sustainability

MDPI

Review

Slow and Steady Wins the Race: A Comparative Analysis of Standing Electric Scooters' European Regulations Integrated with the Aspect of Forensic Traumatology

Luigi Buongiorno [1,*], Alessandra Stellacci [1], Gerardo Cazzato [2,*], Pierluigi Caricato [1], Benedetta Pia De Luca [1], Francesca Tarantino [1], Stefania Lonero Baldassarra [1], Giuseppe Ingravallo [2] and Maricla Marrone [1]

1 Section of Legal Medicine, Interdisciplinary Department of Medicine, University of Bari "Aldo Moro", 70124 Bari, Italy; alestellacci@gmail.com (A.S.); pierluigicaricato@libero.it (P.C.); benedettapia.deluca@gmail.com (B.P.D.L.); tarantinofrancesca.ft@gmail.com (F.T.); stefania.lonerobaldassarra@uniba.it (S.L.B.); mariclamarrone@hotmail.it (M.M.)

2 Section of Pathology, Department of Emergency and Organ Transplantation (DETO), University of Bari "Aldo Moro", 70124 Bari, Italy; giuseppe.ingravallo@uniba.it

* Correspondence: luigibuongiorno@gmail.com (L.B.); gerardo.cazzato@uniba.it (G.C.)

Abstract: Fuel-driven cars are widely considered unsustainable and contrary to the new paradigm of smart growth planning. The need to reform transport behavior, policies, and infrastructure is among the priorities in urban policies around the world. Electric vehicles are an emerging technology that could advance sustainability programs. In the past year, there has been a rapid increase in the diffusion of electric scooters in several European cities, but various states have been unprepared for the rapid spread of green micro-mobility from a regulatory point of view. In addition, in parallel with the spread, there have been numerous road collisions involving standing electric scooters. The aim of this study was to obtain a detailed view of this phenomenon. We focused on the current legislation on electric micro-mobility at the European level to study and summarize the different attitudes adopted by various states whose regulations are present on the web. (It was not possible to evaluate the regulations of all European countries because they are not all available on online platforms.) The elements assessed in the various regulation were age limits, speed limits, compulsory use of helmets, administrative penalties, and the obligation to insure the new e-vehicle (standing scooter). In this study, we analyze the state of the art in electric micro-mobility, highlight the current situation's limits, and propose new strategies to adequately integrate this new smart vehicle into the urban transport network.

Keywords: micro-mobility; standing electric scooter; electric scooter shares; electric scooter injuries; road collisions; ecofriendly

Citation: Buongiorno, L.; Stellacci, A.; Cazzato, G.; Caricato, P.; Luca, B.P.D.; Tarantino, F.; Baldassarra, S.L.; Ingravallo, G.; Marrone, M. Slow and Steady Wins the Race: A Comparative Analysis of Standing Electric Scooters' European Regulations Integrated with the Aspect of Forensic Traumatology. *Sustainability* **2022**, *14*, 6160. https://doi.org/10.3390/su14106160

Academic Editors: Athanasios (Akis) Theofilatos, Apostolos Ziakopoulos and Ioanna Pagoni

Received: 5 April 2022
Accepted: 17 May 2022
Published: 19 May 2022

1. Introduction

The spread of standing electric scooters is a rapidly expanding phenomenon in industrialized countries. Several factors have influenced the rapid spread of these vehicles in most European cities. The following reasons are recognized in the literature: their affordable cost, sustainability, and flexibility of use, as well as the possibility of operating them without a driving license in most European countries. The trend began in the early 2000s. By the early months of 2010 in China, the presence of electric bikes in circulation was estimated to be approximately 120 million [1]. An important change took place in 2018 when, with the intent of promoting green mobility, as well as reducing related road accidents, the city council of Santa Monica (CA, USA) drew up the first micro-mobility pilot plan in the world [2]. On 17 September 2018, in the municipality of Santa Monica, 3000 electric motor devices (2000 e-scooters, 1000 e-bikes) were made available in circulation, thus instituting the first e-scooter/e-bike-sharing system in the world [3]. The introduction of this new vehicle raises the need for a substantial change to the urban network.

In March 2020, the Italian government encouraged the purchase of these vehicles, offering monetary concessions. These incentives have played a key role in the spread of this micro-mobility option. However, in step with the spread of these vehicles, road collisions related to their use, even serious ones, have increased, giving rise to doubts and concerns on the safety front. Most of the claims occurred because of inappropriate behavior on the part of the owners, both contravening the rules established by the highway code and due to the multiplication of specimens made up on roads throughout Europe, and re-engineering practices to boost the power of these vehicles' engines, allowing them to reach much higher speeds (up to four times) than the limit set by the production companies [4]. The European social model could be defined as an attempt to reconcile an economy of a highly competitive market with the protection of rights, as much wealth as possible, universality, and democracy. This model is characterized by differences within the individual states of the European Union and is continuously challenged by conflicts that can arise, for example, from competition between companies in the field of industrial development with workers' rights. The need to combine rights, within individual states and within the European Union, has proved even more difficult considering the challenges posed by the pandemic. There are numerous differences in the regulatory approach of individual European countries regarding the use of electric scooters and guaranteeing equal road safety for the European citizen; thus, we sought to make a regulatory comparison. These data were integrated with the aspects of forensic traumatology linked to injuries resulting from accidents occurring by means of an electric scooter. With this analysis, we aim to study the interactions between e-scooters, the costs of health systems, and the policies adopted to regulate these vehicles extracted from the main online scientific and institutional platforms. Based on these comparisons, more homogeneous regulatory proposals have been formulated to protect electric scooter drivers and other road users. The ultimate aim is to provide legislators with an evaluation tool derived from the comparison to bridge the regulatory gap between the different countries.

This paper consists of five sections. In the second section, the review of the regulation literature is conducted, and the need to conduct research in the outlined area is presented. In the third section, the research methodology is described. The fourth section is devoted to presenting the research results. In the fifth section, the results in question are discussed.

2. Materials and Methods

2.1. Study Selection

This is the first systematic review of the literature concerning the regulations related to the use of electric scooters in Europe. Consequently, there is no protocol to guide the review, and therefore, standard protocols for systematic review have been applied. The starting eligibility criteria were articles that reported primary data on regulations in force at the level of individual European countries. A search strategy to select relevant documents was then applied. In phase 1, the search terminology was designed to limit the number of studies including the terms "micro-mobility" and/or "micro-mobility" or "electric scooter" or "e-scooter" so that a relevant and manageable number of documents could be identified. Studies were only identified if the word "regulation" or "legislation" was present (or a common synonym) next to the words "micro-mobility" and/or "micro-mobility" or "electric scooter" or "e-scooter" or "kick scooter" or "e-kick scooter" in the title or abstract. Thus, documents referring only to the terms "micro-mobility" or "electric scooter" or "e-scooter" were not included. In phase 2, the abstracts of articles with pertinent titles were inspected. In phase 3, the inclusion criteria identified articles with European Union member state regulations. For all documents, reference lists were searched manually to identify other items for potential inclusion. In phase 4, the documents that provided quantitative data were selected. In phases 3 and 4, all documents were independently reviewed for inclusion by two reviewers (P.C. and B.P.D.L.) (Figure 1).

