Research Article

University students' perspectives on micromobility: An evaluation based on e-scooters

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Abstract: While people's expectations and needs affect their behavior and preferences, technological developments increase the options they can choose from. One of these areas has been the field of transportation, which has been offering environmentally friendly options such as e-scooters and e-bikes in recent years. These new transportation options, called micromobility, are becoming increasingly popular, especially among young people. In this study, the opinions of university students about micromobility, with an emphasis on e-scooters, were investigated. Using a structured interview method, 10 female and 10 male students studying at a maritime university were asked about their opinions on the use of these vehicles. The results show that students are reluctant to use them mainly because they find the roads unsafe and the rules and regulations inefficient. From the gender point of view, it is revealed that the majority of female students don't prefer them, especially on quiet roads, because of the harassment they might face. Further research on this topic can be carried out with the participation of more students using different methods

Keywords: Micromobility, E-scooters, University Students, Innovation, Transportation, Safety

Üniversite öğrencilerinin mikromobiliteye bakış açıları: E-scooterlar açısından bir değerlendirme

Özet: İnsanların beklenti ve ihtiyaçları davranış ve tercihlerini etkilerken, teknolojik gelişmeler de tercihte bulunabilecekleri seçenekleri arttırmaktadır. Son yıllarda e-scooter ve e-bisiklet gibi seçenekler sunan ulaşım alanı da teknolojik gelişmelerin olumlu yasımalarının gözlemlendiği alanlardan biridir. Mikromobilite olarak adlandırılan bu yeni ulaşım seçenekleri özellikle gençler arasında giderek daha popüler hale gelmektedir. Bu çalışmada, üniversite öğrencilerinin e-scooter başta olmak üzere mikromobilite hakkındaki görüşleri araştırılmıştır. Yapılandırılmış görüşme yöntemi kullanılarak, bir denizcilik üniversitesinde okuyan 15 kadın ve 15 erkek öğrenciye bu araçların kullanımına ilişkin görüşleri sorulmuştur. Sonuçlar, öğrencilerin yolları güvensiz, kural ve düzenlemeleri yetersiz buldukları için bu araçları kullanma konusunda isteksiz olduklarını göstermektedir. Cinsiyet açısından bakıldığında, kız öğrencilerin çoğunluğunun, özellikle tenha yollarda, karşılaşabilecekleri tacizler nedeniyle bu araçları tercih etmedikleri ortaya çıkmıştır. Çalışma kampüs içi ulaşım için e-scooter ve benzeri araçlara gerek duyulmayan küçük alanlı bir üniversitede gerçekleştirildiğinden öğrencilerin sadece kampüs dışı mikromobilite ve e-scooter kullanımı konusundaki fikirlerine ulaşılabilmiştir.Daha büyük alanlı bir üniversitede söz konusu araçların kampüs içi kullanımı konusunda da fikir elde edilebilir.

Anahtar Kelimeler: Mikromobilite, E-scooter, Üniversite Öğrencileri, İnovasyon, Ulaşım, Güvenlik

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1. Introduction

The rapid advancement of technology brings innovations that were once unimaginable to every aspect of our daily lives. The changes triggered by these innovations are studied in depth from different perspectives and form the basis for different arguments. One of the areas where technology has caused major changes to make human life easier is transportation. Advances in technology have positively affected transportation vehicles in terms of speed, comfort, accessibility, cost, and sustainability, offering people different alternatives that they can choose from depending on their needs. Among these, micromobility vehicles, which young people have recently started to prefer more and more in urban transportation, stand out. The Safe Mobility Report by the OECD defines micromobility as "the use of vehicles with a mass of less than 350 kilograms and a design speed of 45 kilometers per hour or less" (ITF, OECD; 2020). According to the dictionary, "micromobility" refers to transportation over short distances using lightweight vehicles such as bicycles and scooters, usually for a single person (Merriam-Webster, 2023).

Both the types and the quantity of small vehicles that fall under the definition of "micromobility" are increasing day by day. These vehicles are either self-owned by individuals or rented from various companies. The increase in the number of companies where people rent e-scooters and e-bikes is an indication of the increase in demand for these vehicles (Shaheen et al., 2010; Fishman et al., 2013), which constitute one of the four types of micromobility vehicles. In the ITF report, the four types of micro-vehicles are defined according to their mass and speed as Types A, B, C, and D. Type A includes vehicles such as bicycles, e-bikes, and e-scooters that weigh no more than 35 kilograms and have a speed of no more than 25 kilometers per hour. (ITF, OECD, 2020). Figure 1 shows the classification of these vehicles.

