the present study aims to investigate the psychometric properties of 16-items and 38-items versions in samples from Turkey and Sweden and to test the traffic climate differences of these two countries. A total of 309 participants from Turkey and 357 participants from Sweden completed a questionnaire including a demographic information form and the TCS. Confirmatory factor analyses showed that the short TCS had better fit indexes with acceptable reliability. Moreover, the traffic system in Turkey was perceived to be more internally and externally demanding and less functional compared to the traffic system in Sweden. The results suggest that the short TCS is a reliable and user-friendly measurement to understand the perception of road users.



According to the latest two reports of the World Health Organization [1,2], road traffic accidents result in approximately 1.35 million deaths each year. The number of deaths increased by 100,000 from 2013 to 2016. Additionally, these accidents are the leading cause of death for people between the ages of 5 and 29 [2]. Even though road traffic accidents are one of the critical public health problems worldwide, fatality statistics showed crucial regional and country differences. For example, the number of deaths due to road traffic accidents were three times higher in low-income countries than in high-income countries [2]. Özkan and Lajunen [3] proposed a hierarchical structure of traffic culture and climate. According to this model, accidents occur due to either direct or combined effects of factors in a multi-level sociocultural and technical environment of the traffic system. Traffic climate is one of the crucial factors in decreasing adverse outcomes and increasing road safety [4].

Different studies have defined traffic climate by focusing on various aspects. Özkan and Lajunen [3] operationalised traffic climate as "the road users' (e.g. drivers') attitudes and perceptions of the traffic in a context (e.g. country) at a given point in time". With respect to that, Özkan and Lajunen [3,5] highlighted the multi-level and multi-layer structure of traffic culture and climate. In this context, traffic climate can be affected by the components of the environment and conditions of the current traffic system. Besides, drivers' skills, attitudes and behaviours can also be affected by the traffic climate [4].

Following the theoretical discussion on traffic culture and climate [3], the Traffic Climate Scale was developed to measure road users' perception of traffic safety of a country [6]. Özkan and Lajunen [6] measured traffic climate under three dimensions, namely external affective demands, internal requirements and functionality. External affective demands are identified with the emotional engagement while interactions with the traffic (e.g. annoying). Internal requirements are related to the road users' skills and abilities to be successfully part of a traffic system (e.g. demands knowledge of traffic roles). Finally, functionality corresponds to the characteristics (e.g. planned) of a functional traffic system [7]. The TCS could also be used to study country differences in terms of traffic climate. For instance, Üzümcüoğlu et al. [8] found that traffic system in Turkey was perceived to be more internally demanding and less externally demanding and functional than traffic system in China.

Even though the TCS has been used and showed reliable three-factor solutions in different countries such as Germany [7], Turkey [9], Estonia, Greece, Kosovo, Russia [10] and China [4,11], the item content of the factors showed significant differences. For instance, Gehlert et al. [7] used 41 items versions, and the final version suggested included 30 items. In the Chinese adaptation of the TCS [11], the factorial analysis was conducted with 41-items version. However, the final scale consisted of 13 items. Moreover, Üzümcüoğlu Zihni [9] tested the 44-items version

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with Turkish and Chinese samples. The final scales included 40 items in Turkey and 42 items in China with the same three factors with certain item differences under each factor. All in all, considering these differences, Üzümcüoğlu et al. [10] examined the psychometric properties of four different versions (38-, 30-, 22-, and 16-items) in five different countries (Estonia, Greece, Kosovo, Russia and Turkey).

With respect to these differences, the aims of the present study were;

1) To test the psychometric properties of the 38-items and the 16-items versions suggested by Üzümcüoğlu et al. [10] in Turkey and Sweden. In addition to re-examining the psychometric properties of the TCS in a sample from Turkey, the factorial structure of the Swedish version will be tested for the first time in the literature.
2) To investigate correlations of traffic climate factors and demographic variables (i.e. age, gender, last year kilometres and accidents)
3) To examine the differences between Turkey and Sweden in terms of traffic climate.

## 1. Methods

### 1.1. Participants

The study was conducted with a total of 309 participants from Turkey between 19 and 38 years old ($M = 22.44$, $SD = 2.80$) and 357 participants from Sweden between 20 and 66 years old ($M = 30.03$, $SD = 10.38$). There were 206 and 208 females and 103 and 147 males in the samples from Turkey and Sweden, respectively. The demographic characteristics of both samples (age, kilometres driven in the last year and accident history) are given in Table 1.

### 1.2. Measurements

The questionnaire, including additional measures (i.e. Traffic Locus of Control Scale, Driving Skills Inventory and Basic Personality Trait Inventory), was constructed in English (the common language between the authors). The TCS and demographic information form were translated into Swedish and then back-translated to English. In Turkey, previous Turkish versions were used.

#### 1.2.1. Traffic climate scale

The TCS has been used to measure the traffic climate of a traffic system in a country [6]. Participants were asked to rate the traffic system in terms of 44 items in 6-point Likert-type from 1 (does not describe it at all) to 6 (describes it fully). The previous Turkish version [6] was used in Turkey, and the Swedish version was adopted in the present study. In the present study, 38-items and 16-items versions suggested by Üzümcüoğlu et al. [12] were examined. Factorial structures and Cronbach's alpha reliabilities of the subscales were given in section 2.2.1. for 38-items and 2.2.2. for 16-items.

#### 1.2.2. Demographic information form

Participants' age, gender, last year kilometres, number of active accidents and number of passive accidents information were gathered with the demographic information form.