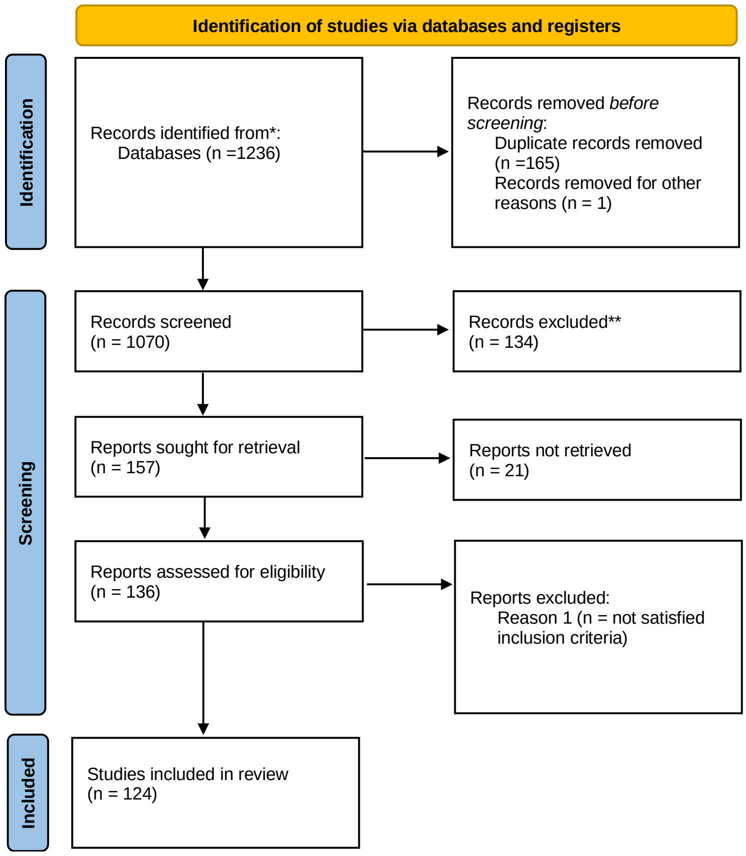

Figure 1. Study selection procedure following PRISMA guidelines. * database and not registrers. ** not met the inclusion criteria.

2.2. Data Extraction

The data were initially extracted by a single reviewer and then checked by a second reviewer. The process was based on the following method: (1) year published, (2) country, (3) category, (4) age restriction, (5) maximum speed limit, (6) maximum power, (7) need for registration plate, (8) need for legal liability insurance, and (9) compulsory use of helmet.

2.3. Data Analysis

The parameters used in the various regulations were aggregated to facilitate the analysis, and data aggregation was necessary in order to summarize the categories. The recoding was conducted by a single reviewer. From each article, the main variables were extracted, as well as the number of limitations envisaged by each individual regulation. The evaluated parameters were then grouped based on conceptual similarity. Several articles were examined within the same topic to reconstruct the key points of the evolution of this means of transport. In order to highlight and discuss the problems connected with electric micro-mobility, statistics regarding injuries related to their use are included in the discussion section.

3. Results

Various European countries were unprepared, from a regulatory point of view, for the advent of this new means of transport. Since then, different governments have been establishing rules to ensure road safety for both drivers and other vehicles, as well as pedestrians. When comparing these regulations, the main regulatory divergences in the individual European countries are apparent. Table 1 summarizes the main regulatory approaches adopted by the main European states. It was not possible to evaluate the regulations of all European countries because they are not all available on online platforms.

The states whose regulations are present on online platforms are mentioned and compared with the aim of showing the regulatory divergences present in the different states of the European Union.

Table 1. Comparison between the main European regulations of electric micro-mobility [5–23].

	Vehicle Classification	Age Restriction	Maximum Speed Limit	Maximum Power	Need for Registration Plate	Need for Obligatory Legal Liability Insurance	Helmet Obligation	Entry into Force
Italy	Bicycles	14	25 km/h	500 watts	No	No	Only for underage	2020
Austria	Dedicated category	12	25 km/h	600 watts	No	No	Only for underage	2022
Belgium	Dedicated category	No	25 km/h	No	No	No	No	2022
Denmark	Bicycles	15	20 km/h	Unclear	No	No	No	2019
Germany	Dedicated category	14	20 km/h	500 watts	Yes	Yes	No	2019
Finland	Pedestrian	No	25 km/h	1000 watts	No	No	No	2020
France	Dedicated category	12	25 km/h	Unclear	No	Yes	No	2020
Hungary	Unclear	No	No	No	No	No	No	2022
Norway	Bicycles	No	20 km/h	Unclear	No	No	No	2021
Poland	Bicycles	No	25 km/h	No	No	No	No	2021
Portugal	Light moped	16	20 km/h	Unclear	No	No	Unclear	2020
Spain	Dedicated category	No	25 km/h	250 watts	No	No	No	2021
Sweden	Bicycles	No	20 km/h	1000 watts	No	No	Only for underage	2021
Switzerland	Light moped	14	20 km/h	500 watts	No	No	No	2022

Starting from the different concepts as to which category the new vehicles belong in Finland, for example, micro-mobility vehicles have been cataloged as on par with pedestrians (if the vehicle does not reach speeds exceeding 15 km/h), unlike in Italy, the Czech Republic, Denmark, Norway, and Poland, where they have been cataloged as velocipedes [5–7]. In Switzerland, Portugal, and Sweden, they have been classified as light mopeds, while in France, Austria, Belgium, Germany, and Spain, a new specific category has been established [8–16]. In Hungary, they have not been cataloged in any way [17]. Most likely, the point of greatest discrepancy among the various regulations in force is the minimum age of use. Portugal, for example, has the highest threshold at 16 years of age. It is 15 years in Denmark and 14 in Germany and Switzerland (but only in possession of a moped license, whereas from the age of 16, a license is not required) [6,8,14,15,24]. In Austria and France, on the other hand, the minimum threshold is 12 years, and in the remaining countries examined, namely, Belgium, Finland, Hungary, Norway, Poland, Spain, and Sweden, no age restrictions have been established. These regulatory gaps are valid only for privately owned vehicles, while for those used in sharing systems, the private companies that offer sharing services have applied the minimum age limit of 18 years for their use [7,12,13]. Regarding the license plate, the only state that demands this identification now is Germany. Furthermore, both German and French legislation impose the obligation to take out insurance for civil liability [8,12]. An emblematic case regarding speed limits is England, where the maximum speed limit is not the same throughout the nation but varies by county.

