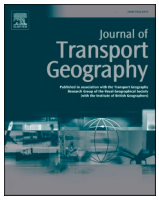
Journal of Transport Geography 128 (2025) 104393

Contents lists available at ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo



Exploring attitudes and behavioural intentions towards e-scooter use in Türkiye: Differences between users and non-users☆

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ARTICLE INFO

Keywords:
E-scooter acceptance
E-scooter experience
Gender
Behavioural intention
micro-mobility

ABSTRACT

E-scooters, as a relatively recent emerging mode of transport, have gained considerable significance for research in recent years, including attitudes and behavioural intentions of the public towards these vehicles. To enhance our understanding, it is essential to examine the roles of previous e-scooter experience and gender on attitudes and behavioural intentions. In order to address this need, the present study aimed to investigate the attitudes and behavioural intentions towards e-scooters of 443 young adults between 18 and 25 years old in Türkiye. Prior experience with e-scooters was found to enhance perceived behavioural control and usefulness, as well as behavioural intention. Males exhibited higher perceived behavioural control and greater behavioural intention than females. Additionally, positive attitudes and greater perceived behavioural control were related to greater behavioural intention. Finally, this study highlights the significance of prior experience with e-scooters and gender as two factors influencing young road users' perception of e-scooter use in Türkiye. The findings provide important inputs for future policy and the development of intervention programmes for safe and inclusive implementation of e-scooters.

1. Introduction

In recent years, e-scooters have garnered significant attention as a mode of transport. They are often seen as a solution for addressing first/last mile connectivity and have the potential to fill gaps in urban mobility systems (Aarhaug et al., 2023; Bozzi and Aguilera, 2021; Christoforou et al., 2021; Félix et al., 2023; Sanders et al., 2020) offering potential benefits in terms of mobility and environmental sustainability, and as a complement to public transport (Aarhaug et al., 2023; McQueen and Clifton, 2022). The rapid deployment of e-scooters has been attributed to their ability to serve areas that are underserved by other modes of transport and to complement public transport by providing quicker alternatives for certain trips (Aarhaug et al., 2023). Furthermore, the environmental advantages of shifting from car use to e-scooters are underlined (e.g., Laa and Leth, 2020), with a positive impact on reducing greenhouse gas emissions for home-work trips. This shift could also lead to long-term individual and societal health benefits, such as increased well-being (Bennouna et al., 2021; Félix et al., 2023). Given the substantial influence of e-scooters on travel behaviour, it is crucial to comprehend the factors associated with e-scooter usage. In light of this, the present study investigates the socio-psychological factors related to e-scooter use among a sample of young adults from Türkiye, who have either previously used or not used e-scooters. The following sections highlight relevant literature and state the rationale for the study.

1.1. Attitudes and behavioural intentions towards e-scooters

Attitudes and behavioural intentions play a vital role in comprehending users' acceptance of emerging modes of transport, especially during the early stages of their introduction into society. Previous research on different modes and trends in transport, such as automated vehicles (e.g., Buckley et al., 2018; Madigan et al., 2017; Nordhoff et al., 2019, 2020, 2023), public transport systems (e.g. Chen and Chao, 2011), and bike-sharing (Chen and Li, 2024; Eren and Uz, 2020; Jahanshahi et al., 2020), have demonstrated the importance of socio-psychological factors in predicting whether and how much individuals will engage with new transportation technologies or systems.

☆ This article is part of a Special issue entitled: 'Gender gap in mobility' published in Journal of Transport Geography.

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https://doi.org/10.1016/j.jtrangeo.2025.104393
Received 18 August 2024; Received in revised form 21 July 2025; Accepted 15 August 2025
Available online 19 August 2025

Likewise, literature on e-scooters has thoroughly investigated various aspects of public acceptance (e.g., Almannaa et al., 2021; Bozzi and Aguilera, 2021; Christoforou et al., 2021; Sanders et al., 2020; Öztaş Karlı et al., 2022). For example, Huang (2021) emphasised that behavioural intention towards e-scooters may be affected positively by habit, social influence, and environmental concerns and negatively by performance and effort expectancy. Studies found that perceived usefulness (e.g., Ratan et al., 2021), perceived ease of use (e.g., Javadinasr et al., 2022), and subjective norms/social influence (e.g., Öztaş Karlı et al., 2022) also demonstrate positive relationships with behavioural intention to use e-scooters.

1.2. Effects of e-scooter experience

Previous research showed the significance of prior experience with e-scooters on a variety of socio-psychological factors (e.g. Almannaa et al., 2021; Buehler et al., 2021; Petzoldt et al., 2021; Sanders et al., 2020). For instance, Petzoldt et al. (2021) discovered disparities in rule knowledge between e-scooter users and non-users. Users and non-users may vary in their perceptions of safety, risk propensity, and willingness to adopt technology, as demonstrated in the context of shared e-scooters (Petzoldt et al., 2021). For example, non-users rated helmet use more important than users of e-scooters (Pourfalatoun et al., 2023). According to Speak et al. (2023), there were also disparities between the priorities of users and non-users regarding safety and the use of urban spaces. While users tended to focus on the need to share space, non-users were more concerned with issues such as the disregard for rules and the illegal use of roads or poor road conditions (e.g., Speak et al., 2023; Filipe Teixeira et al., 2023). Given these significant differences between users and non-users, prior experiences with e-scooters may affect the individuals' perspectives and propensity to use e-scooters.

1.3. Gender differences in travel behaviour

There are travel behaviour differences between females and males. For example, males tend to use private vehicles, while females rely more on public transport (Frändberg and Vilhelmson, 2011; Maciejewska and Miralles-Guasch, 2020). This may also differ in terms of the time of day and the duration of activities (Zhong et al., 2012). These differences have been found to be influenced by societal norms, cultural contexts, and psychological factors (Arman et al., 2018; Chen and Li, 2024; Frändberg and Vilhelmson, 2011; Kronsell et al., 2016; Maciejewska et al., 2019; Maciejewska and Miralles-Guasch, 2020; Priya Uteng and Turner, 2019; Zhong et al., 2012) and to have persisted despite being narrowed over time (D'Agostino et al., 2024). To further understand if these differences exist with e-scooter use, in this study, attitudes and behavioural intentions of young males and females towards the use of e-scooters were investigated.

Gender is also a vital demographic factor in the development of smart future mobility solutions (e.g., Singh, 2020; Torrao et al., 2024) and has emerged as a crucial factor in understanding the attitudes and preferences of people towards e-scooter use as well (Aguilera-García et al., 2020; Guo and Zhang, 2021). Studies showed that e-scooters are more likely to be used by males compared to females (e.g., Aguilera-García et al., 2020; Campisi et al., 2021; Guo and Zhang, 2021; Laa and Leth, 2020; Pourfalatoun et al., 2023). Moreover, males reported a higher likelihood of owning a private e-scooter and having a better understanding of e-scooters than females, whereas females reported paying attention to information about e-scooters more than males (Huang, 2021). Similarly, Sanders et al. (2020) uncovered differences in the barriers to e-scooter use reported by males and females, where males were found to predominantly emphasise technical and equipment-related factors, while females primarily highlighted safety concerns. Finally, Tian et al. (2022) found a higher risk of e-scooter crash involvement with male users compared to females. Collectively, these differences underscore the importance of further examining the role of gender in socio-psychological factors related to e-scooter use.