### 1.3. Procedure

The study was approved by the university's Applied Ethics Research Center. Two prerequisites were determined for participation (i.e. being a university student and having a valid full driving license for a car). The questionnaire package was in Turkish for drivers from Turkey and in Swedish for drivers from Sweden. The online questionnaire link beginning with the informed consent form, was distributed using Qualtrics through social media challenges in Turkey and Sweden. Besides, a study invitation e-mail including a link to the survey was sent to student e-mail addresses in Sweden obtained from the student registration and grading document system (LADOK). In Turkey, some of the participants gained bonus points for their participation in their courses. These students were invited to research through the university's web study system or directly through the course instructors. Along with the other measurements, the study took approximately 15 to 20 min to complete.

### 1.4. Analyses

The analyses were conducted with JASP 0.14.1.0 and SPSS v26. In line with the aims of the study, four different confirmatory factor analyses were conducted for 38- and 16-items versions of the TCS across samples from Turkey and Sweden separately. The fitness of the models was assessed by $\chi 2$/degree of freedom ratio, root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardised root mean square residual (SRMR). A good fit model is evaluated based on having: $\chi^2$/degree of freedom ratio between 2:1 and 5:1, RMSEA below 0.10, CFI above 0.90 and SRMR below 0.10 [13,14]. Following the factorial structures, dimensions based on the mean scores of the items and bivariate correlation coefficients between variables were calculated. Finally, six one-way between-groups analyses of covariance (ANCOVA) were conducted to identify country differences in traffic climate between Turkey and Sweden after controlling for age, gender and kilometres driven in the last year.

## 2. Results

### 2.1. Sample characteristics

The sample characteristics of drivers from Turkey and Sweden in terms of age, kilometres driven in the last year and the number of active and passive accidents in the previous three years are given in Table 1. Drivers from Turkey were significantly younger, less exposed to traffic in terms of kilometres driven in the last year and had more active and passive accidents in the previous three years.

**Table 1**
Traffic climate differences across Turkey and Sweden.

| | Turkey ($N = 309$) | | Sweden ($N = 356$) | | *df* | *F* | *p* | $N_p^2$ |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | | |
| Age | 22.44 | 2.80 | 30.03 | 10.38 | 1, 663 | 155.37 | 0.000 | 0.19 |
| Male | $N = 103$ | 33.3% | $N = 147$ | 41.2% | | | | |
| Last year kilometres | 5041.43 | 11,708.68 | 8384.92 | 13,632.63 | 1, 595 | 10.37 | 0.001 | 0.02 |
| Active accidents | 0.61 | 1.26 | 0.21 | 0.51 | 1, 662 | 30.19 | 0.000 | 0.04 |
| Passive accidents | 0.26 | 0.58 | 0.16 | 0.41 | 1, 663 | 6.85 | 0.009 | 0.01 |

