Behavioural intention of e-scooter use: A comparison of users and non-users

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SUMMARY

In the present study, the behavioural intention and factors affecting the use of e-scooters were examined among young people in Turkey. Previous users and non-users of e-scooters were compared in relation to the various variables. The relationships of attitudes, subjective norms, perceived behavioural control, and perceived usefulness were investigated regarding the intention to use e-scooters. While users reported positive socio-psychological factors related to e-scooter use, all different factors were positively related to behavioural intention. The results highlighted the importance of socio-psychological factors in predicting behavioural intention, as well as differences between e-scooter users and non-users in these factors.

KEYWORDS

Behavioural intention, e-scooter, micro-mobility

Introduction

Technological developments have enabled road users to own and share new micro-mobility devices, such as electric scooters (e-scooters). The use of e-scooters in traffic has become increasingly common in recent years, having a significant impact on the environment and on how people travel. The introduction of e-scooters, as an alternative mode of transport for short trips, is seen as a mode of transport that is fun, good for the environment, convenient and faster than walking (Sanders et al., 2020).

At these earlier stages, it is crucial to understand road users' intentions towards novel technologies, such as e-scooters, along with the antecedents. Previous studies have shown the importance of socio-psychological factors in influencing road users' acceptance of new technologies and practices, such as automated vehicles (e.g., Buckley et al., 2018; Madigan et al., 2017) and public transport systems (e.g., Chen & Chao, 2011).

To this end, a number of studies have been conducted in recent years to better understand the perception of e-scooter use (e.g., Almannaa et al., 2021; Öztaş Karlı et al., 2022; Ratan et al., 2021; Rejali et al., 2021) through the use of various theories and models such as the theory of planned behaviour (Ajzen, 1991) and the technology acceptance model (Davis, 1989). For example, studies found positive effects of perceived usefulness (e.g., Javadinasr et al., 2022; Ratan et al., 2021; Rejali et al., 2021), perceived ease of use (e.g., Javadinasr et al., 2022; Rejali et al., 2021), and subjective norms/social influence (e.g., Javadinasr et al., 2022; Öztaş Karlı et al., 2022; Rejali et al., 2021) on behavioural intention.

Prior literature has also shown that user/non-user differences are important on several dimensions (e.g., Almannaa et al., 2021; Buehler et al., 2021; Petzoldt et al., 2021; Sanders et al., 2020). Petzoldt et al. (2021), for example, investigated the knowledge of and compliance with rules among

users and non-users of electric scooters. Differences in terms of rule knowledge and agreement were observed between e-scooter users and non-users, and also among users. These results indicated the importance of information coming from these groups. Against this background, the present study aimed to understand the factors that influence the intention to use e-scooters and to compare previous users and non-users of e-scooters with respect to socio-psychological factors.

Method

Participants

A total of 443 young people aged between 18 and 25 years (M = 21.25, SD = 1.48, sex: 302 females, 137 males, 4 other) participated in the study. Of the participants, 209 (47.2%) reported having used an e-scooter at least once (age: M = 21.45, SD = 1.42, sex: 127 females, 81 males, 1 other). The remaining 234 participants (52.8%) had never used an e-scooter (age: M = 21.07, SD = 1.50, sex: 175 females, 56 males, 3 other).

Measurements

The survey consisted of several sections. In the first part, questions on demographics, technology acceptance and previous use of e-scooters were included. The second part focused on different aspects of the theory of planned behaviour (Ajzen, 1991) and the technology acceptance model (Davis, 1989) as well as the facilitating conditions. The final item pool was developed based on a review of the literature (e.g., Buckley et al., 2018; Chen & Chao, 2011; Madigan et al., 2017). As a result, attitudes towards e-scooter use were measured using four items (bad-good, stupid-smart, harmful-beneficial, negative-positive) on a 7-point Likert scale with a Cronbach's alpha reliability of .89. A 25-item scale with 5-point Likert scale (from 1: strongly disagree to 5: strongly agree) was developed to measure the remaining constructs.

Procedure

Following the development of the measures for this study, ethical approval was obtained from Middle East Technical University (170 ODTU 2020). In addition to the measurements reported in this paper, the survey also included two questionnaires on personality and values (results not reported here). This study was disseminated using social media and the Sona Systems account of the Department of Psychology, Middle East Technical University. Data were collected by using an online survey platform between October 2020 and June 2021. Participants were provided with an informed consent form prior to entering the survey, and their anonymity and confidentiality were assured. Participants who participated through Sona received bonus points in their courses.

Analyses

The analyses were conducted using SPSS (version 26). First, a principal component analysis with direct Oblimin rotation was performed to examine distinct factorial structures, as the items were obtained from different sources for the study. Following that, a one-way ANOVA was conducted to examine the differences between e-scooter users and non-users in terms of attitudes, perceived behavioural control, perceived usefulness, subjective norms, facilitating conditions, and behavioural intention factors separately. In the final step, a hierarchical regression analysis was conducted to examine the roles of the attitudes, perceived behavioural control, perceived usefulness, subjective norms, and facilitating conditions over behavioural intention after controlling for the effects of sex, age, technology adoption, and previous use of e-scooters.