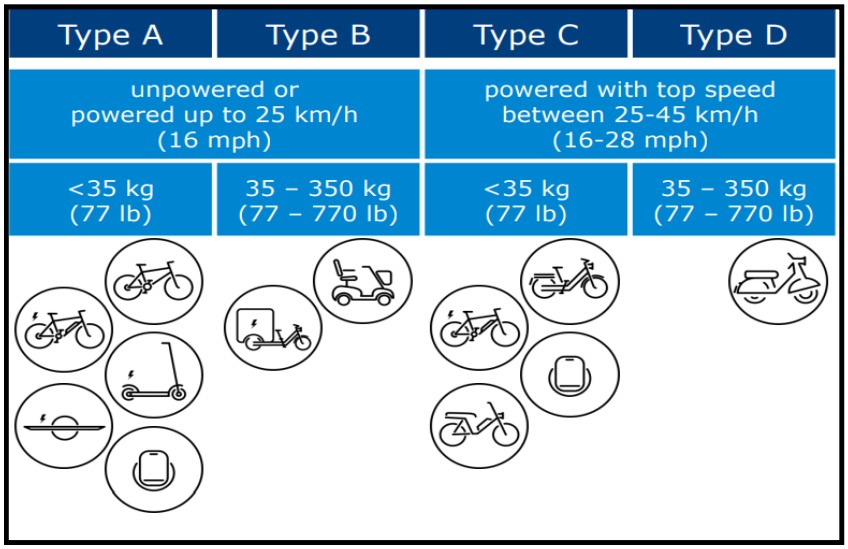

Figure 1. Proposed micromobility definition and classification (ITF, OECD, 2020)

Type A micromobility vehicles are the most widely used means of transportation for short distances. People had been using different forms of bicycles long before scooters were invented towards the end of the 19th century. The first scooters were wooden kick scooters consisting of only plain pieces of wood and wheels. They were easily made by families as toys for their children. Soon, motorized variants were invented. The first motor scooter, which was called an "autoped," was invented in the USA in 1915 (Gibson, 1915) and became widespread with the demand for electric and dockless scooters known as e-scooters (Kobayashi et al., 2019; Hardt & Bogenberger, 2019). Although light transportation vehicles such as bicycles and scooters have been around for a long time, they have gained momentum in recent years since electric models have emerged. As a result of the increase in demand, the frequent use of micromobility vehicles, especially e-scooters, has necessitated the establishment of legal regulations

and sanctions on the subject. Today, dockless e-scooter sharing (ESS) and dockless Bike Sharing System (BSS) are the most common modes of micromobility (Blazanin et al. 2022).

E-bikes and e-scooters, which offer effective solutions to the problem of short-distance and low-speed transportation in big cities, can be owned or shared. Today, shared e-scooters and e-bikes are preferred by more and more people due to the advantages they provide, which has led to a surge in the number of companies renting them. Therefore, stations where these vehicles can be rented have started to be established in almost all major cities (Fishman et al., 2013). Among the advantages they provide are being faster than other means of transportation in heavy traffic in cities, eliminating the stress deriving from finding a suitable parking space or driving in heavy traffic, in addition to the ease of rental and payment, no purchase and maintenance costs, and an increase in physical activity. Being environmentally friendly is also seen as one of the biggest reasons for preference (Teixeira et al., 2020; Blazanin et al., 2022). In addition, everyone, regardless of their financial situation, has almost the same opportunity to access micromobility vehicles. Considering that these tools are cheap enough to be used by everyone, it is possible to say that they help to achieve social equality among people (Lucas et al., 2016).

2. Literature Review

Increasing demand for micromobility, and for fleets that can rent these small vehicles, has led to an increase in technical and academic studies on this subject (Bai et al., 2021). Some of these studies focus on the benefits of using micromobility. For example, Dias and Riberio (2021) studied the environmental, social, and economic benefits of micromobility. They found empirical evidence that micromobility vehicles have caused a significant reduction in CO2 emissions and fossil fuel consumption. It is concluded that micromobility vehicle sharing systems are important in terms of ensuring social equality as they provide transportation to everyone under equal conditions and with equal means. Nevertheless, it is recommended to support social equality by reducing the cost of using micromobility vehicles in areas where people with low purchasing power live. They also found that micromobility causes economic benefits since it reduces travel time and cost. Hardt and Bogenberger (2019) found that problems related to heavy traffic, parking, or emissions could be reduced by the wider use of e-scooters. Another advantage that micromobility brings is sustainability. Because the use of motor vehicles for short-distance trips is reduced, emissions, traffic congestion, noise pollution, and carbon footprint are reduced, too (Fishman et al., 2013; Hardt & Bogenberger, 2019; Abduljabbar et al., 2021).