Some counties also stipulate the need for a mandatory driving document. The U.K. is a stand-alone case regarding the regulatory approach to electric micro-mobility vehicles. The point of agreement among all the counties in the category is that they are classified as light electric vehicles permitted for civil use from the age of 14. The technical and construction requirements are uniform at the European level. The devices must carry the mandatory CE mark for all products (directive 2006/42/EC). The vehicle must be equipped with a hooter audible at 30 m. From half an hour after sunset, as well as in the case of atmospheric conditions making lighting necessary, these devices must be equipped with white front lights and red rear reflectors for visual signals. In addition, the user must wear a reflective vest or suspenders or else have hand-held lighting. The maximum power varies. For example, in Sweden and Finland, the maximum limit is 1000 watts, versus 600 watts in Austria; 500 watts in Italy, Germany, and Switzerland; and 250 watts in Spain. Hungary and Belgium do not have a maximum limit, nor is any limit defined in the remaining states examined. There are no data available about restrictions or limits on their circulation in individual states.

Regarding the circulation methods, however, the same indications given to cyclists must be respected. Among these, proceeding in a single file is preferable; moreover, the driver is obliged to keep both hands on the handlebars and can temporarily detach them only to signal the intention to turn, even if in some European countries it has already become mandatory to keep the arrows lit to avoid the detachment of the hands from the handlebars, resulting in instability. In all European countries, it is absolutely forbidden to transport people, animals, things, and trailers. In addition, the driver is required to comply with all the rules laid down by the highway code (precedence, traffic lights, no use of cell phones, no drunk driving).

Young people under 18 are obliged to wear a helmet in Italy, Austria, and Sweden, and in other states, the use of helmets is recommended for adults but is not compulsory. The approach to the helmet in Portugal is unclear. In any case, the helmet must comply with European regulations and must therefore provide adequate and complete protection of the head. Approved helmets of any type (for road or sports use) are allowed. Finally, in Italy, the municipalities that participated in the experiment to introduce micro-mobility sharing vehicles in their territories needed firstly to evaluate the conditions of the roads and infrastructure, to check that they were suitable and functional for the circulation of micro-mobility devices. They had to install specific vertical and horizontal signs along with the road infrastructure and had to activate an information campaign about the rules of use, including those related to road safety, speed, and parking methods [21,23].

When examining the articles and the various regulatory references, it becomes evident that the sanctioning approach is not well defined in the individual countries, nor is it clear whether this is limited to the payment of a fine or also includes the seizure of the vehicle.

4. Discussion

The EU's climate and energy policy for 2030 includes limiting the greenhouse effect as one of its main objectives, along with reducing gas emissions, improving energy efficiency, and increasing the market share of renewable energy sources. Increasing energy consumption to meet growing economic needs contributes to CO_2 emissions [25,26], which exerts influence on the automotive industry, the development of innovative technologies, and changes in infrastructure that make it possible to use fuels of different and environmentally friendly types in vehicles. The adopted goals render it indispensable to increase the supply of alternative fuels for transport, including charging stations and refueling low-emission and zero-emission vehicles [27]. Answering the above questions is particularly important because based on the average global intensity of CO_2 emissions, green micro-mobility appears as a practical and zero-emission solution for short-distance commuters, and it is growing at a rapid rate thanks to the introduction of sharing services.

Among the various micro-mobility devices, the one most used, especially in sharing, is the standing electric scooter. This form of transportation seems to be a practical solution for short-distance commuters, as it is not only sustainable but also a convenient form of mobility. This vehicle is usually composed of two aligned wheels separated by a support platform with a front handlebar which incorporates a display indicating travel speeds, kilometers traveled, and battery range. The brake controls are integrated into the handlebar and are generally disc-based. Some models also incorporate rear pressure brakes, which are activated by pressing a foot down on the mudguard of the relative wheel. These devices are operated in a standing position and are the modern evolution of classic scooters, with an added electric motor. This varies according to the vehicle and can have a single-phase alternating current controlled by an inverter or a more expensive and efficient brushless motor. Both possible motors can be recharged on the normal domestic electricity network in a short time, and generally guarantee 15 to 50 km of autonomy [28].

The first electric scooter model dates to 2001 and was presented by the company "Autoped"; since then, the speed of diffusion has been steadily increasing up to today's boom [29]. Interestingly, in the early 1900s, Long Island City's "Autoped Company" patented scooters with a 150 cc four-stroke engine that could reach speeds of 16 km/h [30]. The moped, however, was not commercially successful and production ceased in the 1920s, leaving room for a later revival of scooters. Several factors have contributed to the return of the scooter and specifically to the electric version, such as their ease of use (often without needing a license), low cost, ready availability on the street (sharing services), ecological profile, light weight, the possibility of recharging them on the domestic electricity network, and little need for maintenance. Micro-mobility has a positive impact by decreasing traffic congestion and hazardous emissions [31]. However, with the increased traffic of these vehicles, related collisions and accidents have risen, and this balance is destined to grow even more due to the currently unclear regulations, as described in the world medical literature, which make the "scooter rider" weak as well as a potentially dangerous road user [32–49].

The study of Rix et al. [50] comparing the vehicle miles-traveled based injury rate for stand-up electric scooters with the based injury rate for motor vehicle travel showed that the e-scooter injury rate was approximately 175 to 200 times higher than specific injury rates for motor vehicle travel. Many authors have addressed the issue of the type of injury most often reported following a road impact aboard an e-scooter; Trivedi et al. [51] reported head injuries as the most common injury, followed by fractures and skin abrasions and lacerations.

In scientific literature, it is well documented that the most affected anatomical regions are the maxillofacial region, often with related dental problems, and the upper body region [34,40,52–62]. This distribution of injuries has also been found in other types of non-electric means of transport, such as skateboards [63].

The first review carried out on 28 studies published between 2019 and 2020 regarding electric scooter trauma showed that injuries occur mainly at the cranial brain level, as well as in both upper and lower limbs [64], confirming the need for cranio-encephalic protection devices. On this point, various sectoral studies on protective devices for motorcycles and mopeds have shown that the helmet plays a fundamental role in reducing the burden of maxillofacial and craniofacial injuries [61,62,65,66]. Notably, all drivers who suffered head trauma following a collision related to a scooter were not wearing a helmet. Nevertheless, California recently passed a law that allows motorcyclists over the age of 18 years to ride without a helmet [67,68]. The lack of legal obligation to wear a helmet and the absence of an adequate and feasible concept of protective equipment for sharing services are the main barriers to helmet use among riders [68].