1.4. Effects of technology affinity

Another key socio-psychological factor in understanding users' attitudes is the technology affinity/adoption (Cimbaljević et al., 2023). This characteristic reflects individuals' propensity to embrace new technologies (Parasuraman and Colby, 2014). Son and Han (2011) found that various dimensions of technology readiness not only impact the initial adoption of new technologies but are also positively related to continued use and satisfaction. In the field of transport, previous research has demonstrated that technology affinity is positively associated with the acceptance of new vehicle technologies (Cunningham et al., 2019; Kraus et al., 2021; Öztürk et al., 2024, 2025). However, to the authors' knowledge, this has not been considered in e-scooter use research in Türkiye. Therefore, it is crucial to consider the effects of technology affinity as a key confounding variable in this study.

1.5. Aims of the study

In light of the literature, the current study aimed to delve into the differences in attitudes and behavioural intentions exhibited by previous e-scooter users and non-users in Türkiye, while simultaneously exploring the influence of gender.

This study, for the first time in literature, has examined the factors related to e-scooter usage in Türkiye. The focus on Türkiye is particularly significant in the context of road safety. Statistics from the World Health Organisation (2023) indicate that Türkiye is a high-risk country in terms of traffic safety, with a notable prevalence of crashes involving vulnerable road users (Turkish Statistical Institute, 2024). In this context, it is imperative to conduct comprehensive research on e-scooters, a novel and increasingly prominent mode of transport within the traffic system.

The current research concentrates on young populations, as they are the most probable demographic to employ e-scooters (Aguilera-García et al., 2020; Campisi et al., 2021; Laa and Leth, 2020; Pourfalatoun et al., 2023). By comprehending the attitudes and behavioural intentions of this demographic, the findings can contribute to strategies aimed at mitigating risks and enhancing the safe integration of e-scooters into Türkiye's traffic environment. Moreover, the study's focus on the intersection of previous e-scooter use and gender remains relatively unexplored in the extant literature on socio-psychological factors. Research indicates that micromobility adoption is frequently influenced by gender-specific barriers and enablers, such as perceptions of safety (Sanders et al., 2020). However, these dynamics have received limited attention in Türkiye, where cultural, infrastructural, and regulatory contexts differ significantly from other regions studied. Lastly, while previous studies have often focused exclusively on e-scooter users, this study incorporates non-users to provide a comprehensive understanding of behavioural intention across different genders. This focus enables the identification of both shared and unique predictors of e-scooter adoption, offering valuable insights into the barriers faced by non-users and the motivations driving existing users.

In light of these, the objectives of the current study are to:

1. Investigate the effects of previous e-scooter experience on attitudes and behavioural intentions towards e-scooter use,
2. Examine gender differences in attitudes and behavioural intentions towards e-scooter use and
3. Explore the effects of socio-psychological factors on behavioural intention towards e-scooter use across existing users and non-users.

2. Methods

2.1. Participants

The current study involved a total of 443 road users aged between 18 and 25 (M = 21.25, SD = 1.48). The distribution of participants by gender was as follows: 302 females (68.2 %), 137 males (30.9 %), and four individuals with other identities (0.9 %). Of the 443 participants, 209 had previously used an e-scooter (47.2 %), while 234 had not used one (52.8 %).

2.2. Measures

The online questionnaire comprised two main components: background questions and a set of questions pertaining to socio-psychological factors towards the use of e-scooters.

2.2.1. Background questions

The form incorporated demographic questions such as age and gender, as well as information on previous experience with e-scooters. In addition, a single-item measure was used to measure perceived technology affinity. Participants were requested to indicate their agreement on a 5-point Likert (from *completely disagree* to *completely agree*) with the statement, "I am a person who likes to use new technologies as soon as they become available."

2.2.2. Attitudes and behavioural intentions towards e-scooter use

A questionnaire was developed based on relevant literature to assess socio-psychological factors regarding e-scooter use. For the development of the questionnaire, the Theory of Planned Behaviour (Ajzen, 1991) and the Technology Acceptance Model (Davis, 1989) were reviewed. The final set of items was developed based on various modes of transport (e.g., Buckley et al., 2018; Chen and Chao, 2011; Madigan et al., 2017) and included four items to measure attitudes towards e-scooter use (bad-good, stupid-smart, harmful-beneficial, negative-positive) on a 7-point Likert scale, with a Cronbach's alpha reliability of 0.89. Moreover, a 25-item scale with a 5-point Likert scale (ranging from *strongly disagree* to *strongly agree*) was developed to measure the remaining constructs outlined below (see Öztürk and Akay, 2023 for further details on the factorial structure).

Perceived Behavioural Control: The factor consisted of seven items (e.g., *It is easy for me to use an e-scooter.*) with a Cronbach's alpha reliability of 0.92 and measured users' perception of their ability to use e-scooters.

Perceived Usefulness: The factor comprised six items (e.g., *Using an e-scooter saves me time.*) with a Cronbach's alpha reliability of 0.79 and focused on the perceived benefits of e-scooter use.

Subjective Norms: The factor was measured using three items (e.g., *The people around me (*e.g.*, family and friends) is generally supportive of e-scooter use.*), focusing on the perceived social norm regarding e-scooter use, with a Cronbach's alpha value of 0.71.

Facilitating Conditions: The factor comprised of three items (e.g., *E-scooters are compatible/integrated with other modes of transport I use.*) and focused on external factors enabling e-scooter use, with a Cronbach's alpha reliability of 0.46.

Behavioural Intention: The factor was measured using three items (e.g., *I plan to use an e-scooter in the near future.*), focusing on the intention to use e-scooters in the future, with a Cronbach's alpha reliability of 0.91.

2.3. Procedure

The study received ethical approval from Middle East Technical University (170 ODTU 2020). The survey battery was disseminated via social media channels and shared through the instructors and the Middle East Technical University Department of Psychology Sona System, a data collection platform where students could earn bonus points for their anonymous participation. At the outset of the study, all participants were provided with an informed consent form that explained the study's purpose, their right to withdraw at any time, and the confidentiality and anonymity of their responses. The online survey platform Qualtrics.com was utilised for data collection. Participants were provided with an informed consent form (at the beginning) and a debriefing sheet (at the end).

2.4. Analysis

After conducting an analysis of the factorial components of attitudes and behavioural intentions towards e-scooter use as part of a previous study (Öztürk and Akay, 2023), data was examined using SPSS (v29). The range of skewness (−0.02, −0.073) and kurtosis (1.15, −0.67) values of the six factors were in an acceptable range (Field, 2013), suggesting normality for the study variables. Insufficient data was available for participants with other gender identities, which precluded their inclusion in the analysis. Firstly, to present bivariate relationships between variables and to show the exploratory nature of the relationships, Pearson's correlation coefficients between the constructs were computed and presented separately for individuals who had previously used e-scooters and those who had not (see Section 3.1).