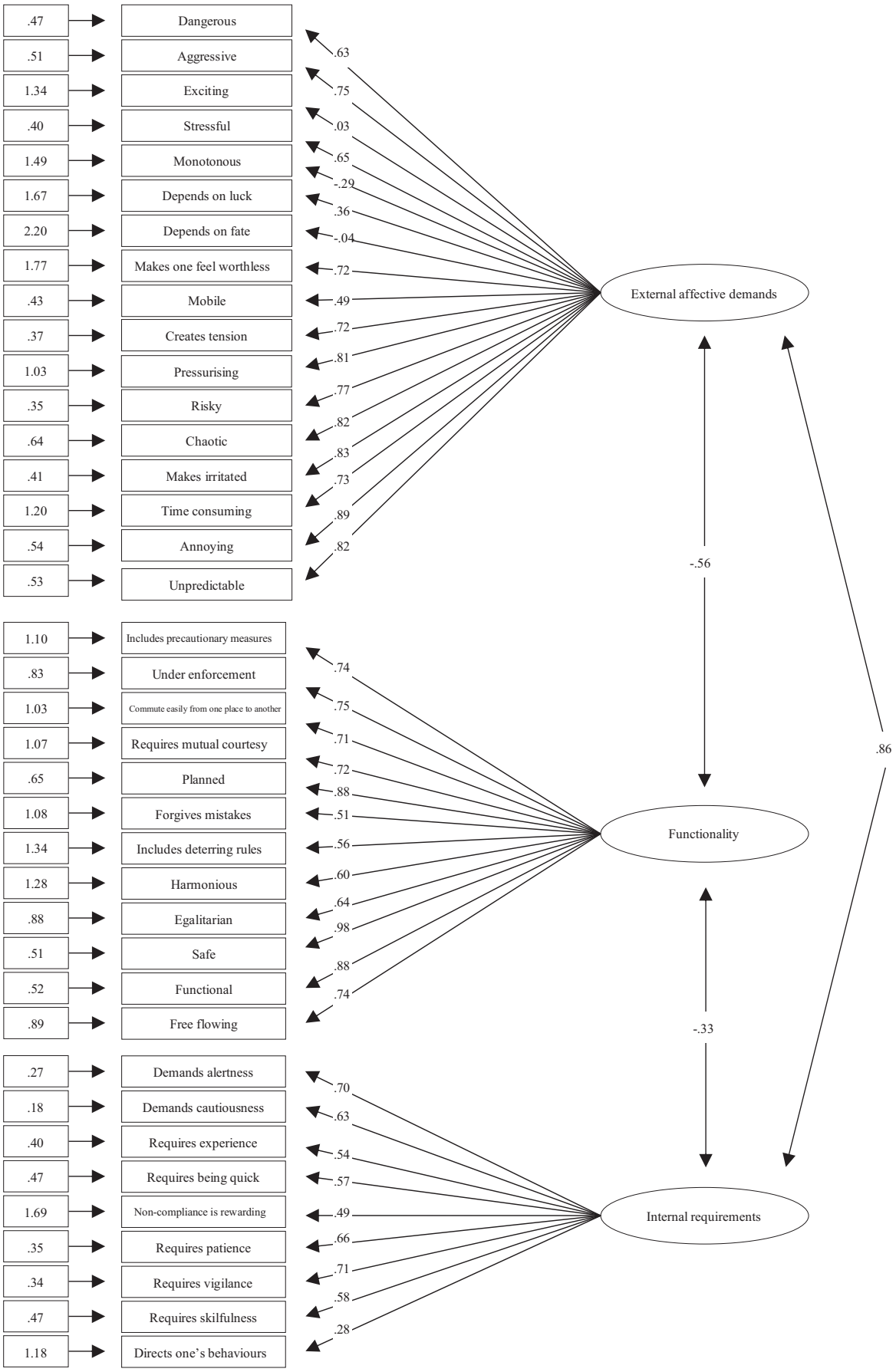


**Fig. 1.** The 38-Items TCS Item Structure in Turkey.

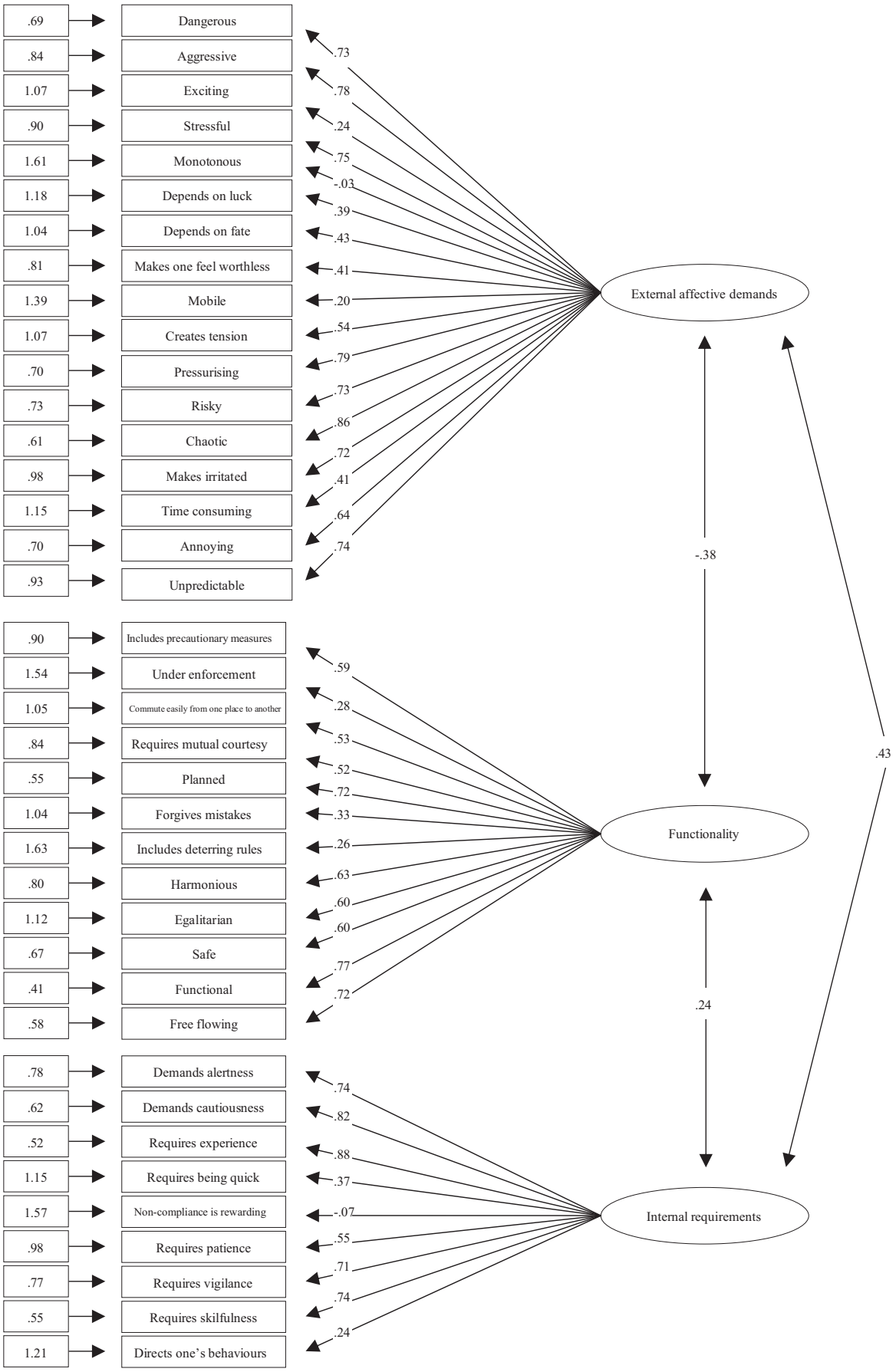


**Fig. 2.** The 38-Items TCS Item Structure in Sweden.

### 2.2. Confirmatory factor analyses

#### 2.2.1. CFA results for 38 items

The CFA results for the 38 items version of the TCS are presented for Turkey (Fig. 1.) and Sweden (Fig. 2.), respectively. The CFA results showed acceptable fit indexes. For external affective demands, the item loadings ranged from −0.29 to 0.89 in Turkey and from −0.03 to 0.86 in Sweden. Items with the highest loadings were *annoying* in Turkey and *chaotic* in Sweden. The item loadings of functionality were between 0.51 and 0.98 in Turkey and 0.26 and 0.77 in Sweden. Items with the highest loadings were *safe* in Turkey and *functional* in Sweden. The item loadings of internal requirements were between 0.28 and 0.71 in Turkey and − 0.07 and 0.88 in Sweden. *Requires vigilance* and *requires experience* were the items with the highest loadings in Turkey and Sweden, respectively. The Cronbach's alpha reliabilities of three factors for Turkey and Sweden were as follows: 0.85 and 0.83 for external affective demands, 0.87 and 0.79 for functionality and 0.82 and 0.72 for internal requirements. The fit indices of the two models showed acceptable