A recent American review showed that in recent years, there has been a spike in road collisions due to electric transport devices [69]. These claims mainly affected millennials (77%), mostly white (54.8%) male (60%) individuals, and resulted in a higher incidence of serious injury among older individuals and a higher incidence of craniocerebral lesions in elderly subjects [34,56,69–72]. An interesting aspect would be to evaluate the statistical significance of the fact that the most claims are made over the weekend, and to assess a possible correlation with alcohol intake. Since there is a high rate of use by millennials, it would be appropriate to encourage social awareness campaigns [73]. Eccarius and Cheng Lu [47] conducted the first empirical investigation about the behavioral determinants of traveler intention to use electric scooters, starting from well-established behavioral theory, noting a marked influence on the part of personological and environmental factors.

A recent study examined the official Instagram and Twitter accounts of two sharing companies to determine whether these companies promote and demonstrate the use of safety gear in their posts to their consumers, but they showed a low propensity on social networks to publish photos of the devices [74]. Not secondary are the dangers associated with the explosion of the lithium batteries of e-scooters that are on the rise and are now the subject of several studies [75–77]. Moreover, e-scooters' use in road sections not equipped with cycle paths can expose the driver to various traffic hazards if such roads are subject to poor maintenance and if the road surface is poor and uneven. Doubts about the safety of e-scooters also come from their use on slippery roads. An interesting study explores possible performance improvements with scooter winter tires, although further in-depth studies are needed [78]. In another recent study from New Zealand, where 69 patients were identified with e-scooter injuries, McGuinness et al. [79] demonstrate a concerningly high e-scooter-related hospitalization rate and suggest that e-scooters are currently not as safe as cycling. The use of helmets was also discussed and they highlighted the need for strategies to improve e-scooter safety, including zero tolerance for alcohol, mandatory protective gear, restricted operating times, and changes in road law. Similar conclusions were drawn by Shiffler et al. [80], reporting the increase in craniomaxillofacial injuries related to substance intoxication, ascribing these conclusions to the inhibition or depression of protective reflexes that leave the face and head vulnerable during standing electric scooter accidents. Only a few countries stipulate the use of safety devices such as helmets and reflective vests (Table 1). In addition to the regulations in the individual states, following the rising numbers of legal claims, independent initiatives have been taken in terms of security at the territorial level [81,82]. The Italian case of the municipality of Sesto San Giovanni in Lombardy is emblematic, where the mayor has made the use of a helmet compulsory for all users (in the rest of Italy, there is at present an obligation only for minors) following the death of a 13-year-old boy aboard his friend's electric standing scooter [83,84]. From this point of view, Italy is to be commended because, to better understand the phenomenon of accidents related to scooters, the National Observatory for road accidents and deaths due to the use of electric scooters was established in May 2020 by the "Association of Supporters and Friends of the Traffic Police". Analysis of these data reveals that following the first collision, which took place on 6 December 2020 in Budrio (Bologna), the phenomenon showed such a rapid upward trend that, only in the first 8 months of 2021, 131 serious collisions occurred, 41 of which were followed by hospitalization with a reserved prognosis.

During the same period, nine deaths were recorded, of eight motorists and one pedestrian. These data highlight the sharp increase in the use of these vehicles compared with 2020, when there was only one death following a road collision [85,86]. However, it should be remembered that these data concern the SARS-CoV2 pandemic period—2020 was characterized by a drastic reduction in the number of vehicles in circulation due to lockdowns, which also affected the incidence of road accidents [86]. Chiu et al. [87] stated that some of the injuries to the upper limbs result from falls with an outstretched hand due to an instinctive protective reaction. Injuries to the lower limbs are usually linked to tripping due to the reduced height of electric scooters following the reflex of exiting the vehicle in dangerous situations. The introduction of shared e-scooters has resulted in many serious related injuries, and many of these patients require further specialist consultation or surgery and place an increased burden on overstretched emergency department services [38,88–93]. The incidence of this phenomenon is such that numerous overloads have been recorded in emergency and orthopedic departments, so an interesting article talks about "A new epidemic in orthopedics" [44,53,57,94–97].

To give an example, in the report made to the emergency room of the Salt Lake Regional Medical Center in the USA, following the launch of electric scooter rental programs, the increase in accidents related to scooters was reported to be equal to 625% [98]. Increases have also been recorded in other cities, but to a lesser extent [51,99–102]. Although most of the patients in the emergency room were discharged, a substantial number required hospitalization. On average, over two-thirds of patients (68.9%) required at least one procedure during their emergency room visit. These results are also supported by a study conducted in New Zealand that examined the impact of electric mobility devices on the healthcare system, data that should not be underestimated, as the adoption of electric scooter rental systems could increase the demand for services in a system that is already overburdened [103,104]. Moreover, Cohen et al. [105] described pediatric e-scooter injuries and focused their study on children, who show a greater rate of fractures and polytrauma from e-scooters compared with adults, but fewer facial injuries despite a similar rate of head trauma. Additionally, the same study demonstrates low helmet use in the pediatric population thanks to the analysis of the data which showed an incidence of craniofacial lesions similar to adults [105]. A causal role of speed has been shown, proportionally reflecting the severity of the injuries sustained by the driver [106,107].

However, according to some studies based on the driver's perceived sensation when driving the vehicle, most participants reported that they felt safer driving an e-bike than a conventional bicycle, thanks to their ability to keep pace with the traffic and thus avoid potential collisions. On the other hand, in other studies, the participants reported that the speed of e-bikes was a source of dangerous situations, negatively affecting their perception of vehicle safety [108–111]. Moreover, the press has reported several cases of illegal/inappropriate behavior onboard electric scooters, such as more than one person onboard or the practice of re-engineering the device to boost its power, which sometimes allows speeds of even 100 km/h to be reached [4]. Although the legislation on bike sharing has generally been taken as a model, the legislation on electric scooters is still uncharted territory. Not secondary in terms of injuries are self-balancing electric scooters, commonly known as hoverboards. This type of vehicle showed a spectrum of injuries similar to those seen in the use of electric scooters. However, the use of these means was more prevalent in children, and the common outcome was the juxta-epiphyseal fracture of the distal phalanx [112–118]. This fracture has been identified as highly related to hoverboard use. However, this type of fracture has treatment implications including the need for irrigation and debridement, antibiotic therapy, and potential surgical fixation [119]. The regulations in place were developed rapidly, based on little or no data available, and hence were created largely based on public opinion and in response to traffic accidents/deaths. Currently, the main limitation of sustainable micro-mobility is road safety, especially when driving in motorized traffic, although, as several recent studies have reported [25,26,31,52,120], the places where road accidents occur most often are sidewalks.