Results

Behavioural intention towards e-scooter use

The Bartlett's test of sphericity yielded a significant result ($\chi 2(300) = 5410.71$, $p < .001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy was .88, indicating that the correlation matrix generated by the items is factorable. Based on the eigenvalues greater than one criterion (Reise et al., 2000), scree plot (Stevens, 2009) and the parallel analysis (O'Connor, 2000), the results supported the five-factor solution. In the final solution, two items were excluded due to factor loadings below the .40 cut-off, and one item was excluded due to not loading on the relevant factor and a decrease in Cronbach's alpha reliability. The total of 22 items explained 64.46% of the variance of the scale. The factor loadings are shown in Table 1.

Table 1. Constructs and factor loadings

Construct	Adapted item	Factor Loading
Perceived behavioural control (α = .92)	I can handle an e-scooter with ease.	.905
	I can ride an e-scooter.	.842
	I cannot use an e-scooter.	-.839
	It is easy for me to use an e-scooter.	.831
	I can drive an e-scooter without much mental effort.	.795
	I have the necessary knowledge to use an e-scooter.	.788
	I can use e-scooter applications easily.	.663
Perceived usefulness (α = .79)	Using an e-scooter helps me with my transport activities	.768
	Using an e-scooter saves me time.	.695
	There are advantages to using an e-scooter for everyday transport.	.690
	Using an e-scooter is useful in traffic.	.683
	E-scooters are budget-friendly.	.581
	Using e-scooters is good for the environment.	.536
Subjective norms (α = .71)	My close circle (e.g., family and friends) is positive about using e-scooters.	.834
	The people around me (e.g., family and friends) is generally supportive of e-scooter use.	.805
	The general public is generally positive about using e-scooters.	.646
Facilitating conditions (α = .46)	The transport infrastructure (roads, traffic signals, etc.) is suitable for the use of e-scooters.	.699
	E-scooters are compatible/integrated with other modes of transport I use.	.569
	The media and/or policy makers support the use of e-scooters.	.568
Behavioural intention (α = .91)	I would use an e-scooter in the future	-.888
	I plan to use an e-scooter in the near future.	-.885
	I intend to use an e-scooter.	-.774

User and non-user differences

In comparison to e-scooter non-users (Table 2), previous users scored higher on technology adoption, perceived behavioural control, perceived usefulness, and behavioural intention, and had more positive attitudes towards e-scooters. Subjective norms and facilitating conditions did not differ significantly between previous users and non-users.

Table 2. Comparison of users and non-users of e-scooters

Construct	Mean (SD) of users	Mean (SD) of non-users	df	F	p	η_p^2
Technology adoption	3.36 (1.15)	2.47 (1.09)	1,441	69.66	<.001	.14
Attitudes	5.76 (1.21)	5.40 (1.22)	1,441	9.84	.002	.02
Perceived behavioural control	4.25 (.72)	3.43 (.75)	1,441	138.19	<.001	.24
Perceived usefulness*	3.93 (.63)	3.69 (.53)	1,409.38	18.36	<.001	.04
Subjective norms	3.53 (.69)	3.42 (.67)	1,441	2.62	.106	.01
Facilitating conditions	2.62 (.68)	2.57 (.63)	1,441	.62	.431	.01
Behavioural intention	3.72 (.95)	3.18 (1.04)	1,441	32.78	<.001	.07

* Welch statistic was reported.

Determining behavioural intention

The regression analysis (Table 3) focusing on behavioural intention was significant ($F(9, 433) = 40.90$, $p < .001$). Analyses of the first step variables revealed that, females, people with high technology adoption and those who had previously used e-scooters had a higher behavioural intention to use e-scooters in the future. All variables at the second step (i.e., attitudes, subjective norms, perceived behavioural control, perceived usefulness and facilitating conditions) were positively related to behavioural intention, meaning that these aspects, as hypothesised, were associated with the participants' increased behavioural intentions to use e-scooters.

Table 3. Factors associated with behavioural intention

	Behavioural intention					
	R^2	$\triangle R^2$	*df*	*FΔ*	*β*	*p*
1. Step	.18	.18	4,438	23.36		<.001
Sex (female, male)					-.112	.013
Age					.060	.171
Technology adoption					.352	<.001
e-scooter use (used, not used)					-.141	.003
2. Step	.46	.28	5,433	45.45		<.001
Attitude					.210	<.001
Perceived behavioural control					.335	<.001
Perceived usefulness					.175	<.001
Subjective norms					.087	.025
Facilitating conditions					.075	.047

Discussion

In this study, the behavioural intention and factors affecting the use of e-scooters were examined among young people in Turkey. The principal component analysis results showed that the majority of the distinct factors of the Theory of Planned Behaviour and the Technology Acceptance Model manifested individual constructs. In line with Ajzen's (2020) discussion, the factorial structure revealed that the perceived behavioural control items also included perceived ease of use items. Ajzen (2020) identified control factors as "*skills and abilities; availability or lack of time, money, and other resources; cooperation by other people; and so forth*" (p. 315). Perceived ease of use could be assessed in a similar way to perceived behavioural control, as the items indicate the ease of using an e-scooter in a way that indicates the users' control beliefs over e-scooter use.