values except for the CFI values for Turkey ($\chi^2$ (662) = 1713.95, $p < .001$, RMSEA = 0.07, CFI = 0.81, SRMS = 0.08) and ($\chi^2$ (662) = 2013.01, $p < .001$, RMSEA = 0.08, CFI = 0.68, SRMS = 0.10).

#### 2.2.2. CFA results for 16 items

The CFA results for the 16 items version of the TCS are presented for Turkey (Fig. 3.) and Sweden (Fig. 4.), respectively. The CFA results showed acceptable fit indexes. For external affective demands, the item loadings ranged from 0.34 to 0.91 in Turkey (see Fig. 3.) and 0.35 to 0.82 in Sweden (see Fig. 4.). Items with the highest loadings were *annoying* in Turkey and *chaotic* in Sweden. The item loadings of functionality were between 0.56 and 0.98 in Turkey and 0.60 and 0.76 in Sweden. Items with the highest loadings were *safe* in Turkey and *functional* in Sweden. The item loadings of internal requirements were between 0.63 and 0.76 in Turkey and 0.71 and 0.91 in Sweden. *Demands alertness* and *demands cautiousness* were the items with the highest loadings in Turkey and Sweden, respectively. The Cronbach's alpha reliabilities of three factors for Turkey and Sweden were as follows: 0.84 and 0.81 for external affective demands, 0.82 and 0.80 for functionality and 0.84 and 0.75 for internal requirements. The fit indices of the two models showed good values

