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Understanding Active Mobility and Micromobility in a Studentified Neighbourhood[1]

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ABSTRACT
Micromobility provides options for first and last-mile connections and shared vehicles (e-scooters, bikes, e-bikes) is becoming popular in the world. However, it is being used not only as first and last mile connection but also as the main mode of transport specifically among the young generations. Therefore, this research focuses on the young generation specifically in a studentified neighbourhood which usually encounters vehicle and pedestrian circulation problems and traffic congestion. For these reasons, this research investigates active mobility and micromobility together in a studentified neighbourhood. The primary data is collected through quantitative data with questionnaires (n=380), and qualitative data with interviews (n=15) among the İzmir Kâtip Çelebi University students and the residents of Balatçık Neighbourhood. Interviews are conducted with pedestrians, private and/or shared e-scooters users and cyclists. The data analysis reveals the importance of road safety and accessibility in mode choice between active mobility and micromobility in the studentified neighbourhood.
Keywords: Micromobility; Active mobility; Studentified neighbourhood; First-mile and last-mile; Electric scooters

HIGHLIGHTS
- One of the first studies to analyse micromobility in a studentified neighbourhood.
- Pricing, affordability and road safety are the main factors in micromobility mode choice.
- Road safety has a major negative impact on micromobility and active mobility.
- Residents and passersby have differing perceptions of the mobility problems in the neighbourhood.
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INTRODUCTION
Micromobility with human-powered or electric-powered micro-vehicles is a new trend for first and last-mile trips between public transport and final destination due to its several benefits including a healthy lifestyle, reduced carbon emissions and autonomy etc. (Oeschger et al., 2020). The micromobility vehicles do not only include privately-owned e-scooters and bicycles but also shared systems. In recent years with the technological improvements, changes in society and the introduction of private companies in the sector, shared systems became widely available and commonly used all around the world. Turkey had its first bike-share system that is integrated with public transport in 2011 in Kayseri (Kaybis, n.d.). Izmir launched its bike-share system 4 years after.

Although the first shared e-scooter system was introduced in 2017 in the US (Yang et al., 2021), it was not introduced in Turkey until late 2019 (Koca, 2019). It has been used by individuals more and more during the COVID pandemic as an alternative to public transport (Erbas, 2020). Since 2020, private and shared e-scooters have become fairly popular in Turkey specifically among the young generations due to providing flexible and rapid transport alternatives.

At this point, it is necessary to explain the existing economic condition and its impact on transport mode choices in Turkey. Passenger car ownership per capita in Turkey is 0,16 (TUIK, 2022a, 2022b). Car ownership per capita in Turkey is lower than many European countries due to petrol prices, car prices and additional taxes (Ceylan et al., 2018). Consequently, car ownership amongst the young population is low in parallel to overall dynamics. Therefore, public transport is the main transport mode among university students.

In order to investigate the micromobility and active mobility, this research focuses on a neighbourhood with a large number of student residents as the case study area; Balatçık Neighbourhood in Izmir, Turkey. The case study area is the home of the Izmir Katip Çelebi University (İKÇÜ). İKÇÜ was founded in 2010 and since then, the Balatçık neighbourhood has become the optimum residential area for students. Increasing the number of students in this particular settlement due to the location selection of higher education institutions has led to a process of changes on the physical, economic and sociocultural structures of Balatçık.

Within the scope of this research, the change on transport modes are observed as well. The new mode of transport and stops, such as expansion of the IZBAN metro line and new dolmus lines, are introduced to increase the connectivity of the neighbourhood with the rest of the city. However, the transport connections could not be seamless due to the property rights and policies. In consequence, the main stops are approximately 1.7 kilometres away from the campus. Thereupon, there is a need for alternative transport modes to make the connection more convenient such as private and shared micromobility vehicles.

Many of the micromobility studies have focused on the transport integration aspect with a single micro-vehicle approach (Adnan et al., 2019; Böcker et al., 2020; Tavassoli and Tamannaei, 2020). At this point, it needs to be emphasised that walking, e-scooters and cycling are studied together in this research. Moreover, active mobility and micromobility are not only discussed under the public transport integration but also as a main mode of transport due to the large number of students residing in the neighbourhood. Therefore, this research aims to fill the gap in the literature with investigating micromobility through a studentified neighbourhood from two aspects; *residents and passersby*.

This research proceeds as follows. The first section provides an overview of micromobility and studentification research. The second section explains the conceptual framework for this research by stating how these two bodies of research are tied together. The third section introduces the methodology and the case study area, Balatçık Neighbourhood, and how the process of studentification has been evolving during the last decade. The Fourth section presents the analyses of the primary data. The fifth section discusses the results of the research and provides suggestions of implementations and interventions for practitioners and policymakers. The final section gives the concluding remarks as well as suggestions for extending and expanding this research.

ACTIVE MOBILITY, MICROMOBILITY AND STUDENTIFICATION: INTERLOCKED PHENOMENON

In the search for a fix for common urban mobility problems such as congestion, carbon emissions and pollution in cities, micromobility is an innovative urban transport solution

for short-distance trips including first and last-mile travel (Abduljabbar et al., 2021; ITF, 2020). While reducing the dependence on private vehicles, micromobility provides an on-demand, sustainable and flexible transport alternative (Shaheen and Cohen, 2019). Micromobility vehicles include human-powered or electric-powered small vehicles weighing less than 350 kilograms and speeding no more than 45 kilometres per hour (ITF, 2020). They are seen as a convenient and innocent addition to the fossil fuel-dominated urban transportation sector. However, what they are used for and what kind of transport mode they replace have a substantial influence on the impact of electric-powered micromobility vehicles on the environment as replacing walking with electric-powered micromobility vehicles puts additional pressure on the environment (Hollingsworth et al., 2019; Laa and Leth, 2020).

The profile of micromobility vehicle users is also important as to how they use it. The majority of micromobility users are younger generations and particularly those who are between eighteen to twenty-four years old (Christoforou et al., 2021; Kaviti et al., 2019; Laa and Leth, 2020; Reck and Axhausen, 2021). There is also a considerable difference in usage between the groups who own their own micromobility vehicles and who rent shared vehicles. The study shows that owning a micromobility vehicle correlates with replacing private car trips with micromobility, which makes it a more sustainable mode of transport (Reck and Axhausen, 2021).