Some studies aimed to find out for which activities e-scooters are mostly used. In their study conducted in Austin, Texas, Bai et al. (2021) investigated the activities for which e-scooters are needed and found that there is a strong correlation between e-scooter use and daily eating, drinking, shopping, and entertainment activities. They also found that e-scooters are used more in city centers and on university campuses, while multiple studies have found e-scooters are specifically suitable for short trips (Hardt & Bogenberger, 2019; Mathew et al., 2019; Noland, 2019).

Some studies were made as to who rides e-scooters the most and why they are preferred. According to the study by Degele et al, (2018), micromobility users are mostly male and in their late twenties. The studies by Reck and Axhausen (2021) and Orozco-Fontalvo et al. (2022), who found that young, upscale men mostly use shared micromobility vehicles, supported this finding. Zhang et al. (2021) conducted research with 2000 students on the campus of Virginia Tech and found that students' preference to ride e-scooters changes with the ease of the roads. They prefer to ride e-scooters on bikeways the most and on one-way roads the least. Zhang et al. (2021) also found that, unlike bicycle riders, the slope of the road does not matter for e-scooter riders since the e-scooters work on electricity, not manpower. The use of electricity has other benefits for cities, too. It was also discovered that one of the reasons people prefer e-scooters is that they are easily charged and suitable for short distance trips. These benefits have increased the number of people who prefer micromobility vehicles to automobiles for short distances, particularly when traveling to and from train or metro stations for in-city transportation (Woods, 2019).

Among micromobility vehicles, the most flexible one is e-scooters since they don't require drop off at a station and can easily be found and used by smartphone applications or GPS (Global Positioning System) technology (Zarif, Pankratz, & Kelman, 2019; Hosseinzadeh et al., 2021).

Although micromobility vehicles are getting more popular and have more benefits compared to other transportation vehicles, they have some drawbacks, such as having no baggage capacity, being vulnerable to inclement weather, and being less safe. The increase in their usage increased concerns for the safety of both e-scooter users and pedestrians (Sikka et al., 2021). It was found by Bozzi and Aguilera (2021) that e-scooter users are more reluctant to put on helmets compared with bicycle users. It may even have a deterrent effect for people in countries where wearing a helmet is a must.

Safety is an important factor affecting the use of these vehicles. Blazanin et al. (2022) revealed that the safe use of micromobility tools is very important, and measures should be taken to ensure this. It is also emphasized that safe transportation with these vehicles is at least as important as the green transportation provided by these vehicles. The same point was emphasized by Sagaris and Tiznado-Aitken (2023), who found that the fact that drivers drive dangerously and that there are insufficient roads for micromobility vehicles prevents them from being preferred. Bozzi and Aquilera (2021) investigated the use of e-scooters from multiple perspectives and found similarities between e-scooter users and users of other micromobility vehicles. They also found that there is a perception that e-scooters are risky and cause accidents. They concluded that in order for the use of e-scooters to become widespread, existing rules and systems on roads and traffic need to be changed and more research needs to be done on the future of e-scooters. The study by Bozzi and Aquilera (2021) revealed that production, use, and maintenance attitude processes should be re-evaluated from the perspective of green vehicle perception.

In addition to the above-mentioned study by Zhang et al. (2021), there are some studies that focused on university students' use of micromobility, particularly e-scooters. One of them is carried out by Moosavi et al. (2022), who identified eleven factors that can affect the e-scooter use of university students' and staff. The factors are daily travel patterns on campus, availability of green space and water, age, road surface quality, daily travel time and cost on campus, monthly income, private vehicle ownership, connected roads, transportation to and from campus, and gender. That is; young women aged 18–29 with an average monthly income were the most likely to always use e-scooters for transportation on campus. They also found that men between the ages of 45 and 60 with high monthly salaries used micromobility vehicles less. The main deterrents were safety issues and the cost of renting e-scooters, while road characteristics and proper infrastructure, such as green spaces and separate lanes for scooters, were key drivers. In addition, the most important advantages of riding an e-scooter from the point of view of the respondents were the lack of social distance during the pandemic and the lack of parking problems.