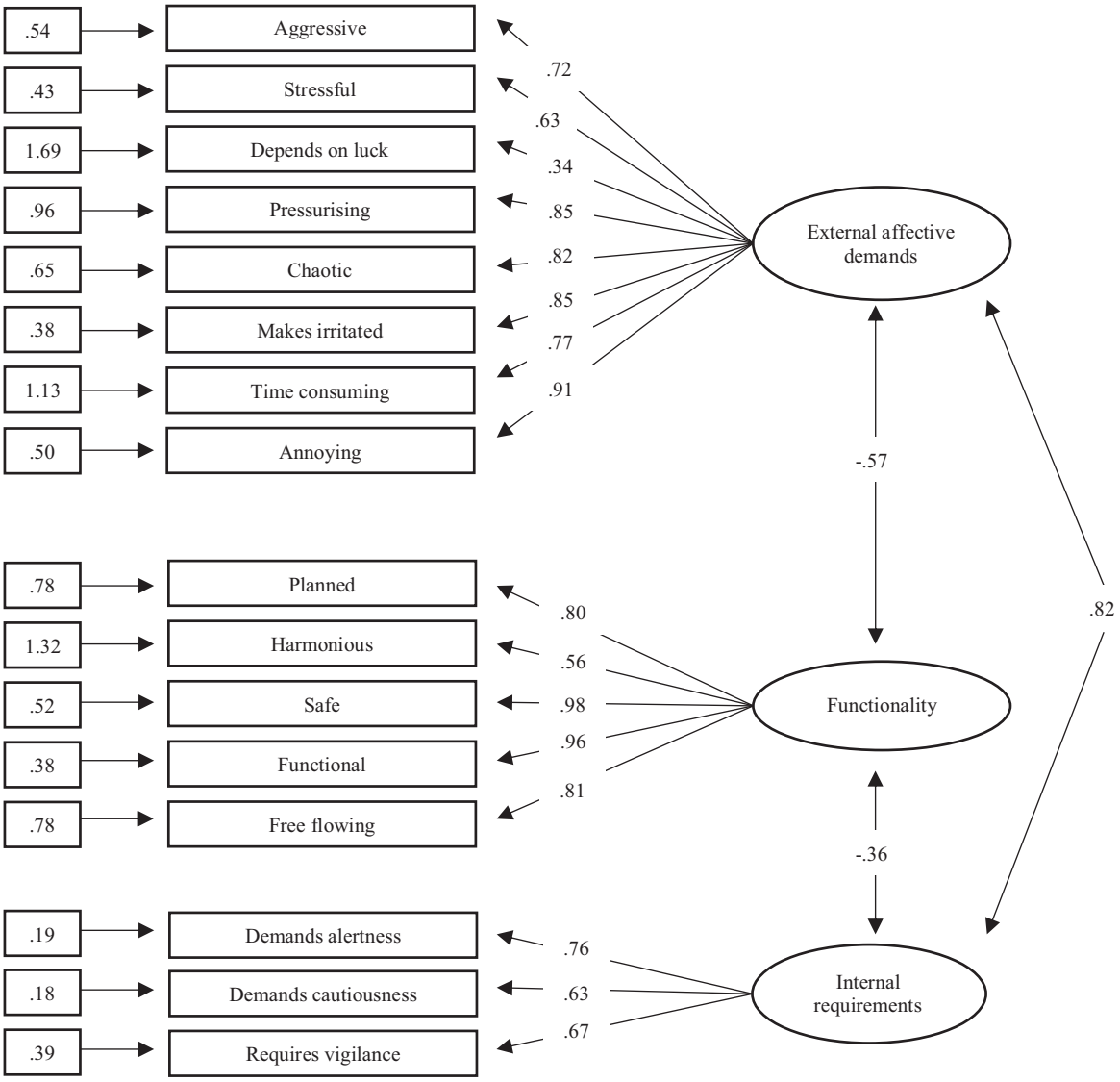


**Fig. 3.** The 16-Items TCS Item Structure in Turkey.

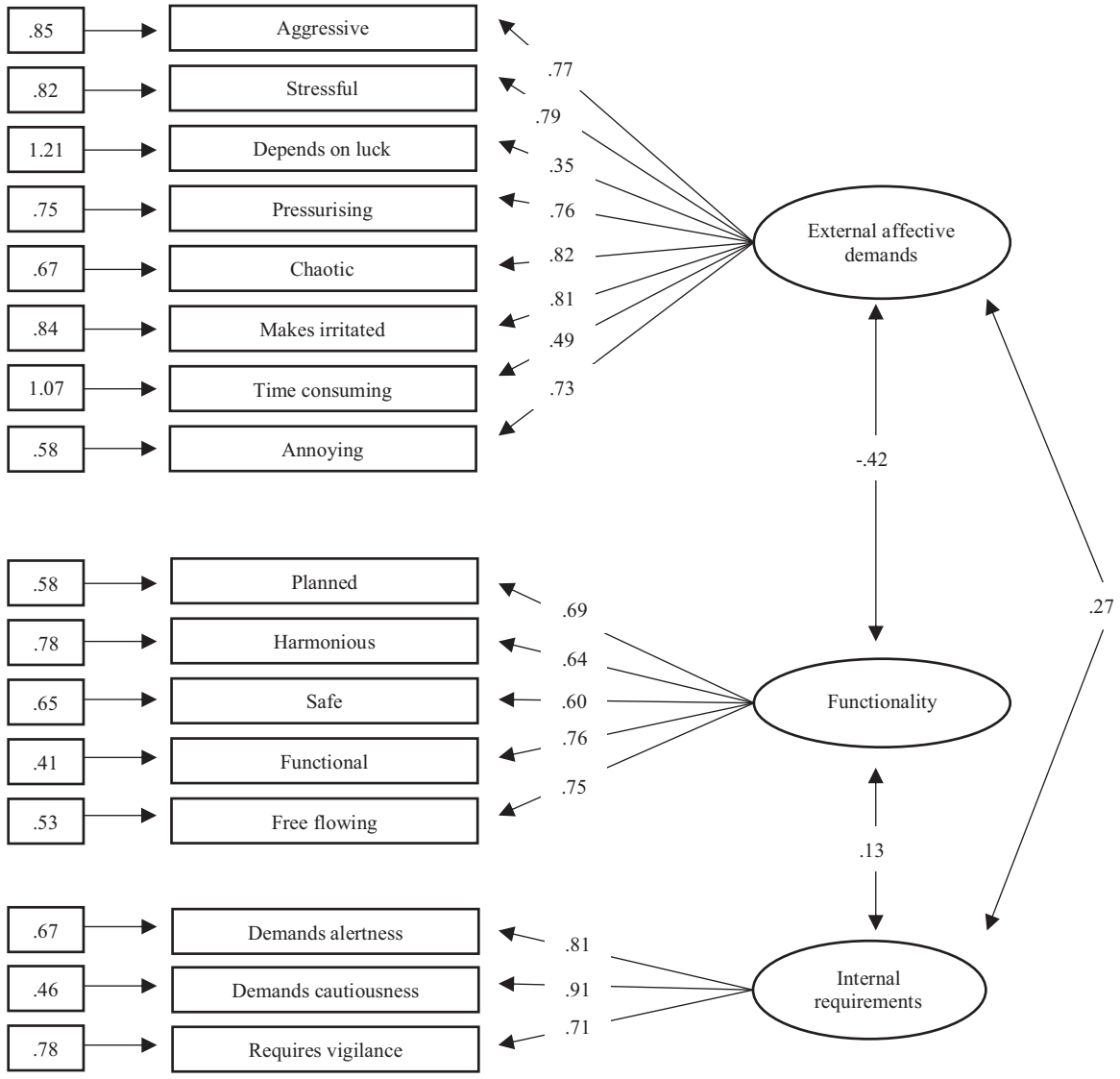


**Fig. 4.** The 16-Items TCS Item Structure in Sweden.

for Turkey ($\chi^2$ (101) = 262.46, $p < .001$, RMSEA = 0.07, CFI = 0.93, SRMS = 0.06) and Sweden ($\chi^2$ (101) = 349.88, $p < .001$, RMSEA = 0.08, CFI = 0.86, SRMS = 0.07). Only the CFI value for Sweden was below 0.90 cut-off but still acceptable.