In deference to the EU Charter of Fundamental Rights Article 35—Health Care, "Everyone has the right of access to preventive health care and the right to benefit from medical treatment under the conditions established by national laws and practices. A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities" [121].

5. Proposals and Conclusions

From the literature, it emerges that the high incidence of head trauma [65] should make helmet use mandatory; many cities are already implementing this legislation independently [122]. The low helmet-wearing rate among shared e-scooter riders indicates the need to ensure that helmets remain available and that police enforce helmet rules. Moreover, for an injury related to the absence of a helmet described in the discussion and for the resulting health costs, our first proposal is to implement mandatory helmet use for users of all ages. To improve user safety, e-scooters should be equipped with a rearview mirror and acoustic signal. Another proposal on the construction aspects is to integrate turning signals that can be operated from the handlebar. In the current situation, to signal the turn, the user must lift the arm from the handlebar, exposing himself to several hazards. Moreover, a collaboration between local authorities and organizations is necessary in order to improve the existing infrastructures in order to better integrate this means in urban mobility [120]. Consistent with the literature, the integration of this vehicle should be allowed only in cities that meet specific criteria, including the presence of an adequate percentage of cycle paths (defined by the competent authorities) and compliance with some quality criteria of the road surface [45,123,124]. Regarding infrastructure, it would evaluate the possibility of providing users with adequate parking and charging stations scattered around the city. The establishment of these hypothetical service stations could also remedy the problem of leaving the vehicle anywhere on pavements or in other areas of road or pedestrian traffic. Nowadays, in Italy and in other states (Table 1), electric scooters are recognized as unregistered movable property not requiring identification data indicating the owner. The chronicles reported several accidents in which pedestrians were run over and it was impossible to trace the culprit. We believe that it would be necessary to oblige the use of an identification plate with which to associate a civil liability insurance coverage to cover damages caused by drivers. Insurance coverage should be essential for using this new transport, and sharing companies should ensure their users have adequate insurance coverage. It is difficult to define an age range at which to make access to these devices possible, but one of the essential requirements is to know the rules of the road. By analogy with bicycles, the authors believe that users of these vehicles must be at least 14 years old.

However, always in accordance with the rules of bicycles, if the fault of a collision with a child is recognized, the parents will take responsibility. It might be useful, at least in the initial phase, to introduce severe penalties both for violations of the highway code and for the use of upgraded engines on these vehicles, to change the cultural concept of the scooter itself. We believe that provided these due precautions are adopted, the electric scooter can truly become an excellent alternative to the current means of urban transport. Obviously, making the proposed changes in favor of the user would lead to an increase in the costs of the scooters both for purchase and for rent. It would be desirable that various bodies, first the state, allocate funds facilitating the use of this new and "safe" green vehicle to make them accessible even to minorities and low-income citizens. Consumer awareness campaigns, an extension of the charging network, incentives, and obligations will be realized by companies to increase the use of electric vehicles, and fleets should be planned.

This paper has several limitations linked to the difficulty of finding online the regulations of individual European countries regarding electric scooters. However, we hope to have provided through this analysis a small contribution and stimulus to the European legislator to standardize the regulations in force on e-scooters to guarantee fair treatment to the individual European citizen.

In the future, to achieve a complete representation of the current regulatory situation regarding electric scooters in the European Union, this comparison should be integrated with the regulations of the missing countries.

Author Contributions: Conceptualization, M.M. and L.B.; methodology, L.B.; software, A.S.; validation, A.S., L.B., P.C. and M.M.; formal analysis, G.C. and G.I.; investigation, B.P.D.L. and F.T.; resources, S.L.B.; data curation, L.B.; writing—original draft preparation, L.B.; writing—review and editing, A.S.; visualization, M.M.; supervision, M.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Goodman, J.D. An Electric Boost for Bicyclists. *New York Times*. 31 January 2010, p. 1. Available online: https://www.nytimes.com/2010/02/01/business/global/01ebike.html (accessed on 4 April 2022).