Urban mobility systems designed around motorised transportation have long been neglecting the needs and comforts of pedestrians in cities. However, in recent years, due to its potential benefit to a healthy lifestyle, increased physical activity and reduced reliance on motorised vehicles, the interest in walking as a form of transport is growing (Dill et al., 2014; Gehl, 2010; Zhao and Wan, 2020). Although walking in the literature is investigated through different types of walking (commuting, recreational, sport etc.), only walking for commuting is examined here in line with the purpose of this research. For cities, walking distance to public transport networks is an important aspect to consider in order to promote public transportation as opposed to regular private car trips within cities.

The literature shows that the acceptable distance to public transport varies between 400 metres and 800 metres depending on the public transport mode, ability and preferences of people (Agrawal et al., 2008; Daniels and Mulley, 2013; van Soest et al., 2020). Moreover, several studies also proved that people's perceptions of distance are affected by the walkability of a route (El-Geneidy et al., 2014; Jiang et al., 2021; Park et al., 2015), which strongly correlates with the physical quality and safety of a neighbourhood (Zhao and Wan, 2020).

Looking at the purpose of micromobility and the profiles of the users, the higher education students and the areas with high student presence call attention to investigating the effects of active and micromobility on a neighbourhood presenting the process of studentification. At this point, it needs to be detailed how the settlements and transport dynamics got affected by the concentration and an increasing number of students; studentification.

When the number of students in a particular settlement increases due to the location selection of higher education institutions, it leads to a process of changes in the physical, economic and sociocultural structures of the neighbourhood. This process is discussed in the literature, mainly in the Global North, over the concept of 'studentification' as a form of gentrification (Smith, 2004; Smith and Holt, 2007; Smith and Hubbard, 2014).

In the literature, the effect of studentification on the local economy, increasing housing values, and diversifying and increasing economic activities has been widely examined (Allinson, 2006; Fabula et al., 2017; Hubbard, 2009; Rugg et al., 2004, 2002; Sage et

al., 2013; Smith et al., 2014). Existing literature mostly explains the physical change in the neighbourhood created by studentification by the change in the housing stock such as the conversion of single-family houses to multiple occupancy houses in accordance with the needs of students (Allinson, 2006; Garmendia et al., 2012; Grabkowska and Frankowski, 2016; Gregory and Rogerson, 2019; Hubbard, 2008; Situmorang et al., 2020). Another physical change brought up in the literature is the intensified vehicle and pedestrian circulation, traffic congestion and insufficient parking spaces (Ackermann and Visser, 2016; Smith and Holt, 2007). Although it is worth noting that private car ownership among higher education students is not very significant in other geographies as in North America, it is essential to scrutinize the use of different modes of transport and mobility in studentified areas. However, it appears that the concepts of active mobility, micromobility and studentification have not been investigated together until now. Therefore, the aim of this research is to explore micromobility and active mobility in a neighbourhood that is currently going through a studentification process.

METHODOLOGY

The primary goal of this research is to investigate active mobility and micromobility issues in a neighbourhood experiencing studentification processes. As mentioned in the literature review, investigating alternative modes of transport and mobility in studentified neighbourhoods are crucial to reaching safe and accessible active mobility and micromobility. In this research, the term of accessibility covers physical and economic access together.

The primary data includes quantitative and qualitative data that is collected through a fieldwork study involving questionnaires, interviews and observations from September to November 2022, the first three months of an academic year.

The quantitative data collection was conducted through questionnaires (n:380 students). The students were reached out through their official university email addresses. The main points of the online questionnaire are to reveal students' perceptions, behaviours, and motivations to prefer active mobility, and shared and/or private micromobility vehicles in their daily commutes to the campus. Therefore, the questions are designed under three parts;

- Socio-demographic questions (e.g., year at the university, department, residency)
- Commuter behaviour (e.g., transport modes, stops)
- Mobility in the neighbourhood (e.g., transport modes, safety, sidewalks).

These answers are evaluated with descriptive and inferential statistics which includes correlation. As the second step, the fieldwork with the direct observation method is undertaken in two phases in September and October 2022 for a week in each period. During the fieldwork, both researchers aim to observe the area on two sides; active mobility / micromobility and studentification aspects. The fieldworks are undertaken to assist the understanding of the neighbourhood dynamics and attributes, which are recorded with photographs and dairies.

The qualitative data was collected with semi-structured interviews. All the interviews were conducted in Turkish and translated into English by the researchers. The interviewees are structured under three categories based on the active mobility and micromobility vehicles; pedestrians (n=5), e-scooter users (n=5) and cyclists (n=5). All 15 interviews were conducted in November 2022.

Table 1 Demographic characteristics of interviewees

Interviewee ID*	Gender	Age	Profile**	Where do they live?
P1	M	23	Student at İKÇÜ	Balatçık (KYK)
P2	F	21	Student at BU	Balatçık (KYK)
P3	F	21	Student at İKÇÜ	Çiğli
P4	F	23	Student at İKÇÜ	Balatçık (KYK)
P5	F	23	Student at İKÇÜ	Balatçık (KYK)
S1	M	21	Student at BU	Balatçık
S2	F	23	Student at İKÇÜ	Balatçık
S3	F	21	Student at İKÇÜ	Balatçık (KYK)
S4	M	21	Student at BU	Balatçık
S5	M	23	Student at İKÇÜ	Balatçık
C1	F	27	PhD Student at İKÇÜ	Bayraklı
C2	M	40	Balatçık Resident	Balatçık
C3	F	38	Academic staff at İKÇÜ	Balatçık
C4	M	68	Business owner in Balatçık	Balatçık
C5	M	23	Student at İKÇÜ	Balatçık

*Pedestrians are named as P; e-scooter users are named as S; cyclists are named as C.
** İKÇÜ refers to İzmir Kâtip Çelebi University; BU refers to Bakırçay University; KYK refers to the state-owned dormitories.