### 2.3. Correlations

The bivariate correlation coefficients between the variables were presented in Table 2. Age was negatively correlated with functionality

**Table 2**
Correlation coefficients in Turkey and Sweden.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Age | 1 | −0.03 | 0.17** | 0.00 | 0.02 | 0.01 | −0.20** | 0.06 | 0.00 | −0.18** | 0.07 |
| 2. Gender (1: Male, 2: Female) | **−0.13*** | 1 | −0.25** | −0.06 | −0.01 | 0.13* | 0.00 | 0.13* | 0.09 | 0.02 | 0.16** |
| 3. Last year kilometres | **0.09** | **−0.11*** | 1 | 0.00 | 0.16** | 0.00 | −0.07 | −0.03 | 0.03 | −0.07 | −0.01 |
| 4. Active accidents | **−0.03** | **−0.01** | **0.24**** | 1 | 0.16** | 0.09 | −0.03 | 0.02 | 0.07 | −0.04 | −0.03 |
| 5. Passive accidents | **−0.01** | **−0.13*** | **0.26**** | **0.28**** | 1 | −0.01 | 0.00 | 0.01 | 0.00 | −0.01 | 0.00 |
| 6. EAD_38 | **0.04** | **0.09** | **−0.05** | **−0.08** | **−0.04** | 1 | −0.17** | 0.45** | 0.93** | −0.26** | 0.30** |
| 7. FUN_38 | **−0.14*** | **0.01** | **0.06** | **0.04** | **0.01** | **−0.38**** | 1 | 0.24** | −0.24** | 0.89** | 0.21** |
| 8. IR_38 | **0.04** | **0.14*** | **−0.01** | **−0.04** | **−0.02** | **0.73**** | **−0.24**** | 1 | 0.35** | 0.13* | 0.81** |
| 9. EAD_16 | **0.06** | **0.09** | **−0.06** | **−0.08** | **−0.05** | **0.96**** | **−0.44**** | **0.69**** | 1 | −0.33** | 0.20** |
| 10. FUN_16 | **−0.10** | **0.07** | **0.04** | **0.06** | **0.00** | **−0.38**** | **0.92**** | **−0.24**** | **−0.44**** | 1 | 0.11* |
| 11. IR_16 | **0.11** | **0.08** | **−0.05** | **0.00** | **0.00** | **0.71**** | **−0.28**** | **0.89**** | **0.69**** | **−0.28**** | 1 |

*Note*. Correlation coefficients in Turkey were given in bold. * $p < .05$, ** $p < .01$. EAD = External affective demands, FUN = Functionality, IR = Internal requirements, _38 = Mean of factor from 38-Items version, _16 = Mean of factor from 16-Items version.

factor from the 38-items scale in two countries. On the other hand, kilometres driven in the last year and the number of active and passive accidents were not correlated with any dimensions of the TCS. Finally, in terms of correlation coefficients between dimensions of the TCS, external affective demands and internal requirements were positively correlated with each other in both countries. Functionality was negatively correlated with external affective demands in both countries. However, the correlations between functionality and internal requirements were negative in Turkey and positive in Sweden.

### 2.4. Country differences in traffic climate

Series of one-way between-subjects ANCOVA were conducted to examine country differences in dimensions of long and short TCS. After controlling the statistical effects of age, gender and kilometres driven in the last year, significant country differences were determined (see Table 3.). Turkey scored higher in external affective demands and internal requirements than Sweden. On the other hand, Sweden had higher functionality scores than Turkey.

## 3. Discussion

The first aim was to examine the psychometric properties of the 38-items and the 16 items versions suggested by Üzümcüoğlu et al. [10] in Turkey and Sweden. In the present study, factorial fit indices of the Traffic Climate Scale [6] were examined with samples of drivers from Turkey and Sweden, respectively. In addition to re-examining the factorial structure in Turkey [10], for the first time in the literature, the TCS was used in Sweden.

Similar to Üzümcüoğlu et al. [10], even though the Cronbach's alpha reliabilities of the scales were higher in the long version, the short version of the TCS showed acceptable internal consistency with better fit indexes. Based on these, it could be suggested that using the short TCS would be more useful considering the practical benefits (such as quicker for participants to complete and higher response rate) of using 16 items scale rather than 38 items scale. Franke et al. [15] discussed that shortened scales have various benefits such as increased response rate and data quality.

In terms of the relations of traffic climate factors, similar to previous findings [10], the correlation coefficients of external affective demands with internal requirements were positive and with functionality were negative. Gehlert et al. [7] discussed that external affective demands and functionality dimensions were related to external characteristics of the traffic system, and internal requirements were associated with the skills requirements of the traffic system. In that sense, it could be suggested that functional traffic systems would also be more likely not to be emotionally demanding. On the other hand, in an emotionally demanding traffic system, drivers were also more likely to perceive higher skill requirements from the traffic system to be part of the traffic system.

**Table 3**
Traffic climate differences across Turkey and Sweden.

| | Turkey ($N = 307$) | | Sweden ($N = 289$) | | $df$ | $F$ | $p$ | $N_p^2$ |
|---|---|---|---|---|---|---|---|---|
| | $M$ | $SD$ | $M$ | $SD$ | | | | |
| External affective demands_38 | 4.46 | 0.63 | 2.81 | 0.62 | | 793.34 | 0.000 | 0.57 |
| External affective demands_16 | 4.71 | 0.81 | 2.91 | 0.77 | | 604.10 | 0.000 | 0.51 |
| Internal requirements_38 | 5.01 | 0.63 | 3.81 | 0.63 | 1, 591 | 426.29 | 0.000 | 0.42 |
| Functionality_38 | 3.09 | 0.78 | 3.96 | 0.61 | | 237.73 | 0.000 | 0.29 |
| Internal requirements_16 | 5.35 | 0.75 | 4.32 | 0.90 | | 191.15 | 0.000 | 0.24 |
| Functionality_16 | 3.10 | 0.91 | 4.00 | 0.78 | | 177.19 | 0.000 | 0.23 |

*Note.* Variables were listed based on F-values (from highest to lowest).