In another study that was focused on university students, Eccarius and Lu (2020) found that legal regulations should be made regarding e-scooters and that the use of shared scooters should be encouraged rather than scooter ownership. They also found that students have environmental awareness, but this awareness does not play a major role in their choice to use e-scooters. In addition, they found that the use of e-scooters varies according to the subject they study at the university and that female students are more likely to use e-scooters.

2.1. A brief history of micromobility from the perspective of e-scooters in the world and in Turkiye

Scooters first appeared on the world stage in the late 19th century, when a simple toy consisting of a pair of wheels and a piece of plank was used by children for recreational purposes. Based on this simple prototype, the first model, which can be regarded as the ancestor of scooters as we currently recognize them, was developed by the Autoped company in New York in the early 20th century. Initially produced in the USA, the model started to be manufactured in Germany in the 1920s but did not become widespread. Photographs from that period show that scooters were used by police officers, postal deliverymen, or members of the higher social classes (Unagiscooters, 2023). In the following years, e-scooters, which have become increasingly popular, were mass-produced in factories and started to be

used as an environmentally friendly, cheap, parking-free, and healthy alternative to urban transportation. Statistics show that e-scooter services provided by popular companies such as Bird, Lime, and Jump in the USA were preferred by 321 thousand people in 2011, while this number increased to 136 million in 2019 (NACTO, 2020). A report on the future of e-scooters finds that by 2030, the e-scooter industry will be worth $200 billion to $300 billion in the US, about $100 billion to $150 billion in Europe, and $30 billion to $50 billion in China (Heineke et al., 2019).

As in many other countries, the first step in the field of micromobility in Turkiye was taken by bicycle sharing. Yapdrom was the first company to be established in this field in 2011. The rapidly expanding company now operates 30.000 vehicles under the brand names Isbike in Istanbul and Bisim in Izmir. Secondly, Martı, Turkiye's first scooter sharing system, was established in 2019. Growing in a short time, Martı started to serve in more than 15 cities with 50 000 vehicles and started to cover e-scooters as well as e-bikes and e-mopeds. Another big company in this field is HOP, which started serving at Ankara University in 2019 and then grew to over 15,000 scooters in 18 cities. In addition, BinBin, which was also established in 2019, is one of the major companies serving in the field of micromobility and especially e-scooters in Turkiye, including indoor areas such as Istanbul Airport. Apart from these, there are 10 companies such as AT, Palm, Volly, Scooby, and Hey in the micromobility service provider market. There are also foreign companies such as "Superpedestrian" and "Go Sharing" serving in Turkiye. Today, Istanbul, the most populous city in Turkiye, is home to 36,000 e-scooters according to 2022 figures. Shared mobility is still in its early stages but has great potential for growth (Gauquelin, 2022).

In one of the studies on e-scooters in Turkiye, Ayözen et al. (2022) investigated the benefits of e-scooters in mail and small package delivery and concluded that they have positive contributions in terms of time, cost, and energy, especially in preventing air pollution. Research by Karlı et al. (2022) has shown that e-scooter users are positively influenced by each other's experiences and opinions, that they see e-scooters as convenient means of short-distance transportation, and that the ease of use of these vehicles increases their rate of preference. In addition, according to their research, the fact that e-scooters are cheaper than other means of transportation is also a reason for preference. The study also concluded that e-scooters are used for transportation rather than hedonistic purposes, and that the most important reason for e-scooter preference is not environmental awareness.

3. Materials and methods

This study tries to reveal the habits surrounding micromobility vehicle use, with an emphasis on e-scooters, among university students. The school where the interviews were conducted is a maritime university located on the coastline of a district in Istanbul. Although there are different ways of transportation from the city center to the university campus, direct access to the campus is provided only by bus. If the students prefer to take the train, Marmaray, to the district where the school is located, they have to take a bus, minibus or shuttle bus provided by the university to arrive at the campus since the train station is not within walking distance of the campus. The distance between the train station and the campus is 4.5 kilometres. The district where the school is located is crowded every day of the week, especially on weekends, and has a long coastline along which there are bike paths. There is heavy traffic congestion, especially on weekends.

The students don’t need any kind of transportation on the campus since everywhere is within walking distance. They cannot ride on e-scooters even if they want to because there are stairs between two main buildings on the campus. For these reasons, the questions were asked in reference to their off-campus transportation habits.

3.1. Data Collection

In this study, the semi-structured interview method was used. In this method, the researcher conducts the interview with certain topics or questions prepared in advance. During the interview, changes can be made to the order of the questions, the way the questions are asked, and questions can be added or removed by the researcher in the context of the interview topic (TUBITAK, 2023).