The interviews are started with the same closed-ended questions to understand the profile of the interviewees such as gender, age, residency, where they work and/or study. The demographic characteristics of the interviewees are listed in the table below. In the second part, they were invited to explain their motivation, whether there are any restrictions for them and whether they have safety concerns. At the end of the interviews, the participants' recommendations for improvements are asked regarding active mobility and micromobility in the area. Overall, the data collection and analyses are capitalised in the table below.

Table 2 Primary Data

	Primary Data		
	Quantitative Data	**Fieldwork**	**Qualitative Data**
Method	Questionnaires	Direct observation	Interviews
Data Collection Period	September-October 2022	Phase 1: September 2022	November 2022
		Phase 2: October 2022	
Sample Size	n=380	Recording with photographs	n=15
Analyses	Descriptive and inferential statistics	Mapping	Thematic content analysis

The Case of Balatçık Neighbourhood, İzmir

Before focusing on the analysis part, the case study area and its context are provided. Balatçık Neighbourhood is located in Çiğli District, the northern part of Izmir. As shown Figure 1, Road D550 (Anadolu Caddesi) and the IZBAN is located in the western part of the neighbourhood. İZBAN is the railway that connects the north and the south edges of the city to the centre. pass through the neighbourhood and the main campus of İKÇÜ The campus area was previously owned by 'Tobacco Leaf Processing Factory' and it was transferred to the İKÇÜ in 2011 (İKÇÜ, 2017). It is significant to highlight that the

Balatçık Neighbourhood is overall 300.18 hectares and one-fifth of the neighbourhood belongs to the university.

The most significant features of the campus are its *edges.* While the Egekent station of IZBAN connects the neighbourhood and the university to the rest of Izmir, the rail tracks create an edge in the neighbourhood. In parallel to the train line, the main road (Anadolu Avenue) creates the second edge on the east side of the campus. The university is surrounded by Çiğli Air Base in the west, Ege Industrial Zone in the north, and Izmir Atatürk Organised Industrial Zone in the south. It needs to be highlighted that the dental hospital of the university is being relocated to the northern part of the university which has a border with Balatçık as well. Because the main campus area is confined by other restricted areas, the only potential residential area for the students is Balatçık.

Figure 1 Balatçık in Izmir and Balatçık Neighbourhood Administrative Area (Source: Google Maps, 2022 and Authors, 2022)

Transport and connectivity
IZBAN is known as the backbone of the Izmir transport system. It connects the city from the north to the south and 21 of its stops (41 stops in total) also have bus stops, which function as transfer hubs. Students who take a means of public transport to reach the campus, need to walk to the campus ~1.7 kilometres which takes approximately 15-20 minutes on foot. Another option to reach the campus from a public transport stop is using a micromobility vehicle.

While this research was being conducted, Izmir Metropolitan Municipality announced a new IZBAN station for the university in August 2022. This new station is named after the university as Katip Çelebi University stop which will provide access to the main entrance of the campus and will be approximately one kilometre to the entrance and 1.5 kilometres to the centre of the campus (İzmir Metropolitan Municipality, 2022). Moreover, the Çiğli Tramway project has been approved in 2020 by the Ministry of Transport and Infrastructure (Tram İzmir, 2020). With this project, the connection of the campus with the city centre of Izmir will be improved.

Campus area
The campus has 3 main entrances; North, South and East entrances. The East entrance is used more than others due to the closeness to the shops and the İZBAN train station. The campus is approximately 60 hectares and the distance between the centre of the campus and the main transport stops are approximately 1.7 km.

Micromobility in the neighbourhood is investigated under three main categories in Balatçık Neighbourhood; walking, scooter and cycling. The researchers observed only one skateboarder in the neighbourhood during the fieldwork. However, there were no skateboarder among 380 participants; therefore, skateboarding is excluded from the research. Based on the direct observations and interviews, the busiest routes between the main stops and the campus are marked in the figure below. The university has 3 main entrances which are indicated with blue dots. The North Entrance is used by the students and the employees who commute with their private vehicles, take dolmuses and/or buses. However, the İZBAN İKÇÜ stop is planned to serve the main campus and Dentistry Faculty which is under construction at the moment. The dashed red and orange lines represent the most preferred walking routes between the main transportation stops and classrooms on the campus. The calculations are done based on the classrooms due to the large university campus.