The second aim of the study was to test correlations of traffic climate factors and demographic variables (i.e. age, gender, last year kilometres and accidents). In previous studies, dimensions of traffic climate showed weak and inconsistent correlations with demographic variables [4,11,12]. For instance, Üzümcüoğlu et al. [12] found the correlations between age and functionality as positive in Turkey and negative in China. In the present study, the correlations were positive for the two countries. Moreover, gender was only related to internal requirements in both countries. Being female was associated with higher internal requirements both in Turkey and Sweden. The difference could be related to the own skill perception of drivers. For instance, while female drivers were more cautious, male drivers had higher confidence in their driving skills [16]. Similarly, if male drivers perceive themselves as more skillful, they may perceive the traffic environment as less demanding than female drivers.

Similar to previous studies [4,7], accident involvement and traffic climate were not correlated. Traffic climate may not be directly related to accident involvement. When considered on the basis of the model proposed by Özkan and Lajunen [3,5], traffic culture/climate take place at the macro-level of traffic system and can be defined as "perception of this whole [traffic system] especially at meso and macro levels". Following the discussion of Lajunen [17] and Sümer [18] on proximal and distal factors leading to road traffic accidents, there could be some behavioural factors between the traffic climate and accident involvement. For instance, Chu et al. [4] found that traffic climate was related to violations that were associated with accidents. In a recent study, Omidi et al. [19] found that functionality is negatively related to accident involvement. However, that finding might be affected by the exposure level of the sample, which is taxi drivers. It was also reported that taxi drivers perceived the traffic system as more demanding and less functional.

Even though the findings with undesired driving outcomes such as accidents and tickets presented weak relations [4,8,9,11,19], it should also be highlighted that the perception of traffic climate also presents crucial findings for policymakers. Based on the studies examining its relations with driver behaviours [4,8,9,11,19], it can be suggested that how the traffic system is perceived at the country level can have a role on the behaviours of road users at the micro-level. Especially as a reflection of that climate, not only drivers but also other road users such as pedestrians and cyclists may be behaving accordingly. In line with the discussion on safe traffic systems by Gehlert et al. [4], policymakers can continue to work on a traffic system that is perceived as less demanding and more functional. For instance, Özkan and Lajunen [5] also suggested that the TCS could be used to measure the traffic climate of *meso* level systems such as cities. Based on this, policymakers can determine the general perception and develop countermeasures by conducting TCS-based nationwide or regional studies.

With respect to the third aim of the present study, traffic climate differences of Turkey and Sweden were examined. In terms of the country differences, the traffic system in Turkey was evaluated high in terms of external affective demands and internal requirements and low in terms of functionality compared to Sweden. Gehlert et al. [7] discussed that a traffic system with higher functionality and lower external affective demands would be a safer traffic system for all road users. Similarly, Chu et al. [4] also reflected that a safer traffic system would be less internally and externally demanding. Concerning that, it could be suggested the traffic system in Sweden is safer for road users than the traffic system in Turkey.

In line with these, it could be suggested that both sample characteristics and the evaluation of traffic climate supported the objectively measured road safety statistics and previous studies examining the differences between drivers from Turkey and Sweden, respectively. According to the statistics of Turkey and Sweden [2], the estimated traffic fatality rate per 100,000 population for Sweden is 2.8 and 12.3 for Turkey. Additionally, drivers from Sweden were more positive to comply with speed limits and had fewer violations than drivers from Turkey [20,21]. In conclusion, it could be suggested that the TCS is a reliable and valid measurement to examine the safety climate of a traffic system in a given country.

There are a few limitations and future suggestions that should be considered in future studies. First of all, the sample of the present study consisted of drivers who were also university students from two countries with different characteristics. With respect to that, the differences and characteristics of the samples restrict the generalisability of the results across Turkey and Sweden. Additionally, it could be discussed that different road user groups may perceive the climate of the traffic differently. For instance, Gehlert et al. [7] showed some similarities and differences in the relations between the traffic climate perception of road users (i.e. car drivers, cyclists and pedestrians) and red-light violations. External affective demands were only positively correlated with intentions for car drivers. Besides, the skill requirements of the traffic system would be different road users (i.e. drivers and cyclists). Because of that, it would be important to examine how different groups of road users perceive the traffic climate of a country.

It should also be noted that the TCS measures the perception of the traffic climate of road users. One of the factors that might be affecting this perception could be where the drivers expose to the traffic system, such as rural or urban areas or size, infrastructure quality and vehicle density of the traffic system they were part of (i.e. within-country variability). There might be some regional differences within that country. Even though the instruction of the scale specifically directs to evaluate general traffic system of that country, it is not known how much drivers are exposed to different parts of their country, or their evaluation is affected by that. Therefore, in future studies, these factors could be considered while measuring the traffic climate of a country. However, contrary to this limitation, it is worth mentioning that the TCS differences between Turkey and Sweden were also in line with the objectively measured indicators of road safety. Consequently, it can be interpreted that the findings of the present study were not significantly affected by this limitation.