In order to answer the first objective (see Section 3.2), a multivariate analysis of covariance (MANCOVA) was conducted to examine differences in attitudes and behavioural intentions between users and non-users with the total sample (N = 443). The statistical effects of age, gender (dummy coded as males and females, with other categories excluded due to the limited number of participants), and technology affinity were controlled. In order to answer the second objective (see Section 3.3), a single MANCOVA was conducted to examine gender differences in attitudes and behavioural intentions where the statistical effects of age, technology affinity, and previous e-scooter use were controlled. To address the imbalance in the sample regarding male and female participants, a random selection of female participants was made to match the male sample size (n = 137) to perform this MANCOVA, reaching a sample size of 274. In both analyses, five dependent variables (i.e., attitudes, perceived behavioural control, perceived usefulness, subjective norms, facilitating conditions, and behavioural intention) were used. Given the significant result of Box's M test for homogeneity of covariance ($\chi2$ = 34.236, df = 21, p = .039 for the first MANCOVA and $\chi2$ = 42.399, df = 21, p = .005 for the second MANCOVA), we used Pillai's Trace for the multivariate test statistic. Pillai's Trace is more robust to violations of the homogeneity of covariance assumption and provides a reliable test in cases of unequal sample sizes across groups (Tabachnick et al., 2013).

To examine the determinants of behavioural intention (*third objective*), two separate hierarchical regression analyses were conducted for user and non-user samples, respectively. For each analysis, age, gender, and technology affinity were entered into the model in the first step. Attitudes, perceived behavioural control, perceived usefulness, subjective norms, and facilitating conditions were entered into the model in the second step. The variance inflation factor values indicated there were no issues of multicollinearity among the variables.

3. Results

3.1. Descriptives and correlations

Means, standard deviations, and correlations are presented separately for users (Table 1) and non-users (Table 2). For both groups, the correlation between age and perceived behavioural control was found to be positive, as was the correlation between technology affinity and attitudes, perceived behavioural control, perceived usefulness, and behavioural intention. For both groups, behavioural intention was positively correlated with other socio-psychological variables.

Table 1
Descriptives and correlations among study variables among users.

	1	2	3	4	5	6	7	8
1. Age	–							
2. Technology affinity	0.018	–						
3. Attitudes	−0.013	**0.190****	–					
4. Perceived behavioural control	**0.171***	**0.213****	**0.328*****	–				
5. Perceived usefulness	0.027	**0.236*****	**0.506*****	**0.310*****	–			
6. Subjective norms	−0.023	0.065	**0.354*****	**0.183****	**0.399*****	–		
7. Facilitating conditions	−0.125	0.128	0.115	0.011	**0.321*****	**0.236*****	–	
8. Behavioural intention	−0.031	**0.318*****	**0.476*****	**0.441*****	**0.570*****	**0.375*****	**0.309*****	–
M (*SD*)	21.45 (*1.42*)	3.36 (*1.15*)	5.76 (*1.21*)	4.25 (*0.72*)	3.92 (*0.63*)	3.53 (*0.69*)	2.63 (*0.68*)	3.72 (*0.95*)

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2
Descriptives and correlations among study variables among non-users.

	1	2	3	4	5	6	7	8
1. Age	–							
2. Technology affinity	0.038	–						
3. Attitudes	0.039	**0.193****	–					
4. Perceived behavioural control	**0.154***	**0.298*****	**0.185****	–				
5. Perceived usefulness	0.113	**0.145***	**0.529*****	**0.229*****	–			
6. Subjective norms	−0.014	0.020	**0.284*****	**0.193****	**0.269*****	–		
7. Facilitating conditions	−0.016	0.108	**0.240*****	0.092	**0.315*****	**0.145***	–	
8. Behavioural intention	**0.113***	**0.310*****	**0.436*****	**0.426*****	**0.376*****	**0.240*****	**0.190****	–
M (*SD*)	21.09 (*1.50*)	2.46 (*1.08*)	5.40 (*1.23*)	3.43 (*0.75*)	3.69 (*0.53*)	3.42 (*0.67*)	2.58 (*0.63*)	3.17 (*1.04*)

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

3.2. Experience differences in attitudes and behavioural intentions towards e-scooter use

According to the MANCOVA results, there was a statistically significant effect of previous e-scooter use ($F(6, 429) = 12.569$, $p < .001$; Pillai's Trace = 0.150). A significant effect of previous experience was observed on perceived behavioural control, perceived usefulness, and behavioural intention (Table 3). Those who had previously used e-scooters demonstrated higher levels of perceived behavioural control, perceived usefulness, and behavioural intention to use e-scooters in the near future (Table 4).

3.3. Gender difference in attitudes and behavioural intentions towards e-scooter use

According to the MANCOVA results, there was a statistically significant effect of gender ($F(6, 264) = 12.650$, $p < .001$; Pillai's Trace = 0.223). A significant effect of previous experience was observed on perceived behavioural control and behavioural intention (Table 5). Males reported greater perceived behavioural control and behavioural intention to use e-scooters in the near future than females (Table 6).

Table 3
Experience difference in attitudes and behavioural intentions.

Independent Variable	Dependent Variables	*df*	*F*	*Sig.*	Partial Eta Squared
Previous e-scooter use	Attitudes	1, 434	1.828	0.177	0.004
	Perceived behavioural control		74.954	<0.001	0.147
	Perceived usefulness		5.500	0.019	0.013
	Subjective norms		1.640	0.201	0.004
	Facilitating conditions		0.007	0.932	0.000
	Behavioural intention		9.792	0.002	0.022

Table 4
Descriptives of dependent variables by previous experience of e-scooter use.

Variable	Previous e-scooter use	Mean	Std. Deviation	*n*
Attitudes	Used	5.758	1.211	208
	Not used	5.397	1.226	231
Perceived behavioural control	Used	5.568	0.722	208
	Not used	4.249	0.750	231
Perceived usefulness	Used	3.924	0.626	208
	Not used	3.693	0.528	231
Subjective norms	Used	3.529	0.690	208
	Not used	3.420	0.671	231
Facilitating conditions	Used	2.627	0.677	208
	Not used	2.578	0.633	231
Behavioural intention	Used	3.722	0.953	208
	Not used	3.170	1.043	231

Table 5
Gender difference in attitudes and behavioural intentions.

Independent Variable	Dependent Variables	*df*	*F*	*Sig.*	Partial Eta Squared
Previous e-scooter use	Attitudes	1, 269	0.131	0.717	0.000
	Perceived behavioural control		20.132	<0.001	0.070
	Perceived usefulness		1.767	0.185	0.007
	Subjective norms		0.749	0.388	0.003
	Facilitating conditions		3.259	0.072	0.012
	Behavioural intention		7.289	0.007	0.026

3.4. Determinants of behavioural intention among users and non-users

According to the regression results (Table 7), the models were significant for both user ($F(8, 199) = 27.143$, $p < .001$) and non-user groups ($F(8, 222) = 17.728$, $p < .001$). More specifically, in the first step, for

Table 6
Descriptives of dependent variables by gender.

Variable	Gender	Mean	Std. Deviation	*n*
Attitudes	Female	5.557	1.260	137
	Male	5.712	1.129	137
Perceived behavioural control	Female	3.571	0.829	137
	Male	4.245	0.738	137
Perceived usefulness	Female	3.802	0.536	137
	Male	3.828	0.638	137
Subjective norms	Female	3.487	0.610	137
	Male	3.470	0.737	137
Facilitating conditions	Female	2.635	0.560	137
	Male	2.545	0.777	137
Behavioural intention	Female	3.377	1.048	137
	Male	3.411	1.091	137

both users and non-users, participants with higher technology affinity demonstrated higher behavioural intention to use e-scooters. Age and gender exhibited a significant relationship only for non-users, wherein younger and female participants displayed greater behavioural intention.