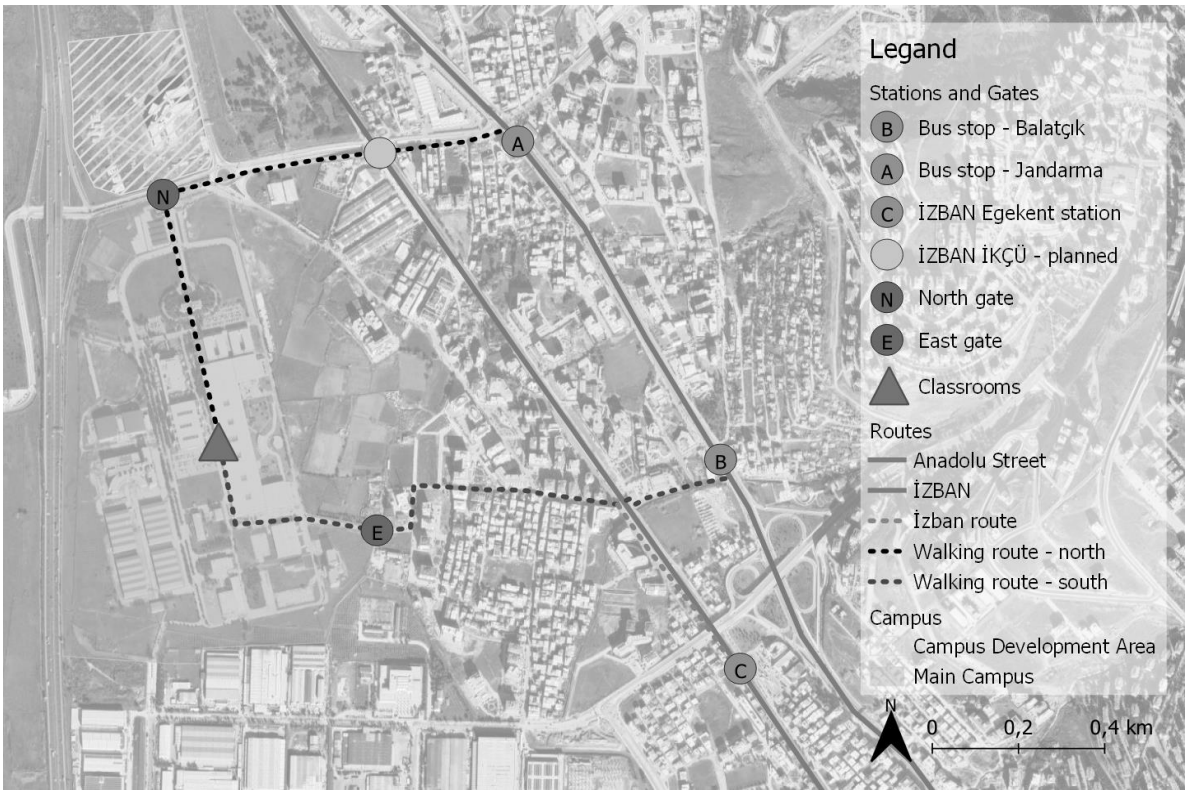

Figure 2 Main transport stops and routes

Student population

Balatçık neighbourhood is located in Çiğli District, the northern part of Izmir, which was a rural settlement until the 1990s. Then, with the population increase and expansion of the city, it became a district of İzmir in 1992. However, the Balatçık neighbourhood of the district sustained its rural characteristics up until the 2010s. The urbanisation of the neighbourhood has been accelerated with the foundation of İKÇÜ as seen in Figure 3.

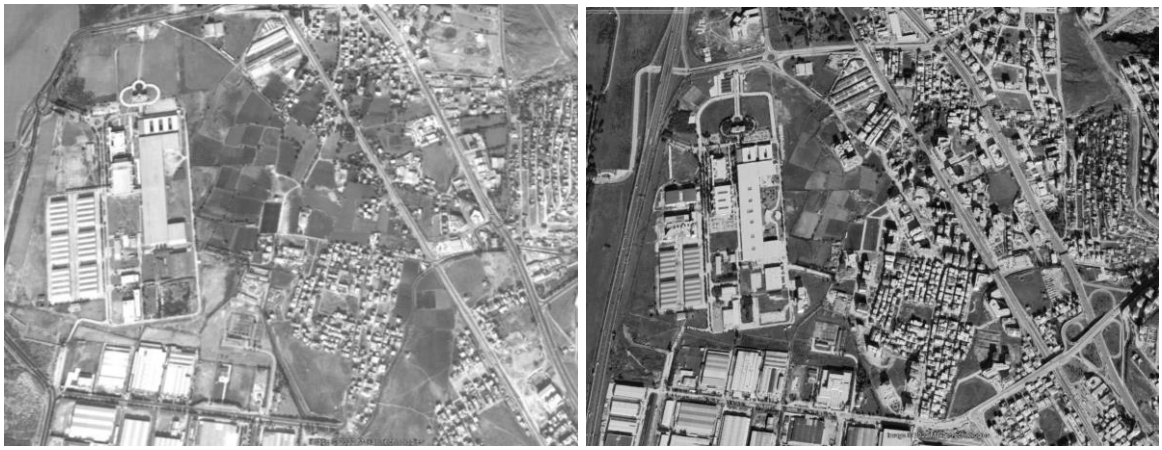

Figure 3 Balatçık Aerial Photos from 2010 (left) and 2022 (right) (Source: Google Earth)

As can be seen in Figure 4, the number of students on the main campus has been increasing rapidly during the last decade. 11,347 students studied in the main campus in undergraduate programmes in the 2020-2021 academic calendar (İKÇÜ, 2022). It needs to be highlighted that the decrease in 2020 can be linked to online teaching due to the COVID-19 restrictions. Universities all over Turkey give the right to students to apply for a 'COVID-19 term leave of absence' which is not to be counted towards students' over all semesters (YÖK, 2020). In parallel with this, the registered students are dropped in İKÇÜ as well.

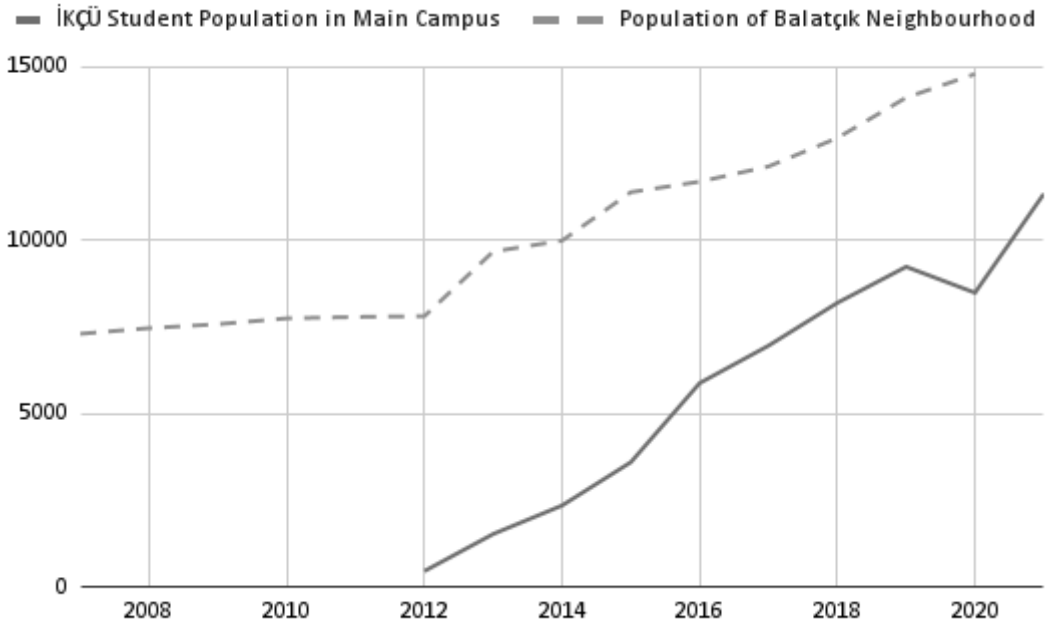

Figure 4 Population Change in Balatçık Neighbourhood and İKÇÜ (Source: İKÇÜ, 2022 & TUIK, 2022)