The interviews were conducted with 15 male and 15 female students studying at the Maritime Vocational School. The interviews, which lasted about 10–13 minutes each, were conducted one-on-one between the researcher and the students, and the responses were recorded in writing to protect the privacy of the students.

During the interviews, students were first asked how often they use micro-mobility transportation vehicles such as e-scooters or e-bikes. Then the interview continued with detailed questions to investigate some of the features related to their use. For the questions related to the hypotheses, they were presented with answer options, and their responses were noted.

The students were then asked if they had anything to add about the subject, and the interview continued with open-ended questions when necessary. For example, when a student mentioned a situation that some of his or her friends faced, the researcher asked the student, "What would your reaction be in this situation?"

If the student stated that he or she had never ridden these vehicles, the reasons for this were sought, and the student's general opinion about micromobility transportation vehicles was sought through general questions.

3.2. Hypotheses

Research reveals that there is a gender gap in micromobility vehicle usage. Degele et al. (2018), Teixeria et al. (2020) and Kailai et al. (2022) found that e-scooters are mostly used by men. Likewise, Reck and Axahusen (2021) found that only around 30% of the micromobility users in Zurich were female. Based on these findings, the first hypothesis was formulated as follows:

H1 Male university students prefer micromobility vehicles more than female university students do.

Safety is one of the most important factors that prevents students from riding e-scooters. Those who think e-scooters are unsafe would never ride e-scooters (Moosavi et al., 2022). E-scooters have even been banned on some university campuses, claiming they are unsafe and cause too many accidents (Abdulahi, 2022). Moosavi et al. (2022) found that 85 percent of the participants in the research that they conducted on a university campus underlined that safety was the most important issue. Depending on these studies, the second hypothesis was formulated as follows:

H2 Safety is the most important factor for university students using e-scooters.

E-scooter riders often use sidewalks, which can be dangerous for pedestrians. Fitt and Curl (2019) and James et al. (2019) argue that the majority of e-scooter users (90%) ride them on the sidewalk. Because this is dangerous for pedestrians, sidewalks should be banned for them. However, some studies have found that e-scooter users prefer the roadway rather than the sidewalk (Arellano & Fang, 2019; Christoforou et al., 2021; James et al., 2019) and are, therefore, exposed to many hazards. Either way, e-scooter users cause danger or are exposed to it. Thus, e-scooter users should be allocated special roads. Based on these results, the third hypothesis can be formulated as follows:

H3 If a special lane is allocated for e-scooters, they will be used by more people.

Studies have shown that the use of micromobility vehicles could reduce energy demand by 50% (Şengül & Mostofi, 2021). Shared e-scooters can be environmentally friendly if they can reduce motor vehicle usage as expected, although this has not been proved yet (Caspi et al., 2020). Hollingsworth et al. (2020) have shown that there will be clear environmental benefits if e-scooter use reduces car use. Studies also show that university students have a high level of environmental consciousness (Arshad et al., 2021; Ningrum & Herdiansyah, 2018; Eren & Yaqub, 2015). Based on these findings, the following hypothesis can be proposed:

H4 Because they care about the environment, university students are expected to prefer electric transportation vehicles over motorized transportation vehicles for short distance travel.

3.3. Findings

The first question in the interview was asked to find out how often students ride e-scooters or other e-micromobility vehicles. They were given four choices for their frequency of riding micromobility vehicles. Figure 2 shows the responses of the students according to their gender.