After controlling for the statistical effects of age, gender, and technology affinity, positive attitudes and greater perceived behavioural control were associated with greater behavioural intention for both users and non-users. Solely for users, greater perceived usefulness and facilitating conditions were related to higher behavioural intention.

4. Discussion

This study examined the attitudes and behavioural intentions regarding e-scooter use of young adults with and without previous experience of e-scooter use. The outcomes demonstrated a positive association between technology affinity and attitudes towards the use of e-scooters, as well as one's behavioural intention. This finding is consistent with previous research that found positive relationships between technology affinity or adoption and attitudes and willingness to utilise various emerging transport modes, such as automatic vehicles (Kraus et al., 2021; Öztürk et al., 2025).

As for the first objective, where the differences between users and non-users are concerned, differences were observed in terms of perceived behavioural control, perceived usefulness, and behavioural intention. According to Pourfalatoun et al. (2023), the perception of safety and other related factors is a crucial distinction between e-scooter users and non-users. It could be inferred that non-users who perceive lower behavioural control may have safety concerns about using scooters. Safety concerns might be later reflected in behavioural intention and actual behaviour. Since the results of this study are based on retrospective data, it is challenging to establish a causal relationship. Users might be high in these aspects due to their experience, which may have contributed to their perception of behavioural control and usefulness. Users might also have used an e-scooter previously because they believed that these new vehicles were useful and they had a prior intention to use them.

As for the second objective of the study, significant differences were found between males and females in relation to perceived behavioural control and behavioural intention. Male participants appeared to exhibit higher levels of perceived behavioural control than female participants, an observation that may be attributable to disparities in confidence or familiarity with e-scooter usage. Males' greater familiarity with e-scooters and the lower amount of time and attention they tend to dedicate to acquiring information about e-scooters compared to females (Huang, 2021) could be associated with a greater sense of control over one's behaviour. The tendency of males to focus on the technical aspects of e-scooters may lead to an overestimation of their capabilities and behavioural control and be linked with increased risky behaviours (e.g., Cubells et al., 2023; Gioldasis et al., 2021; Huemer et al., 2022; Younes et al., 2023) and an increased likelihood of involvement in crashes (Tian et al., 2022). Consistent with previous research (e.g., Laa and Leth, 2020) demonstrating males' higher likelihood of usage, male participants in the current study also exhibited greater behavioural intention, which is congruent with perceiving greater behavioural control.

The difference in perceived behavioural control could also be related to stereotypes in transport due to the disproportionate use of e-scooters by males and females (Aguilera-García et al., 2020; Guo and Zhang, 2021). With regard to driving, male drivers are the dominant group in Türkiye (Turkish Statistical Institute, 2021), and the ability to drive well is considered a masculine trait (Özkan and Lajunen, 2006). Furthermore, previous research in Türkiye has also shown that teenagers (Öztürk and Akay, 2023) and young drivers (Öztürk and Öz, 2025) perceive being a skilled driver as a male attribute and believe that males are more skilled drivers. Perceived behavioural control may be seen as technical proficiency, such as operating an e-scooter successfully. In other words, the disparities between males and females in this context might have been affected by the masculine traffic context (Cubells et al., 2023) and could be reminiscent of those observed between male and female drivers.

As for the final objective, after controlling for demographic variables and technology affinity, positive attitudes and greater perceived behavioural control emerged as significant predictors of behavioural intention for both users and non-users. This aligns with the Theory of Planned Behaviour (Ajzen, 1991), which posits that attitudes and perceived control are key determinants of intention. The regression models for both user and non-user groups were significant, demonstrating strong relationships between the predictors and behavioural intention. In the first step of the models, where demographic factors (age, gender) and technology affinity were introduced, a relatively similar proportion of the variance in behavioural intention was

Table 7
Determinants of behavioural intention among users and non-users.

	User			Non-user		
Factors	β	p	95 % CI	β	p	95 % CI
1st Level		$R^2 = 0.111$, $F\triangle(3, 204) = 8.51$, $p < .001$			$R^2 = 0.138$, $F\triangle(3, 227) = 12.109$, $p < .001$	
Age	−0.015	0.820	−0.100, 0.079	0.136	0.029	0.010, 0.179
Gender (0: Female, 1: Male)	−0.097	0.156	−0.454, 0.073	−0.172	0.008	−0.723, −0.111
Technology affinity	0.334	<0.001	0.167, 0.385	0.348	<0.001	0.214, 0.456
2nd Level		$R^2 = 0.522$, $F\triangle(5, 199) = 34.168$, $p < .001$			$R^2 = 0.390$, $F\triangle(5, 222) = 18.326$, $p < .001$	
Age	−0.030	0.557	−0.088, 0.047	0.076	0.155	−0.020, 0.126
Gender (0: Female, 1: Male)	−0.207	<0.001	−0.612, −0.194	−0.196	<0.001	−0.742, −0.208
Technology affinity	0.162	0.002	0.049, 0.218	0.194	<0.001	0.078, 0.295
Attitudes	0.178	0.003	0.048, 0.233	0.257	<0.001	0.112, 0.325
Perceived behavioural control	0.330	<0.001	0.286, 0.585	0.318	<0.001	0.282, 0.601
Perceived usefulness	0.262	<0.001	0.210, 0.589	0.097	0.138	−0.062, 0.445
Subjective norms	0.097	0.080	−0.016, 0.285	0.072	0.199	−0.060, 0.284
Facilitating conditions	0.140	0.009	0.049, 0.344	0.026	0.644	−0.139, 0.224

explained across both groups. Findings suggest that fostering positive perceptions of e-scooters and enhancing individuals' perceived behavioural control could potentially increase their adoption across both groups.

Despite the direction of the relationship (probably a two-way relationship), the lack of difference in subjective norms and facilitating conditions between user and non-users also suggests that participants, regardless of their prior experience or gender, had a similar perception of these two constructs. Additionally, the average of facilitating conditions is considerably low, indicating that the perceived level of readiness in Türkiye for e-scooter use was low, which could also affect behavioural intention. However, differences emerged in the second step of the regression analysis, where the models explained 39 % of the variance for non-users and 52.2 % for users. This discrepancy may be attributed to the additional effects of perceived usefulness and facilitating conditions, which were significant predictors exclusively for the user group. Specifically, for users, the perception of practical considerations and availability of supportive infrastructure appear to reinforce their intention to continue using e-scooters.

4.1. Implications and recommendations

To address the observed disparities in e-scooter use and foster an inclusive transportation system, several targeted measures and initiatives (e.g., Mehranfar and Jones, 2024) can be suggested based on the findings of the present study. Firstly, the results revealed differences between users and non-users in most of the constructs. If e-scooter use is to be promoted in Türkiye, providing training programs where users could have initial experience with e-scooters would be helpful in building meaningful experiences of e-scooter use. To the best of our knowledge, the general public is not currently offered any specific training to rent and use shared e-scooters, and road traffic crashes with vulnerable road users, including e-scooter users, are becoming increasingly concerning (Turkish Statistical Institute, 2024). These training programs could be a pre-requisite to be able to rent and use an e-scooter, in addition to other interventions such as restricting e-scooters on certain roads or mandating the use of protective equipment. The implementation of these training programs could be a crucial step in promoting the safe and responsible use of e-scooters. Whilst discoursing the accessibility of e-scooters, it is crucial that policymakers and urban planners concurrently take into account the safety of other users. In research conducted by Bloom et al. (2021), it was noted that pedestrian tripping accounted for 6 % of all injuries, which was a result of unregulated e-scooters. Therefore, it is important for policymakers and e-scooter companies to consider these measures as part of their efforts to promote the safe and sustainable use of e-scooters and road safety for all.