Based on the TUIK micro dataset in 2021, 20.78% of the neighbourhood population is in the 20-24 age group which is the largest age group since 2012 (TUIK, 2022c). In parallel with this demographic change, not only the new housing development but also the new retail shops popping up in the neighbourhood have been targeting the student population. The new housing stock mainly has been designed as student-oriented apartment complexes with one and two-bedroom flats. Even though a transformation of existing shops has not been observed due to previously being a small neighbourhood, the

retail sector and new services are shaped by students' needs since 2011 such as cafes, gaming cafes, take-away shops etc.

ANALYSIS

The majority of the students use public transport modes to reach the closest stop during their commute. After that point, they use alternative modes to reach their final destination, the university campus as shown in Table 3. However, a huge student population is also living in the Balatçık Neighbourhood. Therefore, the analysis is conducted from two aspects; *residents' and passersby's* perceptions due to the changing dynamics and mode of choices.

Walking

The questionnaires and the direct observations show that passersby; three third of the students (75%) walk between the campus and the public transport stops (mainly IZBAN). While nine per cent stated that they take a bus, 17 per cent stated that they either walk or take a bus depending on the time as seen in Table 3. Since the scheduled bus service between IZBAN and the campus is not frequent, some students prefer to walk instead of waiting for a bus.

Table 3 Main mode of travel

After the main transportation, how do you reach the university?								
			I walk		**I take a bus**		**Both**	
Main Mode of Travel	n=380	%	n	%	n	%	n	%
IZBAN	122	32.11	89	73.55	11	9.09	21	17.36
Bus	56	14.74	22	75.86	2	6.90	5	17.24
Dolmus	2	0.53	1	50.00		0	1	50.00
Walking	175	46.05						
Cycling	2	0.53						
Private Car	23	6.05						

Based on open-ended questions on the questionnaire, the most encountered problems by the passerby students are *the physical condition of the sidewalks*, *the distance*, and *the stray dogs.*

The most mentioned problems regarding the physical condition of the sidewalks are the fact that sidewalks are narrow and uneven, occupied by items from shops and cafes in some places, and even not reaching up to the campus gate. The distance between the campus and IZBAN is approximately 1.7km. The students pointed out that distance is one of the main problems with walking and stated that they already feel tired when they reach the classrooms in the morning. Walking such a long distance becomes even more uncomfortable on hot days as there is no shading or trees on the route. The average temperature during the daytime between May and October in İzmir where İKÇÜ is located is around 30 degrees Centigrade.

Another problem the resident and passersby students referred to is that they feel insecure while walking due to a large number of stray dogs in the area. This issue with stray dogs is also mentioned in the interviews with the cyclists.

The encountered problems with walking raised by the students residing in the Balatçık neighbourhood are mostly the same; the physical conditions of the sidewalks and the stray dogs. However, this group also mentions unregulated traffic in the area. One particular junction that also functions as a square of the neighbourhood is pointed out by many responders. As can be seen in the figure below, the junction with six converging

streets and an undefined rectangular space creates confusion not only for pedestrians but also micro vehicle users.

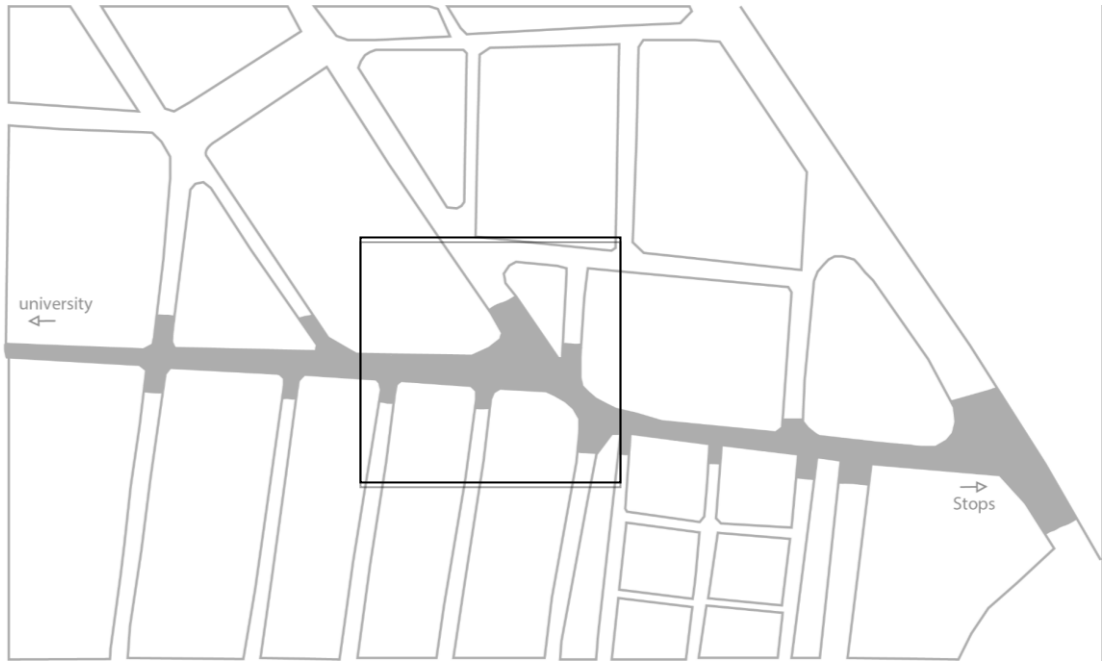

Figure 5 Unorganised intersection

> *'Traffic is a bit of chaos in Balatçık. Pavements are occupied by vehicles. We have to walk on the road. When you walk down the road, often cars threaten pedestrian safety by driving too close.'* (P1)
> *'Many cars are passing [through the junction]. You have to be careful on that road.'* (P3)