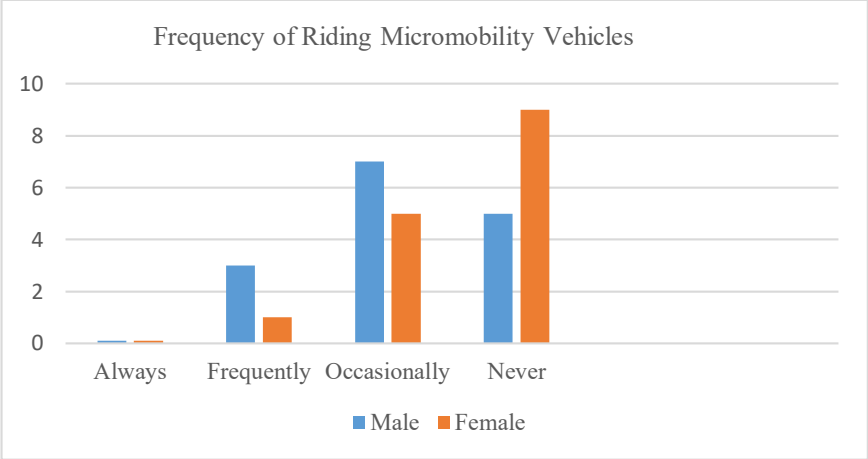

Figure 2. Micromobility using frequency by gender

5 of the 15 male students who participated in the interviews stated that they *never* used micromobility vehicles, while 7 of the remaining 10 students stated that they had used them *occasionally* and 2 of them used *frequently*. There was no one who said that he or she *always* used them. In the case of female students, only 1 out of 15 randomly selected female students who participated in the research stated that she had *frequently* used e-micromobility vehicles such as e-scooters and e-bikes, while 5 of them said that they used them *occasionally*, 9 female students said that they had *never* used them. None of the male or female students stated that they had *always* used micromobility vehicles.

Thus, the number of male students who use micromobility vehicles, especially e-scooters, is higher than the number of female students, and H1 is supported.

The fact that the majority of the students taking part in the interview had never ridden on any e-micromobility vehicles prompted the question that asked the reason for this. Figure 3 gives the reasons why these students never use micromobility. Some of the students indicated more than one reason, all of which were covered in the Figure 3.

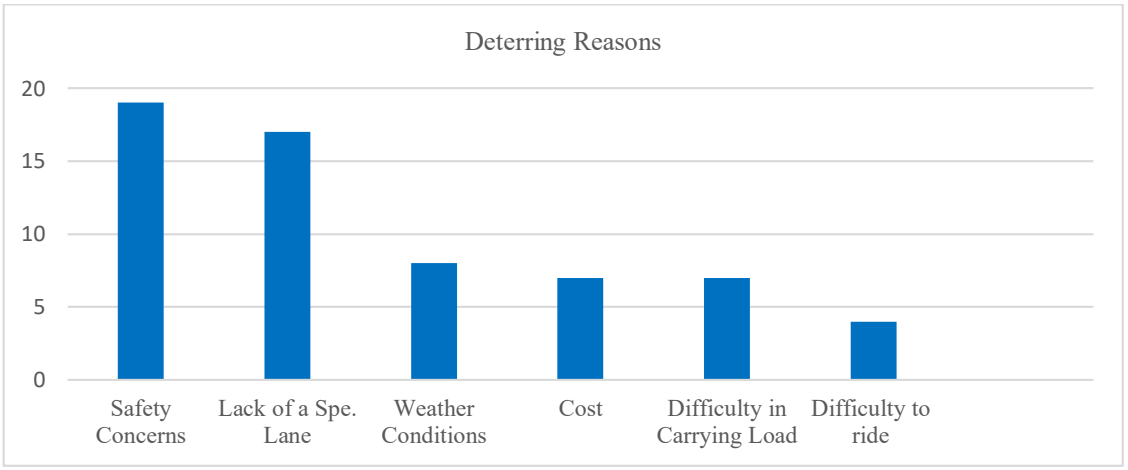

Figure 3. The reasons deterring students from using micromobility

As the figure shows, concerns for safety are among the biggest reasons for students not to prefer micromobility, especially e-scooters. They prefer to ride e-scooters on safe roads such as bicycle roads; however, the scarcity of these roads in the district where the university is located is a factor that prevents them from riding e-scooters widely. Although the students stated that the issue of safety was very important to them, they admitted that they neglected the issue of wearing a helmet, which is seen as the most important prerequisite for the safety of micromobility users. The next reason for not using e-scooters is the lack of special lanes for e-bikes or e-scooters, which means they have to use them on pedestrian roads. That is not safe for them and for pedestrians because micromobility vehicles go much faster than pedestrians do, which causes accidents. Some students said they could use micromobility when the weather was nice or when there was a light rain, but they could not ride them when it rained heavily or when it snowed. Some students stated that they did not prefer them because of the high rental costs. Although low rental costs were defined as a positive side of using e-scooters (Sikka et al., 2019), they were most often described as a negative side by the participants in this study, which suggests the fact that there are differences from country to country or from student to student regarding the purchasing power of the students.

Following are some excerpts from the students related to this question:

"It's difficult to carry things on e-scooters, but not on e-bikes. I prefer e-scooters only if I don't have to carry anything."

"E-scooters are not as cheap as they used to be. They were cheap when they were first introduced, but now they have become quite expensive, so I prefer to walk to nearby places. In fact, it would be nice if there was a student discount."