According to Nikiforiadis et al. (2021), infrastructure quality is considered to be an equally significant factor by both users and non-users. Therefore, it is crucial for the stakeholders in Türkiye to improve the facilitating conditions and increase the perceived level of readiness for e-scooter use in order to encourage the adoption of this sustainable mode of transport and change travel behaviour. To achieve this, stakeholders may consider implementing incentives and regulations that encourage the use of e-scooters and provide the infrastructure that supports their integration into urban transportation systems (e.g., designated parking areas, designated lanes, and clear guidelines for their safe operation). Additionally, public education campaigns that promote the benefits of e-scooter use and address concerns about their safety and convenience can help increase public acceptance and adoption. By taking these steps, policies can lead the way in promoting sustainable transport in a safer way and reducing its environmental impact.

Initiatives or campaigns could additionally serve to tackle gender disparities observed in perceived behavioural control, wherein females have demonstrated less confidence in using e-scooters. As discussed by Aguilera-García et al. (2020), first-time experience could be one of the main barriers to shared e-scooter use. Such campaigns could encompass educational programmes, safety workshops, and community engagement initiatives that directly address the unique concerns and barriers faced by females (Arman et al., 2018; Campisi et al., 2021). Moreover, executing technology affinity programmes can significantly impact the utilisation of e-scooters. Programmes designed to enhance familiarity with e-scooters and related technologies can lead to more positive attitudes and increased usage. These programmes could offer hands-on training sessions, incentives for trying e-scooters, and partnerships with local organisations to promote technology literacy. By addressing these aspects, policymakers can create a more equitable and inclusive mobility environment, ensuring that all individuals, regardless of gender, can benefit from the convenience and efficiency of e-scooters.

While this study has primarily focused on the psychological and demographic predictors of e-scooter use in Türkiye, it is equally important to evaluate the broader implications of e-scooters for sustainable urban mobility. *E*-scooters are frequently promoted as an environmentally friendly alternative mode of transport, particularly for short-distance trips (Dias et al., 2021; Hosseinzadeh et al., 2021). By offering a flexible and relatively low-emission transport option, they can contribute to reducing urban congestion, lowering greenhouse gas emissions, and improving air quality, outcomes that align well with sustainability goals (e.g., Félix et al., 2023). However, integrating e-scooters into existing urban mobility systems presents challenges. Despite their potential, e-scooters have raised significant concerns regarding crashes, pedestrian safety, inappropriate parking, and rule violations (e.g., Abdi and O'Hern, 2025; Bloom et al., 2021; Félix et al., 2023; James et al., 2019). This underscores the tension between their promise as a sustainable transport solution and the practical issues observed in their implementation (e.g., Speak et al., 2023). In Türkiye, where e-scooter adoption is still in its early stages, there is a unique opportunity to address these challenges proactively. The sustainability benefits of e-scooters may be compromised by increased road user conflicts, injuries, and negative public attitudes. Thus, for e-scooters to truly support sustainable mobility in Türkiye and similar contexts, their implementation must be carefully managed. The adoption of e-scooters can positively contribute to sustainable urban transport, but only when paired with thoughtful policies, inclusive infrastructure, and a commitment to public safety. This includes enhancing infrastructure, implementing inclusive design principles, and promoting user education and accountability.

4.2. Limitations

The study has a few limitations due to its sample and data collection methods. Firstly, the sample consists only of individuals aged between 18 and 25. Consequently, the results may not fully capture the diverse road user groups, which significantly limits the generalisability of the findings across different ages. For instance, Mitra and Hess (2021) discovered that individuals over the age of 65 were less inclined to adopt shared e-scooters. In a separate study, Guo and Zhang (2021) identified distinct motivational factors influencing e-scooter usage. While these motivational factors may be relatively consistent within our age group, they could exhibit greater variability across different age cohorts. The findings also may vary across different socio-demographic groups (e.g., Delavary et al., 2025; Huo et al., 2021; Li et al., 2021; Ma et al., 2022; Sanders et al., 2020). This variability may later impact mode shift behaviour (e.g., Laa and Leth, 2020; Weschke et al., 2022), as participants' choice of travel mode might differ across different socio-demographic groups. Moreover, Sanders et al. (2020) identified that practicality and equipment-related issues as significant barriers to e-scooter usage among young non-riders. These variations are likely to influence the attitudes and results of the study across different sample groups.

While the sample size and distribution across females and males are sufficient for the objectives of the study, the gender imbalance in the sample warrants consideration when interpreting the results. Despite

employing random selection of female participants to address the unequal sample size between males and females, this imbalance, coupled with the relatively smaller sample size for gender comparison, may have introduced biases in the analysis and affected the generalisability of the findings. Furthermore, additional sociodemographic variables, including age, education level, socioeconomic status, and cultural background, may influence the factors examined in this study (e.g., Asgharpour et al., 2025; Ma et al., 2022; Li et al., 2021). The limited scope of the sample concerning age and gender, along with the exclusion of the aforementioned confounding variables, may introduce bias into the results and conclusions. These limitations of this study necessitate more research recruiting participants from diverse demographic backgrounds, including various age groups, income levels, ethnicities, and geographic locations.

It is important to note that the results of this study are based on correlational analyses, which prevent causal inferences. For example, the examination of gender differences in relation to study variables such as perceived behavioural control and behavioural intention effectively highlights the disparities observed among road user groups. However, to inform policy recommendations and enhance theoretical understanding, further research is required, particularly focusing on the antecedents of these disparities, including potential moderating factors. More experimental research is needed to better understand the causation in the tested relationships. For example, test track studies can offer both users and non-users the opportunity to experience e-scooters in a relatively safer environment. Additionally, longitudinal studies could offer valuable insights into how the behavioural intention and actual usage patterns of e-scooters change over time. Subsequent studies employing diaries or app-based monitoring systems can facilitate the collection of detailed data. Additionally, the acquisition of more objective data from naturalistic studies (e.g., Pai and Dozza, 2025; Tuncer et al., 2020) may enable the examination of the relationship between attitudes and riding outcomes, such as crashes. As previously discussed, cultural context and social norms of females and males may also influence the outcomes. Therefore, investigating gender differences in e-scooter usage across different cultural settings would contribute to a more comprehensive understanding of the underlying variables and ultimately contribute to gender-smart mobility (Elmashhara et al., 2022; Singh, 2020).

5. Conclusion

This study has examined socio-psychological factors influencing behavioural intention regarding e-scooter usage among users and non-users. Additionally, it has explored gender differences in these factors in Türkiye. *E*-scooter use in Türkiye was at a nascent stage, and no specific regulatory framework was in place at the time of data collection. Therefore, this study provides important information on the perspectives of young males and females e-scooter users and non-users towards the use of e-scooters. The findings imply that tailored interventions, such as training and infrastructure improvements, can promote more inclusive and fair transport environment. Addressing concerns and barriers faced by females and improving facilitating conditions can significantly increase the use of e-scooters. Future research should strive to overcome the study's limitations by incorporating diverse populations, using longitudinal designs, and considering cultural contexts to provide a more comprehensive understanding of e-scooter usage patterns and inform effective policy-making.