E-scooter riders

E-scooters have rapidly become part of mobility in Turkish cities since 2019 (Koca, 2019). Therefore, the major cities in Turkey such as Istanbul and Izmir met with scooter-sharing systems without having any time to plan and prepare the cities in physical and legal aspects. Several shared e-scooter schemes are introduced in İzmir. However, only one of them serves the Balatçık Neighborhood and the İKÇÜ main campus when this research is conducted between September and November 2022. The shared e-scooter system has 50 scooters in the neighbourhood which is distributed around Balatçık (Link, 2022). Students use their micromobility vehicles in the neighbourhood and the campus.

When the primary data was collected through the questionnaire, there was no-scooter rider among the participants. However, as seen in Figure 6, the researchers observed several privately owned and shared e-scooter in the neighbourhood. Some residents and passerby students ride the shared e-scooters to their final destinations or the nearest transit stop to reduce the commuting time of their first and last-mile trips. Therefore, several e-scooter riders were reached out with the interviews.

Figure 6 E-scooters in the Neighbourhood (Source: Authors, 2022)

There are two main problems raised by residents and passersby students in connection with micromobility vehicles: road safety and accessibility.

Road safety

The last but not least point to highlight is safety. The existing E-scooter Regulation (2021) plays a crucial role in e-scooter safety issues (Republic of Turkey, 2021). The restriction is stated in Article 5. It is forbidden to use on pedestrian paths; however, if there is a separate bike path or bike lane, the e-scooter shall not be used on public roads Article 5 (1) and (4). In addition to that, Article 5(8) put restrictions on the users regarding parking; 'Parking in a way that violates public order violates private property, and prevents safe and independent movements, vehicle and pedestrian traffic of pedestrians, the disabled or people with reduced mobility is forbidden'. In addition to that, Izmir Metropolitan Municipality has regulated e-scooter systems since 2021 (İzmir Metropolitan Municipality, 2021).

Safety issues are investigated during the interviews as well. All the interviewees who are e-scooter users have the same concerns about traffic; road safety and road quality. As mentioned above, e-scooters are forbidden to use on pedestrian paths. However, they highlighted that car drivers do not respect e-scooters.

> *"Vehicles do not pay any attention to scooter users; therefore, it is dangerous* [for e-scooter users]*."* (S4)

Two of the scooter riders mentioned the road quality and road surface material which affects the safety of e-scooter riders.

> *"There are a lot of bumps and potholes, so it's not very suitable for scooter use."* (S5)
>
> *"The roads are not very suitable for scooters, especially the interlocking paver block section [the most preferred walking route]."* (S1)

Accessibility

The existing e-scooter sharing system does not have an unlock fee and charges 1.89TL per minute. This company is a private one and it is not subsidised by the district or the metropolitan municipality. From the university to the IZBAN metro station cost approximately 15 TL (0,78 Euro as of 11/23/2022) for one way. One of the interviewees who uses the e-scooter sharing system and also owns his own e-scooter complains about the pricing of the shared system. Also, he emphasises that they should have discounted pricing for students.

> *"When we travel for 10 minutes, it costs 16-17 liras. There is also an opening fee. It's 18-19 liras. Let's round it up to 20 liras. A 10-minute journey shouldn't be 20 liras. A student discount may apply."* (S1)
>
> *"The most troublesome issue is e-scooter fees. It costs an average of 10-15 TL from IZBAN [the train station] to the university."* (S2)

In the physical accessibility aspect, none of the participants mention the number of shared e-scooters whether it is enough or not for the neighbourhood. The shared scheme was introduced recently in the neighbourhood; therefore, it might be claimed that it has not reached its popularity yet.

Cyclists

The questionnaires and direct observations reveal that there are limited cyclists in the neighbourhood when we compare them with pedestrians. Only six per cent of the questionnaire participants cycle who are passersby. 94 per cent of students do not prefer to use bicycles due to not owning a bike (46.28%), not feeling safe (22.31%), and not needing to cycle (14.87%). In addition to these, all the interviewees who cycle state the same concern; not having a safe cycling environment.

As mentioned in the previous section, two main problems are raised by the students regarding e-scooters. The same issues are stated for cycling as well: road safety and accessibility.

Road safety

An interviewee shared her safety aspect as a woman cyclist. She states that having student residents in the Balatçık Neighbourhood increases the perception of neighbourhood safety and security.

> *"For example, as a woman, there are no safety issues with cycling and riding at any hour. Because it* [Balatçık] *is a place where there are many students. So, you feel the spirit of the students there. Generation Z has reflections. So, there is no problem with security, to be honest. It's about road safety."* (C3)

The same interviewee points out that the safety issues are related to road safety not to the safety of the neighbourhood. She highlighted the quality of the roads and continues change on the roads in the neighbourhood. However, she is aware that even though this is the municipality's responsibility, it is common in developing areas in Turkey.

> *"Since Balatçık is a newly developing area, there are many ongoing constructions such as streets and sidewalks. One day, you see* [the road as] *asphalt, then it becomes soil, then a pit. It is related to the municipality."* (C3)

Another passerby cyclist emphasised the same issue about the unfinished construction and road safety.

> *"It's a problem that the roads are constantly changing as there is a lot of construction around the campus."* (C1)

Accessibility

As mentioned earlier in this research, the term of accessibility covers physical and economic access together. While physical access is scrutinised as infrastructure and services; economic access is examined for the affordability of micro vehicles.

Bicycles and personal mobility vehicles are not only allowed in public transport but also free of extra charge in Izmir (ESHOT, 2017; İZBAN, 2022). There is no restriction regarding the type of vehicles. However, based on the interviews, whereas the passersby cyclists use their foldable bikes, the residents prefer to use their road bikes.

