



Micromobility users' perception of safety and comfort of different cycling infrastructure and pavement configurations

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In recent years, there has been a noticeable shift towards a more sustainable urban mobility model. This transition encompasses the adoption of personal mobility vehicles, such as bicycles and stand-up electric scooters (e-scooters). However, this shift has prompted concerns regarding the comfort and safety of the infrastructure for users of these modes of transportation. Therefore, the objective of the presented study is to evaluate users' perceptions in order to address these concerns effectively.

An online survey comprising four sections was designed. The first section was dedicated to collecting demographic information from respondents (such as age, gender, and experience) to facilitate effective characterization and contextual understanding of the results. In the second section, participants were prompted to assess their perception of safety regarding both meeting and overtaking manoeuvres across eleven different configurations of cycle tracks. The third section focused on their comfort perception concerning five common pavement typologies frequently encountered on bike lanes. Lastly, the fourth section aimed to measure perception of comfort regarding the presence of singular elements (e.g., manhole covers) across four different types of pavements.

Each section was structured to include: (i) the description of the situation, (ii) images illustrating the scenarios under assessment, and (iii) the 5-level Likert scale. For safety assessments, respondent rated their perception of risk from 1 (lowest perceived risk) to 5 (highest perceived risk). When evaluating comfort, a rating of 1 signified “very uncomfortable”, whereas a rating of 5 signified “very comfortable”.

A total of 120 responses were received, with respondent ages ranging from 18 to 67 years old, the majority of whom were under 28 years old (65.8%). Although the survey was focused on micromobility users, respondents were asked about the most commonly used vehicle in urban areas. In response to this question, the distribution by modes of transportation was: 53% by bicycle (public or private), 20% by public transport, 14% by car, 8% by e-scooters, and 5% by motorcycle. The rest of the survey respondents stated that they primarily travel by walking. Therefore, 61% of the survey individuals reported using some form of micromobility vehicle. Among them, 86% use bicycles and 14% use e-scooters.



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Regarding the frequency of micromobility vehicle usage, 30% of participants travel less than 3 km per day, while 32.5% travel between 3 and 5 km per day, 25% travel between 5 and 10 km per day, and the remainder travel over 10 km per day.

They were also queried about the purpose of their trips using micromobility vehicles. Leisure emerged as the primary reason for over half of the trips, followed closely by work and study commitments (each at 40%). Shopping ranked as the fourth most common reason, with sports being the least cited.

Regarding risk perception, both overtaking and meeting manoeuvres showed similar results. While it might seem that bike lanes on the roadway are considered the most dangerous, respondents indicated that, for these types of manoeuvres, the most hazardous bike lanes are those located near parking lines, especially when parking is in perpendicular spaces. Also considered high-risk are bike lanes situated on the median separating two directions of motor vehicle traffic flow when they are at sidewalk level without separating elements from motorized traffic. Those considered safest for these manoeuvres are those located away from motorized traffic, both on sidewalks and medians, and those on the roadway with separating elements.

Risk perception when performing both manoeuvres is very similar among men and women, except when the bike lane is very close to motorized traffic. In these cases, women's perception of risk is significantly higher than that of men.

In terms of pavement comfort, continuous pavements are considered as the most comfortable, with asphalt being preferred over concrete pavement. The comfort of modular pavements is rated lower. In this case, longitudinally oriented cobblestones pavement was considered acceptable, though with a notable portion of dissatisfactory answers. Conversely, square tiles and transversally oriented cobblestones pavement were perceived as notably uncomfortable. This assessment is similar for both men and women, whereas in the case of continuous pavements, the difference between them is significant, with women perceiving greater discomfort.

Considering the presence of singular elements, the comfort reported by both men and women is very similar in the case of modular pavements. However, for continuous pavements, the presence of singular elements results in a decrease of one point in comfort for both genders.

Hence, in the planning of new infrastructure, authorities should advocate for the use of continuous pavements, which are considered to be more comfortable. Moreover, it is crucial to minimize the excessive presence of singular elements such as manhole covers on these paths.

The administration should also strive for this new infrastructure to be located away from motorized traffic, as it poses the least risk perception for respondents for the studied manoeuvres, especially in the case of women.

This research is part of the research project PID2019-111744RB-I00, funded by MCIN/AEI/10.13039/501100011033, and partially funded by the FPU21/03675 contract from the Ministry of Universities, awarded to Víctor Just-Martínez to carry out his doctoral thesis.