CRediT authorship contribution statement

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

Acknowledgement

The authors hereby confirm that they have no conflicts of interest to declare, and that the study was not financially supported. The data underpinning the findings of this study are accessible upon request from the corresponding author (i.ozturk@leeds.ac.uk).

Data availability

Data will be made available on request.

References

Aarhaug, J., Fearnley, N., Johnsson, E., 2023. E-scooters and public transport – complement or competition? Res. Transp. Econ. 98, 101279. https://doi.org/10.1016/j.retrec.2023.101279.

Abdi, A., O'Hern, S., 2025. Understanding e-scooter rider crash severity using a built environment typology: A two-stage clustering and random parameter model analysis. Accid. Anal. Prev. 215, 108018. https://doi.org/10.1016/j.aap.2025.108018.

Aguilera-García, Á., Gomez, J., Sobrino, N., 2020. Exploring the adoption of moped scooter-sharing systems in Spanish urban areas. Cities 96, 102424. https://doi.org/10.1016/j.cities.2019.102424.

Ajzen, I., 1991. The theory of planned behavior. Organ. Behav. Hum. Decis. Process. 50 (2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T.

Almannaa, M.H., Alsahhaf, F.A., Ashqar, H.I., Elhenawy, M., Masoud, M., Rakotonirainy, A., 2021. Perception analysis of E-scooter riders and non-riders in Riyadh, Saudi Arabia: Survey outputs. Sustainability 13 (2), 863. https://doi.org/10.3390/su13020863.

Arman, M.A., Khademi, N., de Lapparent, M., 2018. Women's mode and trip structure choices in daily activity-travel: a developing country perspective. Transp. Plan. Technol. 41 (8), 845–877. https://doi.org/10.1080/03081060.2018.1526931.

Asgharpour, S., Javadinasr, M., (Kouros) Mohammadian, A., Khan, N.A., Auld, J., 2025. E-scooter safety: how attitudinal factors influence risky behavior among shared e-scooter riders. Transport. Res. F: Traffic Psychol. Behav. 114, 758–779. https://doi.org/10.1016/j.trf.2025.06.015.

Bennouna, Y., Omeiri, D., Marquez, T., Ndounzi, J.L., Ramond, C., 2021. Evaluation of electric scooters as an alternative transportation mode for home-work trips in France. In: Proceedings of the International Conference on Evolving Cities. https://doi.org/10.55066/proc-icec.2021.15.

Bloom, M.B., Noorzad, A., Lin, C., Little, M., Lee, E.Y., Margulies, D.R., Torbati, S.S., 2021. Standing electric scooter injuries: impact on a community. Am. J. Surg. 221 (1), 227–232. https://doi.org/10.1016/j.amjsurg.2020.07.020.

Bozzi, A.D., Aguilera, A., 2021. Shared E-scooters: A review of uses, health and environmental impacts, and policy implications of a new Micro-mobility service. Sustainability 13 (16), 8676. https://doi.org/10.3390/su13168676.

Buckley, L., Kaye, S., Pradhan, A.K., 2018. Psychosocial factors associated with intended use of automated vehicles: A simulated driving study. Accid. Anal. Prev. 115, 202–208. https://doi.org/10.1016/j.aap.2018.03.021.

Buehler, R., Broaddus, A., Sweeney, T., Zhang, W., White, E., Mollenhauer, M., 2021. Changes in Travel Behavior, Attitudes, and Preferences among E-Scooter Riders and Nonriders: First Look at Results from Pre and Post E-Scooter System Launch Surveys at Virginia Tech. Transpor. Res. Record. https://doi.org/10.1177/03611981211002213.

Campisi, T., Skoufas, A., Kaltsidis, A., Basbas, S., 2021. Gender equality and E-scooters: mind the gap! A statistical analysis of the Sicily region, Italy. Soc. Sci. 10 (10), 403. https://doi.org/10.3390/socsci10100403.

Chen, C., Chao, W., 2011. Habitual or reasoned? Using the theory of planned behavior, technology acceptance model, and habit to examine switching intentions toward public transit. Transport. Res. F: Traffic Psychol. Behav. 14 (2), 128–137. https://doi.org/10.1016/j.trf.2010.11.006.

Chen, G., Li, C., 2024. Gender differences in spatio-temporal dynamics: Visualizing bike-sharing mobility patterns in New York City. In: Environment and Planning B: Urban Analytics and City Science. https://doi.org/10.1177/23998083241258521.

Christoforou, Z., De Bortoli, A., Gioldasis, C., Seidowsky, R., 2021. Who is using e-scooters and how? Evidence from Paris. Transp Res Part D: Transp Environ 92, 102708. https://doi.org/10.1016/j.trd.2021.102708.

Cimbaljević, M., Demirović Bajrami, D., Kovačić, S., Pavluković, V., Stankov, U., Vujičić, M., 2023. Employees' technology adoption in the context of smart tourism development: the role of technological acceptance and technological readiness. Eur. J. Innov. Manag. https://doi.org/10.1108/EJIM-09-2022-0516.

Cubells, J., Miralles-Guasch, C., Marquet, O., 2023. Gendered travel behaviour in micromobility? Travel speed and route choice through the lens of intersecting identities. J. Transp. Geogr. 106, 103502. https://doi.org/10.1016/j.jtrangeo.2022.103502.

Cunningham, M.L., Regan, M.A., Horberry, T., Weeratunga, K., Dixit, V., 2019. Public opinion about automated vehicles in Australia: results from a large-scale national survey. Transp. Res. A Policy Pract. 129, 1–18. https://doi.org/10.1016/j.tra.2019.08.002.

D'Agostino, C., Piva, E., Pucci, P., Rossi, C., 2024. A systematic literature review on women's daily mobility in the global north. Transp. Rev. 1-29. https://doi.org/10.1080/01441647.2024.2350613.