The existing infrastructure in the neighbourhood is not convenient for sustainable transport modes. For instance, the lack of designated/segregated bike paths, lack of bicycle racks, and not taking part in a bike-share programme puts off people who otherwise might cycle or use scooters in the neighbourhood. In the case of the campus, there are also limitations such as entrance and bike racks.

One of the interviewees points out that neither cyclists nor e-scooter users are taken into consideration at turnstile passes as seen in Figure 7.

"*There is no place for cyclists* [at turnstile passes at university entrances]. [They are] *suitable for pedestrians only. The issue starts there. Because it isn't designed for me* [as a cyclist]." (C3)

Figure 7 Turnstile passes at east entrance (Source: Authors, 2022)

At the campus level, the existing bike racks in the campus are marked in Figure 8. As can be seen in the figure, there are five cycle parking areas on the campus; one bike rack in front of the Library, two bike racks in front of the Engineering and Architecture Faculty, one bike rack in front of Central Lecture Halls A-B, one bike rack in front of Central Lecture Halls E1-E2. Due to their design, the capacity of bicycle parking cannot be calculated precisely; however, each of them can host approximately 20 bicycles. During the fieldwork, bicycles tied to trees and stair rails drew the researchers' attention. It might be linked to not having enough bicycle parking areas at the various locations on the campus as shown in Figure 8. An interviewee complained about this issue; not having enough bicycle parking areas on the campus.

"There should be more bike racks on the campus. It was in the back [east side], they even removed it. I don't understand why they removed it." (C1)

Figure 8 Cycle parking in the campus and bicycles parked in unauthorized areas in the campus (Source: Authors, 2022)

Another point to discuss under the infrastructure section is the bike-share program. İzmir Metropolitan Municipality established a bike share program (BISIM) on January 18th, 2014 which is publicly owned and operated by one of the companies of the municipality,

IZULAŞ (BISIM, 2022). BISIM has 60 active stations as can be seen in the figure below. Most of the stations are located at the quayside for recreational purposes other than transport and micromobility. In addition to that, the existing bike share program does not serve the case study area. However, as can be seen on the map, there are a couple of bike stations in Bornova and Buca where Ege University and Dokuz Eylül University are located and many students live. The interviewees bring attention to the need for an extension of the bike-share programme in Balatçık as well.

"I think BISIM bike share [programme] should be expanded [to Balatçık]" (C5).

The bike-share programme might change the dynamics of the neighbourhood by providing an affordable option for students.

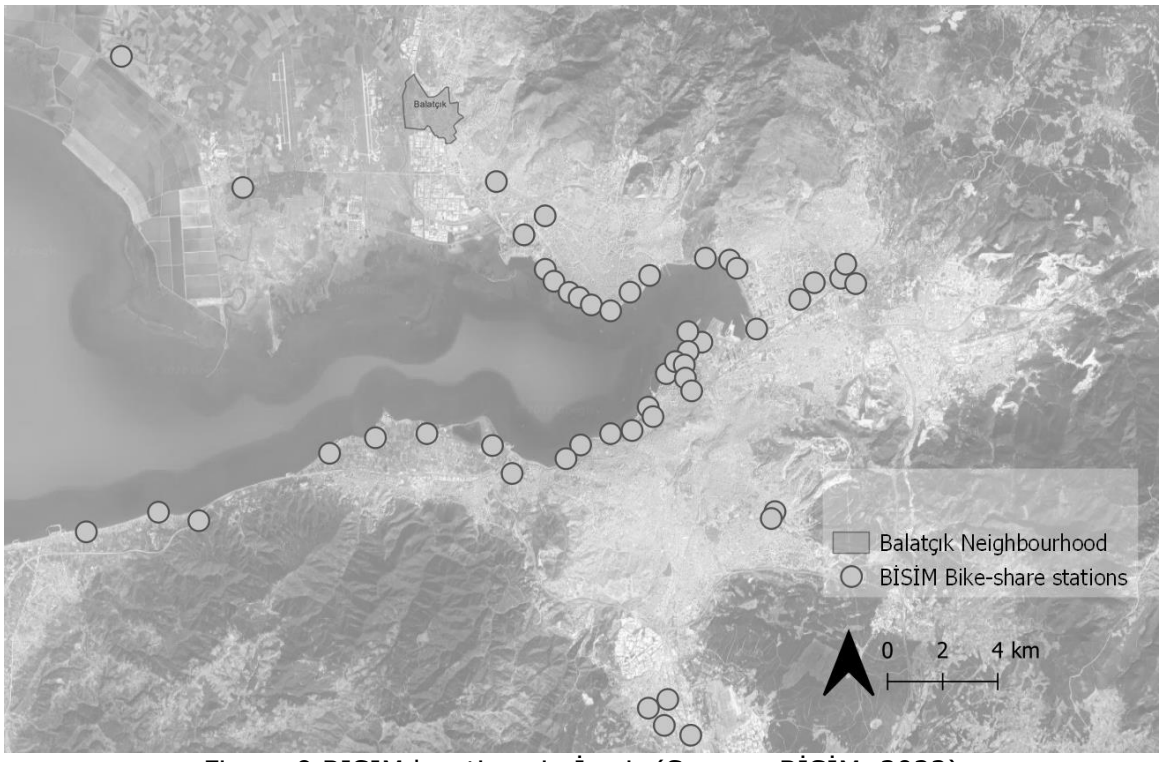

Figure 9 BISIM locations in İzmir (Source: BİSİM, 2022)

Based on open-ended questions on the questionnaire regarding why the participants do not cycle, the most encountered problems are *too* expensive *to buy bicycles, no second-hand bicycle market, and no bike-share scheme in the neighbourhood.* In parallel with this topic, the researchers asked the following questions to the participants; 'if there was a bike-share scheme in Balatçık with the existing infrastructure, would you prefer to use it?'. 60 per cent of students stated that they would like to use a bike share program with only segregated bike lanes.

DISCUSSION

This research has explored some of the active mobility and micromobility dynamics of a studentified neighbourhood, Balatçık and primarily focused on the road safety and accessibility aspects.