2. Bird Rides Inc. Santa Monica Mobility Pilot Program. In *Santa Monica*; 30 August 2018. Available online: https://www.santamonica.gov/press/2018/08/30/santa-monica-selects-bird-jump-lime-and-lyft-for-shared-mobility-pilot (accessed on 4 April 2022).
3. Hall, M. *Bird Scooters Flying around*; Santa Monica Daily Press: Santa Monica, CA, USA, 2018; Available online: https://www.smdp.com/bird-scooters-flying-around-town/162647 (accessed on 4 April 2022).
4. Haworth, N.L.; Schramm, A. Illegal and risky riding of electric scooters in Brisbane. *Med. J. Aust.* **2019**, *211*, 412–413. [CrossRef] [PubMed]
5. Nowe przepisy dotyczące hulajnóg elektrycznych i urządzeń transportu osobistego. 2021. Available online: https://www.gov.pl/web/infrastruktura/nowe-przepisy-dotyczace-hulajnog-elektrycznych-i-urzadzen-transportu-osobistego (accessed on 4 April 2022).
6. Elektriske løbehjul Den 17. Januar 2019 Trådte en Forsøgsordning for Elektriske Løbehjul I Kraft. Her kan du Læse Om Reglerne. Available online: https://www.sikkertrafik.dk/raad-og-viden/smaa-motoriserede-koeretoejer/elektriske-loebehjul (accessed on 4 April 2022).
7. Sähköiset Liikkumisvälineet. Available online: https://www.traficom.fi/fi/liikenne/tieliikenne/sahkoiset-liikkumisvalineet (accessed on 4 April 2022).
8. Bundesregierung macht Weg frei für E-Scooter. Available online: https://www.bundesregierung.de/breg-de/suche/bundesregierung-macht-weg-frei-fuer-e-scooter-1596736 (accessed on 4 April 2022).
9. Nueva Normativa Estatal Sobre Vehículos de Movilidad Personal, Entre Ellos, Los Patinetes Eléctricos. Available online: http://www.bandomovil.com/vercomunicado.php?cod_municipio=sotodelreal&id=526124 (accessed on 28 October 2021).
10. Nya Regler Och Krav På Förare Ska Göra Elsparkcyklar Trafiksäkrare. Available online: https://www.transportstyrelsen.se/sv/Nyhetsarkiv/2021/nya-regler-och-krav-pa-forare-ska-gora-elsparkcyklar-trafiksakrare (accessed on 4 April 2022).
11. Regulamentos VMP (scooters elétricos, hoverboards, segways...): Requisitos e rotas para dirigir. Available online: https://www.denia.com/pt/normativa-vmp-patinetes-electricos-hoverboards-segways-requisitos-y-vias-para-circular (accessed on 4 April 2022).
12. Les Motos éLectriques Peuvent Circuler Sur Certaines Voies Réservées. Available online: https://www.service-public.fr/particuliers/actualites/A14476 (accessed on 4 April 2022).
13. Scoot-er. Available online: https://www.oesterreich.gv.at/themen/freizeit_und_strassenverkehr/Elektro-Scooter,-Quads-und-Co/Seite.280200.html (accessed on 4 April 2022).
14. e-Bikes und Elektro Scooter im Strassenverkehr. Available online: https://eflizzer.ch/elektro-scooter-strassenzulassung-und-andere-rechtliche-fragen (accessed on 4 April 2022).
15. Vorschriften Für Elektrische Trendfahrzeuge. Available online: https://www.astra.admin.ch/astra/de/home/themen/verkehrsregeln/vorschriften-trendfahrzeuge.html (accessed on 4 April 2022).
16. Het Gebruik Van Een Elektrische Step in België. Available online: https://elektrische-steps.com/belgie/ (accessed on 4 April 2022).
17. Köhém Rendelet a Közúti JárműVek Forgalomba Helyezésének éS Forgalomban Tartásának MűSzaki FeltételeirőL. Available online: https://net.jogtar.hu/jogszabaly?docid=99000006.koh (accessed on 4 April 2022).
18. Hirst, D. Regulating Electric Scooters (e_scooters). 2021. Available online: https://mydriving.co.uk/wp-content/uploads/2021/09/E-scooters.pdf (accessed on 4 April 2022).
19. Kamphuis, K.; van Schagen, I. *E-scooters in Europe: Legal Status, Usage and Safety Results of a Survey in FERSI Countries*; SWOV Institute for Road Safety Research: Den Haag, The Netherlands, 2020; Available online: https://trid.trb.org/view/1741960 (accessed on 4 April 2022).
20. Safe Micromobility. Paris. 2020. Available online: https://www.itf-oecd.org/sites/default/files/docs/safe-micromobility_1.pdf (accessed on 4 April 2022).
21. Dell'Interno, M. Le Regole per I Monopattini Elettrici. 2020. Available online: https://www.interno.gov.it/it/notizie/regole-i-monopattini-elettrici (accessed on 28 October 2020).
22. Polizia Stradale. Circolazione su Strada Dci Monopattini Elettrici e Dei Dispositivi per la Micromobilità Elettrica. Available online: https://www.interno.gov.it/sites/default/files/allegati/circolare_n._300-a-1974-20-104-5_del_9_marzo_2020.pdf (accessed on 4 April 2022).
23. Dei Trasporti, M. Dispositivi per la Micromobilità Elettrica E Procedure per L'Autorizzazione Alla Circolazione Sperimentale. 2019. Available online: http://www.patente.it/normativa/decreto-ministero-trasporti-04-06-2019-n-229-micromobilita-elettrica?idc=3926 (accessed on 4 April 2022).
24. Kleinertz, H.; Ntalos, D.; Hennes, F.; Nüchtern, J.V.; Frosch, K.H.; Thiesen, D.M. Accident Mechanisms and Injury Patterns in E-Scooter Users–A Retrospective Analysis and Comparison With Cyclists. *Dtsch Arztebl Int.* **2021**, *118*, 117–121. [CrossRef]
25. Nguyen, D.K.; Huynh, T.L.D.; Nasir, M.A. Carbon emissions determinants and forecasting: Evidence from G6 countries. *J. Environ. Manag.* **2021**, *285*, 111988. [CrossRef]