Davis, F.D., 1989. Technology acceptance model: TAM. Al-Suqri, MN, Al-Aufi, AS: Inform. Seeking Behav. Tech. Adop. 205 (219), 5.
Delavary, M., Lyon, C., Vanlaar, W.G., Robertson, R.D., Nikolaou, D., Yannis, G., 2025. E-scooter riders: A cross-cultural analysis of traffic safety attitudes and behaviors. IATSS Res. 49 (2), 247–258. https://doi.org/10.1016/j.iatssr.2025.05.002.
Dias, G., Arsenio, E., Ribeiro, P., 2021. The role of shared E-Scooter Systems in urban sustainability and resilience during the Covid-19 mobility restrictions. Sustainability 13 (13), 7084. https://doi.org/10.3390/su13137084.
Elmashhara, M.G., Silva, J., Sá, E., Carvalho, A., Rezazadeh, A., 2022. Factors influencing user behaviour in micromobility sharing systems: A systematic literature review and research directions. Travel Behav. Soc. 27, 1–25. https://doi.org/10.1016/j.tbs.2021.10.001.
Eren, E., Uz, V.E., 2020. A review on bike-sharing: the factors affecting bike-sharing demand. Sustain. Cities Soc. 54, 101882. https://doi.org/10.1016/j.scs.2019.101882.
Félix, R., Orozco-Fontalvo, M., Moura, F., 2023. Socio-economic assessment of shared e-scooters: do the benefits overcome the externalities? Transp Res Part D: Transp Environ 118, 103714. https://doi.org/10.1016/j.trd.2023.103714.
Field, A., 2013. Discovering Statistics Using IBM SPSS Statistics.
Filipe Teixeira, J., Diogo, V., Bernát, A., Lukasiewicz, A., Vaiciukynaite, E., Stefania Sanna, V., 2023. Barriers to bike and e-scooter sharing usage: An analysis of non-users from five European capital cities. Case Studies on Trans. Policy 13, 101045. https://doi.org/10.1016/j.cstp.2023.101045.
Frändberg, L., Vilhelmson, B., 2011. More or less travel: personal mobility trends in the Swedish population focusing gender and cohort. J. Transp. Geogr. 19 (6), 1235–1244. https://doi.org/10.1016/j.jtrangeo.2011.06.004.
Gioldasis, C., Christoforou, Z., Seidowsky, R., 2021. Risk-taking behaviors of e-scooter users: A survey in Paris. Accid. Anal. Prev. 163, 106427. https://doi.org/10.1016/j.aap.2021.106427.
Guo, Y., Zhang, Y., 2021. Understanding factors influencing shared e-scooter usage and its impact on auto mode substitution. Transp Res Part D: Transp Environ 99, 102991. https://doi.org/10.1016/j.trd.2021.102991.
Hosseinzadeh, A., Algomaiah, M., Kluger, R., Li, Z., 2021. E-scooters and sustainability: investigating the relationship between the density of E-scooter trips and characteristics of sustainable urban development. Sustain. Cities Soc. 66, 102624. https://doi.org/10.1016/j.scs.2020.102624.
Huang, F., 2021. User behavioral intentions toward a scooter-sharing service: an empirical study. Sustainability 13 (23), 13153. https://doi.org/10.3390/su132313153.
Huemer, A.K., Banach, E., Bolten, N., Helweg, S., Koch, A., Martin, T., 2022. Secondary task engagement, risk-taking, and safety-related equipment use in German bicycle and e-scooter riders – an observation. Accid. Anal. Prev. 172, 106685. https://doi.org/10.1016/j.aap.2022.106685.
Huo, J., Yang, H., Li, C., Zheng, R., Yang, L., Wen, Y., 2021. Influence of the built environment on E-scooter sharing ridership: A tale of five cities. J. Transp. Geogr. 93, 103084. https://doi.org/10.1016/j.jtrangeo.2021.103084.
Jahanshahi, D., Tabibi, Z., Van Wee, B., 2020. Factors influencing the acceptance and use of a bicycle sharing system: applying an extended unified theory of acceptance and use of technology (UTAUT). Case Stud. Transp. Pol. 8 (4), 1212–1223. https://doi.org/10.1016/j.cstp.2020.08.002.
James, O., Swiderski, J.I., Hicks, J., Teoman, D., Buehler, R., 2019. Pedestrians and E-scooters: an initial look at E-scooter parking and perceptions by riders and non-riders. Sustainability 11 (20), 5591. https://doi.org/10.3390/su11205591.
Javadinasr, M., Asgharpour, S., Rahimi, E., Choobchian, P., Mohammadian, A.K., Auld, J., 2022. Eliciting attitudinal factors affecting the continuance use of E-scooters: An empirical study in Chicago. Transpor. Res. Part F: Traffic Psycho. Behav. 87, 87–101. https://doi.org/10.1016/j.trf.2022.03.019.
Kraus, J., Scholz, D., Baumann, M., 2021. What's driving me? Exploration and validation of a hierarchical personality model for trust in automated driving. Hum. Factors 63 (6), 1076–1105. https://doi.org/10.1177/0018720820922653.
Kronsell, A., Smidfelt Rosqvist, L., Winslott Hiselius, L., 2016. Achieving climate objectives in transport policy by including women and challenging gender norms: the Swedish case. Int. J. Sustain. Transp. 10 (8), 703–711. https://doi.org/10.1080/15568318.2015.1129653.
Laa, B., Leth, U., 2020. Survey of E-scooter users in Vienna: who they are and how they ride. J. Transp. Geogr. 89, 102874. https://doi.org/10.1016/j.jtrangeo.2020.102874.
Li, W., Zhao, S., Ma, J., Qin, W., 2021. Investigating regional and generational heterogeneity in low-carbon travel behavior intention based on a PLS-SEM approach. Sustainability 13 (6), 3492. https://doi.org/10.3390/su13063492.
Ma, J., Zhao, S., Li, W., Liu, M., Luo, H., 2022. Heterogeneity in seniors' unmet walking needs: A latent class analysis. J. Transp. Geogr. 104, 103434. https://doi.org/10.1016/j.jtrangeo.2022.103434.
Maciejewska, M., Miralles-Guasch, C., 2020. Evidence of gendered modal split from Warsaw, Poland. Gend. Place Cult. 27 (6), 809–830. https://doi.org/10.1080/0966369X.2019.1639631.
Maciejewska, M., Marquet, O., Miralles-Guasch, C., 2019. Changes in gendered mobility patterns in the context of the great recession (2007–2012). J. Transp. Geogr. 79, 102478. https://doi.org/10.1016/j.jtrangeo.2019.102478.
Madigan, R., Louw, T., Wilbrink, M., Schieben, A., Merat, N., 2017. What influences the decision to use automated public transport? Using UTAUT to understand public acceptance of automated road transport systems. Transport. Res. F: Traffic Psychol. Behav. 50, 55–64. https://doi.org/10.1016/j.trf.2017.07.007.
McQueen, M., Clifton, K.J., 2022. Assessing the perception of E-scooters as a practical and equitable first-mile/last-mile solution. Transp. Res. A Policy Pract. 165, 395–418. https://doi.org/10.1016/j.tra.2022.09.021.
Mehranfar, V., Jones, C., 2024. Exploring implications and current practices in e-scooter safety: A systematic review. Transport. Res. F: Traffic Psychol. Behav. 107, 321–382. https://doi.org/10.1016/j.trf.2024.09.004.
Mitra, R., Hess, P.M., 2021. Who are the potential users of shared e-scooters? An examination of socio-demographic, attitudinal and environmental factors. Travel Behav. Soc. 23, 100–107. https://doi.org/10.1016/j.tbs.2020.12.004.
Nikiforiadis, A., Paschalidis, E., Stamatiadis, N., Raptopoulou, A., Kostareli, A., Basbas, S., 2021. Analysis of attitudes and engagement of shared e-scooter users. Transp Res Part D: Transp Environ 94, 102790. https://doi.org/10.1016/j.trd.2021.102790.
Nordhoff, S., Kyriakidis, M., Van Arem, B., Happee, R., 2019. A multi-level model on automated vehicle acceptance (MAVA): A review-based study. Theor. Issues Ergon. Sci. 20 (6), 682–710. https://doi.org/10.1080/1463922X.2019.1621406.
Nordhoff, S., Louw, T., Innamaa, S., Lehtonen, E., Beuster, A., Torrao, G., Bjorvatn, A., Kessel, T., Malin, F., Happee, R., Merat, N., 2020. Using the UTAUT2 model to explain public acceptance of conditionally automated (L3) cars: A questionnaire study among 9,118 car drivers from eight European countries. Transport. Res. F: Traffic Psychol. Behav. 74, 280–297. https://doi.org/10.1016/j.trf.2020.07.015.
Nordhoff, S., Stapel, J., He, X., Gentner, A., Happee, R., 2023. Do driver's characteristics, system performance, perceived safety, and trust influence how drivers use partial automation? A structural equation modelling analysis. Front. Psychol. 14, 1125031. https://doi.org/10.3389/fpsyg.2023.1125031.
Özkan, T., Lajunen, T., 2006. What causes the differences in driving between young men and women? The effects of gender roles and sex on young drivers' driving behaviour and self-assessment of skills. Transport. Res. F: Traffic Psychol. Behav. 9 (4), 269–277. https://doi.org/10.1016/j.trf.2006.01.005.
Öztaş Karlı, R.G., Karlı, H., Çelikyay, H.S., 2022. Investigating the acceptance of shared e-scooters: empirical evidence from Turkey. Case Stud. Transp. Pol. 10 (2), 1058–1068. https://doi.org/10.1016/j.cstp.2022.03.018.
Öztürk, İ., Akay, N., 2023. Sex stereotypes of adolescents in traffic: the role of sex and family relationships. Trafik ve Ulaşım Araştırmaları. Dergisi 6 (2), 111–130. https://doi.org/10.38002/tuad.1318312.
Öztürk, İ., Öz, B., 2025. Female and male drivers' sex roles, driver skills, and driving-related sex stereotypes. European Rev. Applied Psycho. 75 (3), 101026. https://doi.org/10.1016/j.erap.2024.101026.
Öztürk, İ., Wallén Warner, H., Özkan, T., 2024. Preferred level of vehicle automation: how technology adoption, knowledge, and personality affect automation preference in Türkiye and Sweden. Cogent Psychol. 11 (1), 2314840. https://doi.org/10.1080/23311908.2024.2314840.
Öztürk, İ., Akay, N., 2023. Behavioural intention of e-scooter use: A comparison of users and non-users. In: *Contemporary Ergonomics and Human Factors 2023*. Chartered Institute of Ergonomics & Human Factors (CIEHF).
Öztürk, İ., Lehtonen, E., Madigan, R., Lee, Y.M., Aittoniemi, E., Merat, N., 2025. Cross-country differences in willingness to use conditionally automated driving systems: impact of technology affinity, driving skills, and perceived traffic climate. Technol. Soc. 82, 102903. https://doi.org/10.1016/j.techsoc.2025.102903.
Pai, R.R., Dozza, M., 2025. Understanding factors influencing e-scooterist crash risk: A naturalistic study of rental e-scooters in an urban area. Accid. Anal. Prev. 209, 107839. https://doi.org/10.1016/j.aap.2024.107839.
Parasuraman, A., Colby, C.L., 2014. An updated and streamlined technology readiness index. J. Serv. Res. 18 (1), 59–74. https://doi.org/10.1177/1094670514539730.
Petzoldt, T., Ringhand, M., Anke, J., Schekatz, N., 2021, July. Do German (non) users of E-scooters know the rules (and do they agree with them)?. In: International Conference on Human-Computer Interaction. Springer International Publishing, Cham, pp. 425–435.
Pourfalatoun, S., Ahmed, J., Miller, E.E., 2023. Shared electric scooter users and non-users: perceptions on safety, adoption and risk. Sustainability 15 (11), 9045. https://doi.org/10.3390/su15119045.
Priya Uteng, T., Turner, J., 2019. Addressing the Linkages between Gender and Transport in Low- and Middle-Income Countries. Sustainability 11 (17), 4555. https://doi.org/10.3390/su11174555.
Ratan, R., Earle, K., Rosenthal, S., Hua Chen, Gambino, A., Goggin, G., Stevens, H., Li, B., Lee, K.M., 2021. The (digital) medium of mobility is the message: Examining the influence of e-scooter mobile app perceptions on e-scooter use intent. Computers Human Behav. Report. 3, 100076. https://doi.org/10.1016/j.chbr.2021.100076.
Sanders, R.L., Branion-Calles, M., Nelson, T.A., 2020. To scoot or not to scoot: findings from a recent survey about the benefits and barriers of using E-scooters for riders and non-riders. Transp. Res. A Policy Pract. 139, 217–227. https://doi.org/10.1016/j.tra.2020.07.009.
Singh, Y.J., 2020. Is smart mobility also gender-smart? J. Gend. Stud. 29 (7), 832–846. https://doi.org/10.1080/09589236.2019.1650728.
Son, M., Han, K., 2011. Beyond the technology adoption: technology readiness effects on post-adoption behavior. J. Bus. Res. 64 (11), 1178–1182. https://doi.org/10.1016/j.jbusres.2011.06.019.
Speak, A., Taratula-Lyons, M., Clayton, W., Shergold, I., 2023. Scooter stories: user and non-user experiences of a shared E-scooter trial. Active Travel Stud. 3 (1). https://doi.org/10.16997/ats.1195.
Tabachnick, B.G., Fidell, L.S., Ullman, J.B., 2013. Using Multivariate Statistics, vol. 6. pearson, Boston, MA, pp. 497–516.
Tian, D., Ryan, A.D., Craig, C.M., Sievert, K., Morris, N.L., 2022. Characteristics and risk factors for electric scooter-related crashes and injury crashes among scooter riders: A two-phase survey study. Int. J. Environ. Res. Public Health 19 (16), 10129. https://doi.org/10.3390/ijerph191610129.
Torrao, G., Lehtonen, E., Innamaa, S., 2024. The gender gap in the acceptance of automated vehicles in Europe. Transport. Res. F: Traffic Psychol. Behav. 101, 199–217. https://doi.org/10.1016/j.trf.2023.11.002.