A few of them said they did not think they were safe while riding them. One student said:

"I have a hard time keeping my balance while riding e-scooter. Especially if I have a heavy backpack, I feel like I'm going to fall even on gentle curves."

Because safety concerns were mentioned most frequently by students as a deterrent factor to using e-scooters, H2 is accepted.

The third hypothesis was "If a special lane is allocated for e-scooters, they will be used by more people." In the interviews, it was seen that the second-most important reason preventing students from using e-scooters was the lack of a special lane reserved for e-scooters. It was found that the reasons given by students who demanded a special lane for e-scooters varied according to their gender. The following are selected excerpts from student statements related to this issue:

"I don't want to use my e-scooter on the sidewalk because pedestrians go too slowly, and I don't want to use it on the driveway because cars go too fast." In this case, I think having a separate lane for e-scooters would make more people, including me, prefer them. (A male student)

"Yes, it is dangerous to use an e-scooter on the highway because it is reserved for motor vehicles, and drivers don't want to see any micromobility vehicles there." "Especially if they realize that the person driving this vehicle is a woman, they may try to harass her, deliberately, drive over her, or try to run her off the road." (A female student)

"I never thought about using an e-scooter." "When the roads are so dangerous even for women drivers, women e-scooter users have no chance." (A female student)

"My intention to use an e-scooter may vary depending on location." "I might consider using it in crowded places with more educated people, but I don't think by-walks are safe for female users, especially after it gets dark." (A female student)

Based on the responses by the students and statements related to this question, H3 was validated.

In order to test the next hypothesis, the students who participated in the interviews were asked about their reasons for preferring e-mobility vehicles. They were given five options, one of which was "because I care about the environment." Students chose among these options to determine what motivated them to use micromobility. They were free to make more than one choice. Figure 4 shows the responses to this question.

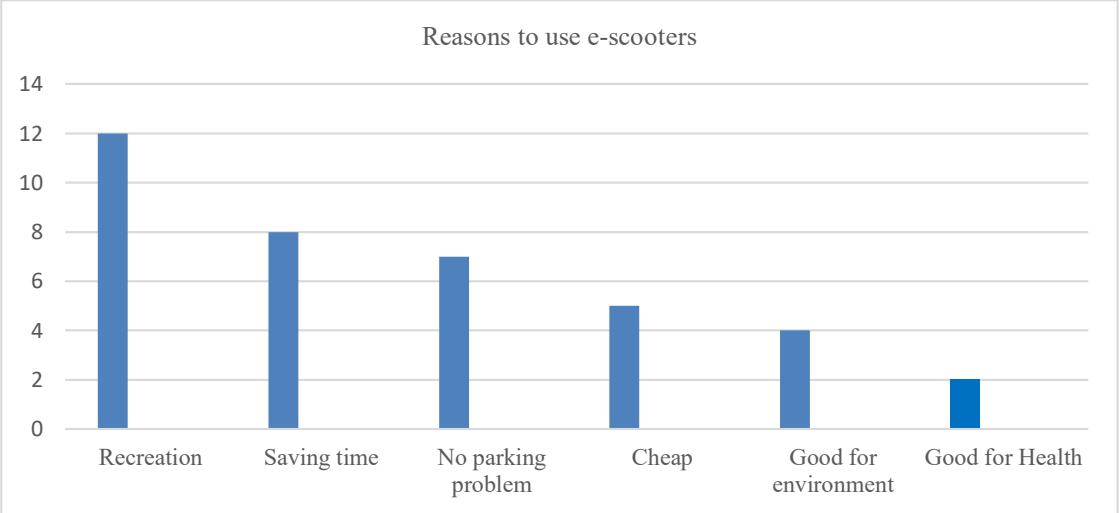

Figure 4. The reasons motivating students for micromobility

As Figure 4 shows, caring for the environment was not one of the top reasons given by the students who chose micromobility, particularly e-scooters. They stated that their primary purpose in choosing this mode of transportation was to have fun and have a good time. Two of them said:

"It is nice to ride e-scooters along the coast line and watch the sunset. That's the only reason that my friends and I rent e-scooters."

"It's nicer to ride an e-scooter when you don't have to rush anywhere, when you're not in a hurry, just for pleasure."

Secondly, they said that they could reach their destination quickly, without being stuck in traffic, on e-scooters. The next reasons for the students to choose e-scooters were having no parking problems and spending less money on transportation. Although the students said they cared about the environment as much as possible, the option of "good for the environment" came after these choices, which means that students do not have a strong sense of environmental consciousness, or they are aware of the importance of environment protection but they don't put their thoughts into practice.