To sum up, even though previous studies [4,10,11] have reported various use of the TSC with different items representing the same factorial and theoretical background, it could be suggested that, supporting the findings of Üzümcüoğlu et al. [10], the short TCS has shown better fit indexes with acceptable Cronbach's alpha reliabilities in Turkey and Sweden and also reflected the theoretical background robustly on traffic climate [3]. In addition to re-examining the goodness of fit findings in Turkey, the factorial structure of TCS was examined in Sweden for the first time. Furthermore, the country-level comparisons showed that the traffic system in Sweden was perceived to be more functional and less demanding in terms of emotions and driving skills. With respect to that, the short TCS was evaluated to be a reliable and user-friendly measurement of the road users' perception of the traffic climate of a country.

## Declaration of competing interest

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

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## References

[1] World Health Organization, Global Status Report on Road Safety, http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/ 2015.
[2] World Health Organization, Global status report on road safety 2018, https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/ 2018.
[3] T. Özkan, T. Lajunen, Person and environment: Traffic culture, in: B.E. Porter (Ed.), Handbook of Traffic Psychology, Elsevier, San Diego 2011, pp. 179–192.
[4] W. Chu, C. Wu, C. Atombo, H. Zhang, T. Özkan, Traffic climate, driver behaviour, and accidents involvement in China, Accid. Anal. Prev. 122 (2019) 119–126, https://doi.org/10.1016/j.aap.2018.09.007.
[5] T. Özkan, T. Lajunen, A General Traffic (safety) Culture System (G-TraSaCu-S). TraSaCu Project, European Commission, RISE Programme, 2015https://doi.org/10.13140/RG.2.2.16515.20006.
[6] T. Özkan, T. Lajunen, Traffic Culture and Traffic Climate Scale, 2021 Unpublished manuscript.
[7] T. Gehlert, C. Hagemeister, T. Özkan, Traffic safety climate attitudes of road users in Germany, Transport. Res. F: Traffic Psychol. Behav. 26 (2014) 326–336, https://doi.org/10.1016/j.trf.2013.12.011.
[8] Y. Üzümcüoğlu, T. Özkan, C. Wu, H. Zhang, How drivers perceive traffic? How they behave in traffic of Turkey and China? Transport. Res. F: Traffic Psychol. Behav. 64 (2019) 463–471, https://doi.org/10.1016/j.trf.2019.06.006.
[9] Y. Üzümcüoğlu Zihni, The Relationship between Traffic Climate and Driver Behaviors: Explicit and Implicit Measures with Turkish and Chinese Samples, Doctoral dissertation Middle East Technical University, 2018.
[10] Y. Üzümcüoğlu, Ö. Ersan, B. Kaçan, G. Solmazer, D. Azık, G. Fındık, T. Özkan, T. Lajunen, B. Öz, A. Pashkevich, M. Pashkevich, V. Danelli-Mylona, D. Georgogianni, E. Berisha Krasniqi, E. Makris, K. Shubenkova, G. Xheladini, A short scale of traffic climate across five countries, Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi 17 (46) (2020) 673–702.
[11] Q. Zhang, Y. Ge, W. Qu, K. Zhang, X. Sun, The traffic climate in China: the mediating effect of traffic safety climate between personality and dangerous driving behavior, Accid. Anal. Prev. 113 (2018) 213–223, https://doi.org/10.1016/j.aap.2018.01.031.
[12] Y. Üzümcüoğlu, T. Özkan, C. Wu, H. Zhang, Traffic climate and driver behaviors: the moderating role of driving skills in Turkey and China, J. Saf. Res. 75 (2020) 87–98, https://doi.org/10.1016/j.jsr.2020.08.004.
[13] D.W. Russell, In search of underlying dimensions: the use (and abuse) of factor analysis in personality and social psychology bulletin, Personal. Soc. Psychol. Bull. 28 (12) (2002) 1629–1646, https://doi.org/10.1177/014616702237645.
[14] K. Schermelleh-Engel, H. Moosbrugger, H. Müller, Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures, Methods Psychol. Res. Online 8 (2) (2003) 23–74.
[15] G. Franke, R. Rapp, A. "Mick" Andzulis, J. Using shortened scales in sales research: Risks, benefits, and strategies, J. Pers. Sell. Sales Manag. 33 (3) (2013) 319–328, https://doi.org/10.2753/PSS0885-3134330306.
[16] A. Sundström, Self-assessment of driving skill–a review from a measurement perspective, Transport. Res. F: Traffic Psychol. Behav. 11 (1) (2008) 1–9, https://doi.org/10.1016/j.trf.2007.05.002.
[17] T. Lajunen, Personality Factors, Driving Style, and Traffic Safety, Doctoral Dissertation Faculty of Arts, University of Helsinki, Helsinki, 1997.
[18] N. Sümer, Personality and behavioral predictors of traffic accidents: testing a contextual mediated model, Accid. Anal. Prev. 35 (6) (2003) 949–964, https://doi.org/10.1016/S0001-4575(02)00103-3.
[19] L. Omidi, S. Mousavi, G. Moradi, F. Taheri, Traffic climate, driver behaviour and dangerous driving among taxi drivers, Int. J. Occup. Saf. Ergon. (2021) 1–8, https://doi.org/10.1080/10803548.2021.1903705.
[20] Warner Wallén, H. Özkan, T. Lajunen, T., Cross-cultural differences in drivers' speed choice, Accid. Anal. Prev. 41 (2009) 816–819, https://doi.org/10.1016/j.aap.2009.04.004.
[21] Warner Wallén, H. Özkan, T. Lajunen, T. Tzamalouka, G.., Cross-cultural comparison of drivers' tendency to commit different aberrant driving behaviours, Transport. Res. F: Traffic Psychol. Behav. 14 (2011) 390–399, https://doi.org/10.1016/j.trf.2011.04.006.