26. Mattioli, G.; Roberts, C.; Steinberger, J.K.; Brown, A. The political economy of car dependence: A systems of provision approach. *Energy Res. Soc. Sci.* **2020**, *66*, 101486. [CrossRef]
27. Abduljabbar, R.L.; Liyanage, S.; Dia, H. The role of micro-mobility in shaping sustainable cities: A systematic literature review. *Transp. Res. Part D Transp. Environ.* **2021**, *92*, 102734. [CrossRef]
28. Electric Motorcycles and Scooters. Wikipedia, Wikimedia Foundation. 2018. Available online: https://en.wikipedia.org/wiki/Electric_motorcycles_and_scooters (accessed on 4 April 2022).
29. Wilson, H. The A-Z of Motorcycles. In *Encyclopedia Motorcycle Book*; Dorling Kindersley: London, UK, 1995; p. 22, ISBN 978-0-7513-0206-6.
30. Wang, M.; You, M. The study of evolution of motor scooters. *Bull. Jpn. Soc. Sci. Des.* **2009**, *56*, 23–32. [CrossRef]
31. Van Boven, J.F.M.; Le An, P.; Kirenga, B.J.; Chavannes, N. Electric scooters: Batteries in the battle against ambient air pollution? *Lancet Planet. Health* **2017**, *1*, e168–e169. [CrossRef]
32. Neuroth, L.M.; Humphries, K.D.; Wing, J.J.; Smith, G.A.; Zhu, M. Motor vehicle-related electric scooter injuries in the US: A descriptive analysis of NEISS data. *Am. J. Emerg. Med.* **2022**, *55*, 1–5. [CrossRef]
33. Heuer, S.; Landschoof, S.; Kornherr, P.; Grospietsch, B.; Kühne, C.A. Epidemiology and Injury Pattern of E-Scooter Injuries—Initial Results. *Z. Orthop. Unfall* **2021**. [CrossRef]
34. LaGreca, M.; Didzbalis, C.J.; Oleck, N.C.; Weisberger, J.S.; Ayyala, H.S. Increasing Incidence of Hand and Distal Upper Extremity Injuries Associated with Electric Scooter Use. *J. Hand Surg.* **2021**. [CrossRef]
35. Mukhtar, M.; Ashraf, A.; Frank, M.S.; Steenburg, S.D. Injury incidence and patterns associated with electric scooter accidents in a major metropolitan city. *Clin. Imaging* **2021**, *74*, 163–168. [CrossRef] [PubMed]
36. Moftakhar, T.; Wanzel, M.; Vojcsik, A.; Kralinger, F.; Mousavi, M.; Hajdu, S.; Aldrian, S.; Starlinger, J. Incidence and severity of electric scooter related injuries after introduction of an urban rental programme in Vienna: A retrospective multicentre study. *Arch. Orthop. Trauma. Surg.* **2020**, *141*, 1207–1213. [CrossRef] [PubMed]
37. Lavoie-Gagne, O.; Siow, M.; Harkin, W.; Flores, A.R.; Girard, P.J.; Schwartz, A.K.; Kent, W.T. Characterization of electric scooter injuries over 27 months at an urban level 1 trauma center. *Am. J. Emerg. Med.* **2021**, *45*, 129–136. [CrossRef] [PubMed]
38. Harbrecht, A.; Hackl, M.; Leschinger, T.; Uschok, S.; Wegmann, K.; Eysel, P.; Müller, L.P. What to expect? Injury patterns of Electric-Scooter accidents over a period of one year - A prospective monocentric study at a Level 1 Trauma Center. *Eur. J. Orthop. Surg. Traumatol.* **2022**, *32*, 641–647. [CrossRef] [PubMed]
39. Yarmohammadi, A.; Baxter, S.; Ediriwickrema, L.S.; Williams, E.C.; Kobayashi, L.M.; Liu, C.Y.; Korn, B.S.; Kikkawa, D.O. Characterization of Facial Trauma Associated with Standing Electric Scooter Injuries. *Ophthalmology* **2020**, *127*, 988–990. [CrossRef] [PubMed]
40. Bhatnagar, A.; Al-Hihi, M.; Ali, R.; Sharma, N.; Lai, P.; Monga, A.; Hadidchi, S.; Kayder, O.; Amalraj, B.; Kordbacheh, H.; et al. Imaging Utilization Patterns and Injury Characteristics Associated with Electric Standing Scooters in a Major Urban Area. *J. Emerg. Med.* **2021**, *62*, 182–190. [CrossRef]
41. Alwani, M.; Jones, A.J.; Sandelski, M.; Bandali, E.; Lancaster, B.; Sim, M.W.; Shipchandler, T.; Ting, J. Facing Facts: Facial Injuries from Stand-up Electric Scooters. *Cureus* **2020**, *12*, e6663. [CrossRef]
42. Trivedi, B.; Kesterke, M.J.; Bhattacharjee, R.; Weber, W.; Mynar, K.; Reddy, L.V. Craniofacial Injuries Seen with the Introduction of Bicycle-Share Electric Scooters in an Urban Setting. *J. Oral Maxillofac. Surg.* **2019**, *77*, 2292–2297. [CrossRef]
43. Kim, H.S.; Kim, W.S.; Kim, H.K.; Kang, S.H.; Bae, T.H. Facial injury patterns associated with stand-up electric scooters in unhelmeted riders. *Arch. Plast. Surg.* **2022**, *49*, 50–54. [CrossRef]
44. Coelho, A.; Feito, P.; Corominas, L.; Sánchez-Soler, J.; Pérez-Prieto, D.; Martínez-Diaz, S.; Alier, A.; Monllau, J. Electric Scooter-Related Injuries: A New Epidemic in Orthopedics. *J. Clin. Med.* **2021**, *10*, 3283. [CrossRef]
45. Mulvaney, A.C.; Smith, S.; Watson, M.C.; Parkin, J.; Coupland, C.; Miller, P.; Kendrick, D.; McClintock, H. Cycling infrastructure for reducing cycling injuries in cyclists. *Cochrane Database Syst. Rev.* **2015**, *2015*. [CrossRef] [PubMed]
46. Gulino, M.-S.; Zonfrillo, G.; Damaziak, K.; Vangi, D. Exploring Performances of Electric Micro-Mobility Vehicles and Behavioural Patterns of Riders for In-Depth Accident Analysis. *Designs* **2021**, *5*, 66. [CrossRef]
47. Eccarius, T.; Lu, C.-C. Adoption intentions for micro-mobility—Insights from electric scooter sharing in Taiwan. *Transp. Res. Part D Transp. Environ.* **2020**, *84*, 102327. [CrossRef]
48. Bozzi, A.; Aguilera, A. Shared E-Scooters: A Review of Uses, Health and Environmental Impacts, and Policy Implications of a New Micro-Mobility Service. *Sustainability* **2021**, *13*, 8676. [CrossRef]
49. Gitelman, V.; Levi, S.; Carmel, R.; Korchatov, A.; Hakkert, S. Exploring patterns of child pedestrian behaviors at urban intersections. *Accid. Anal. Prev.* **2018**, *122*, 36–47. [CrossRef]
50. Rix, K.; Demchur, N.J.; Zane, D.F.; Brown, L.H. Injury rates per mile of travel for electric scooters versus motor vehicles. *Am. J. Emerg. Med.* **2020**, *40*, 166–168. [CrossRef]
51. Trivedi, T.K.; Liu, C.; Antonio, A.L.M.; Wheaton, N.; Kreger, V.; Yap, A.; Schriger, D.; Elmore, J.G. Injuries Associated with Standing Electric Scooter Use. *JAMA Netw. Open* **2019**, *2*, e187381. [CrossRef]
52. Lin, S.; Goldman, S.; Peleg, K.; Levin, L.; Abbod, N.; Bahouth, H.; Bala, M.; Becker, A.; Ben Eli, M.; Braslavsky, A.; et al. Dental and maxillofacial injuries associated with electric-powered bikes and scooters in Israel: A report for 2014–2019. *Dent. Traumatol.* **2020**. [CrossRef]