The literature shows that the acceptable distance to public transport varies between 400 metres and 800 metres depending on the public transport mode, ability and preferences of people (Agrawal et al., 2008; Daniels and Mulley, 2013; van Soest et al., 2020). As shown in Figure 2, the main road for students to reach their campus buildings from Anadolu Caddesi and Egekent IZBAN train station is approximately 1.7 km long. Due to the lack of alternative and consistent public transport options between these most used

stations and the campus, the majority of the students opt for walking this uncomfortable distance twice a day. However, the issue with the route is not limited to the distance. The same route is not just used by pedestrians but also by e-scooter users, cyclists and private cars. The current width of neighbourhood streets accommodates pedestrian paths and public roads but not segregated cycling paths. Therefore; pedestrians and micromobility vehicle users do not feel safe due to not having continuous sidewalks, and segregated micromobility vehicle paths.

Although the results of the study overlap with the literature suggesting that the physical quality and safety of a neighbourhood are closely linked with the walkability of a route (Zhao and Wan, 2020), the participants expressed that they still prefer to walk as opposed to micromobility for two reasons. First, they feel micromobility is not safer than being a pedestrian due to the lack of segregated routes/lanes. Second, they are not able to afford to possess/rent a micromobility vehicle.

Micromobility provides an on-demand transport alternative (Shaheen and Cohen, 2019) which is preferred mainly by younger generations, specifically those who are between eighteen to twenty-four years old (Christoforou et al., 2021; Kaviti et al., 2019; Laa and Leth, 2020; Reck and Axhausen, 2021). As we mentioned earlier, the case study area is a studentified neighbourhood and university students have flexible timetables. Therefore, they prefer on-demand rather than fixed-time transport options. Accordingly, micromobility development in the neighbourhood has great potential as it serves short-distance trips including first and last-mile travel (Abduljabbar et al., 2021; ITF, 2020).

In addition to that, some of the participants, particularly the ones who reside in the neighbourhood, state that they use micromobility as their main transport mode within the neighbourhood while others express that they would use micromobility once road safety and accessibility issues are addressed.

Suggestions for policymakers and practitioners

Micromobility has the potential to improve connectivity within the neighbourhood, not just for students but also residents in general. Therefore, taking into consideration of the participants' road safety and accessibility concerns and researchers' observations, the following suggestions are made.

İzmir Transport Master Plan 2030 aims to support public and sustainable transport options (IMM, 2017). Based on the Master Plan, pedestrian paths and zones should be the priority. However, as can be seen in the analysis part, Balatçık is a developing area and either the pedestrian paths are not completed or they are occupied by shops and restaurants. In addition to that, the plan does not have any decision or plan about either privately-owned or shared e-scooter systems due to being a recent trend in urban mobility. However, the city has had the Bisim bike-share system since 2014. However, it does not serve the neighbourhood. Therefore, suggestions for policymakers are listed in the table below under two main categories; road safety and accessibility.

While the existing e-scooter system in the neighbourhood is dockless, a potential extension of the existing bike share system (BISIM) would have docks. Although having designated docking stations for micromobility vehicles would be preferable for local authorities due to increasing complaints (Fang et al., 2018; James et al., 2019; Shaheen and Cohen, 2019), it would provide better service to have various and well-distributed micro-hubs. Additionally, micromobility vehicles accessed and/or parked not only at a couple of designated main hubs but at various micro-hubs would help to avoid additional obstacles for pedestrians on sidewalks and also increase accessibility.

Table 4 Suggestions for policymakers and practitioners

Road Safety	*Pedestrian safety:* 8788th and 8910th streets (see Figure 2; from C to E) should be car-free and re-organized for pedestrians, cyclists and scooter-riders.
	Micromobility lanes: Alternative and segregated micromobility routes between the campus and the public transport hubs should be designated.
	Parking zones: Designated micro-hubs for parking dockless micromobility vehicles should be enforced for reducing sidewalk and bike path blockages.
Accessibility	*Extension of the shared micromobility:* The existing bike share program with dockless system and e-scooter sharing system should be extended in the neighbourhood and in the campus with the collaboration of İKÇÜ and the municipality.
	Long-term micromobility vehicle rent: To have budget-friendly systems for students, the University should launch term-long bicycle and scooter rental programmes. Additionally, the bike share and e-scooter systems can be subsidized by the municipality for the students.
	Integrated payment between transport modes: Transit integration between public transport and micromobility vehicles should be supported with smart technology such as the city's official public transport mobile application and smart card (İzmirim Card).

CONCLUSION

The research scrutinises active mobility and micromobility through the studentified neighbourhood in a Turkish city. The results show us that most of the residents and passerby students have been looking for alternatives for their micromobility in Balatçık and they have similar yet differing perceptions of the mobility problems in the neighbourhood.

While residents and passerby pedestrians highlight the following issues; *the physical condition of the sidewalks*, *the distance*, and *the stray dogs;* residents stress the unregulated traffic in the area. While students are keen to experience micromobility vehicles, road safety and accessibility concerns, specifically not having segregated bike paths and the ability to finance, discourage them. E-scooter riders remark that not only road safety but also the quality of road pavements impacts their driving comfort and overall safety.

The main limitation of the study is the data collection process of the research. The research would benefit from the actual data of users' profiles and usage patterns from micromobility companies servicing the neighbourhood. It would have been used to understand the routes and distribution among the resident and passersby students. The second limitation is based on the generalisation of the research findings. The majority of collected data was on pedestrians' mobility behaviours and perceptions. Therefore, the micromobility section could be accepted as a preliminary result of the research. However, these preliminary findings on micromobility and active mobility in a studentified neighbourhood can lead to future research. Additionally, for extending and expanding this study, optimal improvement strategies and design suggestions on road safety and accessibility for pedestrians and micromobility vehicle users would be investigated.

Credit authorship contribution statement

Ozge ERBAS MELIS: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Roles/Writing - original draft; Writing - review & editing.

Duygu OKUMUS PRINI: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Resources; Software; Supervision; Validation; Roles/Writing - original draft; Writing - review & editing.

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