

Protective behaviours of e-scooter riders in five countries

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1 INTRODUCTION

Micro-mobility use, such as electric scooters (e-scooters), offers convenience and environmental benefits (Christoforou et al., 2021; Vestri, 2021) and it has increased over the last five years following the introduction of shared e-scooter schemes in the United States in 2017 (Christoforou et al., 2021). Following the introduction of shared e-scooters there has been an observed increase in the number of people choosing to use personal devices (Haworth et al., 2021). E-scooters are typically used more for transport (Sanders et al., 2020), often replacing active travel modes than motor vehicle use (Sanders et al., 2020) although that is location-dependent (Wang et al., 2022). The use of shared and personal e-scooters is primarily associated with travel time and money savings, as well as the enjoyability of the transport mode (Christoforou et al., 2021).

Perceived lack of safety has been shown to influence consumer acceptance (Kopplin et al., 2021). E-scooter riders have been shown to be at risk of trauma to the head and extremities (Bauer et al., 2020), although little is known about the events leading to trauma (e.g., fall as a result of rough terrain, collision with a vehicle). Protective equipment can reduce the risk of incidents (e.g., improving visibility of vulnerable road users) or lessen the risk of injury (e.g., helmets). Generally, little is known regarding the use of helmets and other protective equipment by e-scooter riders, except when injuries occur. Trauma studies have reported low (4.4%; Trivedi et al., 2019) to moderate (46%; Mitchell et al., 2019) use of helmets. While the majority of e-scooter presentations occur during evenings (Vernon et al., 2020), little is known about the use of reflective equipment by scooter riders.

The aim of this paper is to explore factors that influence the use of protective equipment, including helmets and reflective equipment, by e-scooter riders.

2 METHODOLOGY

An online survey of e-scooter riders was undertaken in Australia, Belgium, the Czech Republic, Norway, and Sweden during June to September 2020. Participants aged 18 years and older were recruited by paid Facebook advertising and snowballing. Decision tree models, a non-parametric analysis method, were used to identify factors found to influence the use of various protective equipment by e-scooter riders. Decision trees were estimated for helmet use, fluorescent item/element use, reflective item/element use, and not using any protective equipment when riding e-scooters. All decision trees examined the following factors: gender, age, frequency of e-scooter use, use own or rented e-scooters, perceived level of e-scooter skill among other road users, perceived level of e-scooter skill over rough terrain, and perceived safety of using an e-scooter. The reflective and fluorescent item/element and using no protective equipment decision trees also included the additional factor of what time did your most trip start.

3 RESULTS

The majority of e-scooter riders surveyed (n=1,126) were male (69.6%) under the age of 44 (74.4%), with almost half (49.5%) riding a shared e-scooter on their most recent trip. Almost half (47.4%) believed riding an

e-scooter was safe or very safe. More than 80% agreed or strongly agreed that they were confident in their ability to ride near other road users, although their confidence was lower on rough terrain (62.5%). The use of protective equipment was mixed, with many people not using any (see Table 1). The decision tree for self-reported helmet use showed that the strongest factor influencing use was country of residence, and use of a private e-scooter more likely to result in helmet use. There was less use of fluorescent clothing, although use was higher for e-scooter riders in Australia, Belgium or the Czech Republic than for riders in Norway or Sweden, with more frequent riders more likely to wear fluorescent clothing. The factor most associated with self-reported use of retro-reflective clothing was also country of residence, with retro-reflective protective equipment use higher in Australia, Belgium and the Czech Republic and influenced by the perceived ability of riders to handle e-scooters on rough terrain.

Table 1. Reported use of protective gear the last time an e-scooter was used (%)

The last I rode an e-scooter I wore:	Australia (n=329)	Belgium (n=89)	Czech Republic (n=283)	Norway (n=374)	Sweden (n=151)	Total (n=1126)
A helmet	93.0	64.0	37.5	11.2	17.9	43.9
Wrist protection	6.7	14.6	3.9	0.8	0.1	4.1
Elbow protection	5.5	12.4	2.5	0.0	0.0	2.9
Knee protection	4.6	5.6	2.5	0.3	0.0	2.3
Fluorescent jacket/ clothing/ element (eg., backpack, helmet)	14.9	48.3	22.3	6.1	1.3	14.7
Light-reflecting item (e.g., strip on pants/jacket or backpack)	18.5	28.1	39.9	6.1	6.0	18.8
None of the above	5.8	30.3	40.6	81.8	80.1	48.0

4 CONCLUSIONS

E-scooter users are most likely to use them regularly, but not for every trip. Social norms and local regulations, self-perceptions of skills, and perceptions of risk are likely to influence protective behaviour use among e-scooter users. While country of residence, user age, type of e-scooter used (shared or personal), confidence in ability to handle an e-scooter on rough terrain and frequency of use influenced the use of protective equipment, the perceived safety of using e-scooters did not. A multi-faceted approach is required to improve the uptake of safety equipment for e-scooter riders to reduce the risk of crashes occurring and mitigate the severity if crashes do occur.

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