Two of the students said:

"I don't have to ride e-scooter because I have a car. No matter how close the place I want to go, I prefer my car to e-scooters."

"I prefer to drive to wherever I go, even if it's close. I know it's bad for the environment, but I like driving."

On the other hand, this conclusion supports the findings of Abbas and Singh (2014), who said that students are aware of the importance of environmental protection but do very little in practice to protect the environment. It was revealed that students were aware of the need to protect the environment, but they did not put this into action and did not reflect it in their actions (Novotný et al., 2021; Ozdemir, 2021).

The last option in this question was “Good for Health”. Almost none of the students preferred e-scooters due to the fact that they require physical movement, which is beneficial for health.

Based on these findings, it is concluded that the students' primary reason for preferring e-scooters is not to protect the environment but for recreation. Therefore, H4 is rejected.

4. Conclusion

This study revealed that the participants, who are the students of a university in Istanbul, do not regard e-scooters as a convenient alternative for short-distance transportation. The study focused on investigating students' off-campus e-scooter use, based on the fact that students would not need to use e-scooters at the university because the campus is small and has stairs. However, most students indicated that they have never tried to use e-scooters off-campus either.

The study showed that the biggest concern of the students regarding e-scooter riding is safety. The students approached the safety issue from several perspectives. They stated that the lack of a special lane reserved for e-scooters reduces the safety of the roads in the first place. They also complained about the motor vehicle drivers who ignored them and caused accidents. A particular complaint by female students was that some drivers, realizing that the e-scooter user was a girl, deliberately tried to push them out of the road. Reasons such as the difficulty of using them in unfavorable weather conditions or their inability to carry heavy backpacks while using them were less emphasized by students. Interestingly, a few students said that they had difficulty balancing on the e-scooter and did not feel safe.

From the gender perspective, it was found that male students tended to use e-scooters more than female students did, since the majority of female students said they had never tried e-scooters or their only experience with scooters was using them as toys when they were children, which was not surprising given the possibilities of harassment they mentioned.

The study also found that students studying at a green university and identifying themselves as environmentally conscious did not use e-scooters primarily to protect the environment, as one might expect, but rather for recreation, which might be considered less likely for environmentally conscious students.

Depending on the above-mentioned results of the study, the following recommendations can be made to promote micromobility, especially e-scooter usage, among students to create an environment free from noise and air pollution, and to offer an alternative for short distance transportation:

- The number of existing roads or lanes for micromobility users should be increased since this is the top factor deterring students from using these vehicles.

- Since one of the biggest reasons why students do not want to use e-scooters is the harassment by motor vehicle drivers, it is necessary to make these drivers aware of the rights of other road stakeholders. However, it is undoubtedly a two-way phenomenon. It should be emphasized on every platform possible that both e-scooter and motor vehicle users should respect each other's rights. Awareness-raising measures such as informative and educational films or announcements should be intensively disseminated through the media. As another awareness-raising measure, the bad results of the incidents caused by not following the rules and not respecting each other's rights should be shared frequently in the media, and awareness should be raised. Likewise, good results from good practices should also be shared.

- Some habits can be very difficult, if not impossible, to acquire at the university level. This is why habits such as being considerate and careful in traffic or respecting women should be acquired at a young age. Children should be taken to traffic education parks from an early age, and awareness of safety in traffic and respect for other drivers and pedestrians should be raised.

In this way, respect for users of micromobility vehicles and women can be established to a certain extent.

- The habit of wearing a helmet should definitely be established, and the lack of a helmet should be severely punished.

- To encourage university students to use e-scooters, they should be given a discount on their cost or a student tariff should be charged.

- It should be emphasized that using e-scooters will contribute to creating a green environment, and students should be encouraged to use e-scooters as much as possible, at least on the roads that they find safe.

Today, e-scooters are faster than walking, cheaper and more environmentally friendly than driving, easier to access than taxis, and also enjoyable to use. They are preferred, especially by young people, for short-distance transportation. Depending on the place, they are regarded as the best mode of transportation for university students traveling short distances to and from campus. Since the campus where this study was conducted is too small to allow the use of e-scooters, the e-scooter habits of the students were examined only on the basis of their transportation to and from the campus. This issue constitutes a limitation of the research. Future studies on this subject can be conducted on a larger campus to examine students' on-campus e-scooter usage habits.

Researchers' Contribution Rate Statement

All stages of the study were carried out by the corresponding author.

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There is no conflict of interest to declare.

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