Tuncer, S., Laurier, E., Brown, B., Licoppe, C., 2020. Notes on the practices and appearances of e-scooter users in public space. J. Transp. Geogr. 85, 102702. https://doi.org/10.1016/j.jtrangeo.2020.102702.

Turkish Statistical Institute, 2021. Cinsiyete göre sürücü belgesi sahipliği, 2010–2021. https://data.tuik.gov.tr/Bulten/DownloadIstatistikselTablo?p=IRNe2oKtl3ASpjtZ0O1hxuSwVnI8xEf2yMb7x1UahziORSljZaCrYIriTByupIeV.

Turkish Statistical Institute, 2024. Road Traffic Accident Statistics, 2023 (Corrected). https://data.tuik.gov.tr/Bulten/Index?p=Road-Traffic-Accident-Statistics-2023-53479&dil=2#:~:text=In%20the%20road%20network%20of,were%20with%20death%20or%20injury.

Weschke, J., Oostendorp, R., Hardinghaus, M., 2022. Mode shift, motivational reasons, and impact on emissions of shared e-scooter usage. Transp Res Part D: Transp Environ 112, 103468. https://doi.org/10.1016/j.trd.2022.103468.

World Health Organisation, 2023. Global Status Report on Road Safety 2023. https://www.who.int/teams/social-determinants-of-health/safety-and-mobility/global-status-report-on-road-safety-2023.

Younes, H., Noland, R.B., Andrews, C.J., 2023. Gender split and safety behavior of cyclists and e-scooter users in Asbury Park, NJ. Case Stud. Transp. Pol. 14, 101073. https://doi.org/10.1016/j.cstp.2023.101073.

Zhong, M., Wu, C., Hunt, J.D., 2012. Gender differences in activity participation, time-of-day and duration choices: new evidence from Calgary. Transp. Plan. Technol. 35 (2), 175–190. https://doi.org/10.1080/03081060.2011.651880.