Comparing users and non-users, significant differences were found in individual factors (i.e., technology adoption, attitudes, perceived behavioural control, perceived usefulness, and behavioural intention). The study was carried out during the early phase of e-scooter use in Turkey. Therefore, it is not surprising that the e-scooter users had higher technology adoption and more positive attitudes and beliefs towards e-scooters in comparison to non-users. In addition, the greatest difference between users and non-users of electric scooters was observed on perceived behavioural control. Perceived behavioural control was also the strongest predictor of behavioural intention. It can be argued that the lack of perceived behavioural control over e-scooter use, combined with the perception that e-scooters are difficult to use, may be the greatest barrier for current non-users of e-scooters.

On the other hand, e-scooter users and non-users did not differ on technical or social aspects (i.e., subjective norms and facilitating conditions). The reason for this difference could be related to the level of integration of e-scooters into everyday life. Similar to previous studies which failed to find the impact of facilitating conditions (Öztaş Karlı et al., 2022), in this study facilitating conditions showed the weakest significant impact on behaviour prediction, with the lowest average score across our samples. This may indicate that the infrastructure and policy readiness of the transport system for e-scooters might not have been sufficient to make a difference in the users' mode choice yet. Similarly, various studies have reported a lack of suitable infrastructure as being one of the barriers for e-scooter use (Almannaa et al., 2021; Buehler et al., 2021; Rejali et al., 2021; Sanders et al., 2020). Official regulations regarding e-scooters were only published in April 2021 (Resmi Gazete, 2021), which corresponds to the last two months of our data collection. However, the hierarchical regression also showed that both subjective norms and facilitating conditions are important factors in behavioural intention. This could mean that positive subjective norms towards e-scooter use and improved facilitating conditions could play a key role for a certain group of young people to start (or increase) the use of e-scooters.

In line with previous studies (e.g., Javadinasr et al., 2022; Öztaş Karlı et al., 2022; Ratan et al., 2021; Rejali et al., 2021), all predictors were positively related to the behavioural intention to use e-scooters in the near future. The results of this study suggest that the theory of planned behaviour, along with the additional constructs (perceived usefulness and facilitating conditions), are useful in explaining the adoption of electric scooters. The results also imply that individual factors such as attitude, perceived behavioural control, perceived usefulness, and behavioural intention are important in predicting e-scooter adoption. The results of this study can be used to inform policymakers and transport planners about the importance of these factors in increasing e-scooter use among young people.

This study is limited in the following ways: First, the current study did not differentiate the types of e-scooter use/ownership (e.g., owning an e-scooter, using shared transport apps). Future studies may control certain aspects of e-scooter use to make inferences with higher detail, such as e-scooter apps, ease of access, and parking. Second, the sample of the current study is limited to young people between the ages of 18 and 25. The generalisability of the results may be limited to this group of road users, given differences with other age groups in terms of transport activities and other key factors pertaining to road use. Therefore, there is a need for further research with varying age groups to improve the generalisability of the results.

Finally, the findings of this study suggest a number of theoretical and practical implications. Theoretically, in addition to the original theory of planned behaviour constructs (attitude, subjective norms, perceived behavioural control), facilitating conditions and perceived usefulness were examined in explaining behavioural intention to use e-scooters. This perspective has yielded results that indicate the value of examining different constructs originating from different theories together. Practically, it is also believed that the comparison of users and non-users will help researchers,

policy makers and industry to understand the current point of view of e-scooter users and non-users. These findings can be used to improve e-scooter infrastructure, safety, policy, and marketing. A study conducted by Buehler et al. (2021) showed a positive increase in non-users' perceptions of various aspects of e-scooters, such as safety and usefulness, following a pilot project. Public perception and subjective norms of e-scooter use could be improved through controlled pilot projects.

Conclusion

Overall, all aspects considered in this study had a unique and positive effect on behavioural intention to use e-scooters. Perceived behavioural control and attitude were the strongest predictors, and facilitating conditions and subjective norms were the weakest predictors. The results of our study explored the existing difference between e-scooter users and non-users and the usefulness of the constructs in understanding young people's acceptance of e-scooters. The results can be used to inform policymakers, city planners and e-scooter companies in developing strategies to increase the safe use of e-scooters.

Author contribution

İbrahim Öztürk: Methodology, Conceptualisation, Formal analysis, Writing – original draft, Nazlı Akay: Methodology, Conceptualisation, Writing – review & editing.

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Data access statement

The data supporting the results of this study are available on request from the corresponding author (I.O., i.ozturk@leeds.ac.uk).

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