53. Yeung, E.; Brandsma, D.; Karst, F.; Smith, C.; Fan, K. The influence of 2020 coronavirus lockdown on presentation of oral and maxillofacial trauma to a central London hospital. *Br. J. Oral Maxillofac. Surg.* **2021**, *59*, 102–105. [CrossRef]
54. Aurora, F.; Cove, G.; Sandhu, P.; Thomas, S.J.; Gormley, M. Oral and maxillofacial injuries from electric scooters in Bristol; a retrospective observational study. *Br. J. Oral Maxillofac. Surg.* **2021**. [CrossRef]
55. Thoenissen, P.; Salewski, D.; Heselich, A.; Sader, R.; Marzi, I.; Muehlenfeld, N.; Ghanaati, S. Patterns of Craniomaxillofacial Trauma After E-Scooter Accidents in Germany. *J. Craniofacial Surg.* **2021**, *32*, 1587–1589. [CrossRef] [PubMed]
56. Bs, A.K.; Yaremchuk, K.; Tam, S. Head and Neck Injuries and Electronic Scooter Use in the United States. *Laryngoscope* **2021**, *131*. [CrossRef]
57. Störmann, P.; Klug, A.; Nau, C.; Verboket, R.D.; Leiblein, M.; Müller, D.; Schweigkofler, U.; Hoffmann, R.; Marzi, I.; Lustenberger, T. Characteristics and Injury Patterns in Electric-Scooter Related Accidents—A Prospective Two-Center Report from Germany. *J. Clin. Med.* **2020**, *9*, 1569. [CrossRef] [PubMed]
58. Oksanen, E.; Turunen, A.; Thorén, H. Assessment of Craniomaxillofacial Injuries after Electric Scooter Accidents in Turku, Finland, in 2019. *J. Oral Maxillofac. Surg.* **2020**, *78*, 2273–2278. [CrossRef]
59. Liew, Y.K.; Wee, C.P.J.; Pek, J.H. New peril on our roads: A retrospective study of electric scooter-related injuries. *Singap. Med. J.* **2020**, *61*, 92–95. [CrossRef]
60. Kim, M.; Lee, S.; Ko, D.R.; Kim, D.; Huh, J.; Kim, J. Craniofacial and dental injuries associated with stand-up electric scooters. *Dent. Traumatol.* **2020**, *37*, 229–233. [CrossRef]
61. Unkuri, J.H.; Salminen, P.; Kallio, P.; Kosola, S. Kick Scooter Injuries in Children and Adolescents: Minor Fractures and Bruise. *Scand. J. Surg.* **2018**, *107*, 350–355. [CrossRef]
62. Baumgartner, E.N.; Krastl, G.; Kühl, S.; Filippi, A. Dental injuries with kick-scooters in 6- to 12-year-old children. *Dent. Traumatol.* **2011**, *28*, 148–152. [CrossRef]
63. Nathanson, B.H.; Ribeiro, K.; Henneman, P.L. An Analysis of US Emergency Department Visits from Falls From Skiing, Snowboarding, Skateboarding, Roller-Skating, and Using Nonmotorized Scooters. *Clin. Pediatr.* **2015**, *55*, 738–744. [CrossRef]
64. Toofany, M.; Mohsenian, S.; Shum, L.K.; Chan, H.; Brubacher, J.R. Injury patterns and circumstances associated with electric scooter collisions: A scoping review. *Inj. Prev.* **2021**, *27*, 490–499. [CrossRef]
65. Adams, N.S.; Newbury, P.A.; Eichhorn, M.G.; Davis, A.T.; Mann, R.J.; Polley, J.W.; Girotto, J.A. The Effects of Motorcycle Helmet Legislation on Craniomaxillofacial Injuries. *Plast. Reconstr. Surg.* **2017**, *139*, 1453–1457. [CrossRef] [PubMed]
66. Fonseca-Cabrera, A.S.; Llopis-Castelló, D.; Pérez-Zuriaga, A.M.; Alonso-Troyano, C.; García, A. Micromobility Users' Behaviour and Perceived Risk during Meeting Manoeuvres. *Int. J. Environ. Res. Public Health* **2021**, *18*, 12465. [CrossRef] [PubMed]
67. Riding an E-scooter without a Helmet to Be Legal in California. What Could Go Wrong?—The San Diego Union-Tribune. Available online: https://www.sandiegouniontribune.com/opinion/the-conversation/sd-california-helmets-optional-for-electric-scooters-20180920-htmlstory.html (accessed on 28 October 2021).
68. Serra, G.F.; Fernandes, F.A.; Noronha, E.; de Sousa, R.J.A. Head protection in electric micromobility: A critical review, recommendations, and future trends. *Accid. Anal. Prev.* **2021**, *163*, 106430. [CrossRef] [PubMed]
69. Aizpuru, M.; Farley, K.X.; Rojas, J.C.; Crawford, R.S.; Moore, T.J.; Wagner, E.R. Motorized scooter injuries in the era of scooter-shares: A review of the national electronic surveillance system. *Am. J. Emerg. Med.* **2019**, *37*, 1133–1138. [CrossRef]
70. Gross, I.; Weiss, D.J.; Eliasi, E.; Bala, M.; Hashavya, S. E-Bike–Related Trauma in Children and Adults. *J. Emerg. Med.* **2018**, *54*, 793–798. [CrossRef]
71. Shichman, I.; Shaked, O.; Factor, S.; Elbaz, E.; Khoury, A. Epidemiology of Fractures Sustained During Electric Scooter Accidents. *J. Bone Jt. Surg.* **2021**, *103*, 1125–1131. [CrossRef]
72. Yang, H.; Ma, Q.; Wang, Z.; Cai, Q.; Xie, K.; Yang, D. Safety of micro-mobility: Analysis of E-Scooter crashes by mining news reports. *Accid. Anal. Prev.* **2020**, *143*, 105608. [CrossRef]
73. Daniel, J.; Reck, K.; Axhausen, W. Who uses shared micro-mobility services? Empirical evidence from Zurich, Switzerland. *Transp. Res. Part D Transp. Environ.* **2021**, *94*, 102803.
74. Kerr, B.; Lee, R.; Barbosa, M.; Benis, A.; Dormanesh, A.; Majmundar, A.; Allem, J.-P. Follow-Up Investigation on the Promotional Practices of Electric Scooter Companies: Content Analysis of Posts on Instagram and Twitter. *JMIR Public Health Surveill.* **2020**, *6*, e16833. [CrossRef]
75. Khor, S.N.; Chong, S.J.; Tan, K.C. Electric scooter burns and the danger of personal mobility device battery. *ANZ J. Surg.* **2018**, *88*, 250. [CrossRef]
76. Ragonez, D.; Mimoun, M.; Chaouat, M.; Levy, S.; Vairinho, A.; Boccara, D.; Serror, K. Burns Caused by Exploding Standing Electric Scooters (E-Scooters): A New Phenomenon. *J. Burn Care Res.* **2020**, *42*, 348–349. [CrossRef] [PubMed]
77. Hsieh, M.K.H.; Lai, M.C.; Sim, H.S.N.; Lim, X.; Fok, S.F.D.; Joethy, J.; Kong, T.Y.; Lim, G.J.S. Electric Scooter Battery Detonation: A Case Series and Review of Literature. Ann Burns Fire Disasters. *Cochrane Database Syst. Rev.* **2021**, *34*, 264–276.
78. Montgomery, R.E.; Li, Y.; Dutta, T.; Holliday, P.J.; Fernie, G.R. Quantifying Mobility Scooter Performance in Winter Environments. *Arch. Phys. Med. Rehabil.* **2021**, *102*, 1902–1909. [CrossRef] [PubMed]
79. McGuinness, M.J.; Tiong, Y.; Bhagvan, S. Shared electric scooter injuries admitted to Auckland City Hospital: A comparative review one year after their introduction. *N. Z. Med. J.* **2021**, *134*, 21–29. [PubMed]
80. Shiffler, K.; Mancini, K.; Wilson, M.; Huang, A.; Mejia, E.; Yip, F.K. Intoxication is a Significant Risk Factor for Severe Craniomaxillofacial Injuries in Standing Electric Scooter Accidents. *J. Oral Maxillofac. Surg.* **2020**, *79*, 1084–1090. [CrossRef] [PubMed]

81. Pimentel, D.; Lowry, M.B.; Koglin, T.W.; Pimentel, R.W. Innovation in a Legal Vacuum: The Uncertain Legal Landscape for Shared Micro-Mobility. *JL Mobil.* **2020**, *17*. Available online: https://heinonline.org/HOL/LandingPage?handle=hein.journals/jlwmby2020&div=3&id=&page= (accessed on 27 March 2022). [CrossRef]
82. Sareen, S.; Remme, D.; Haarstad, H. E-scooter regulation: The micro-politics of market-making for micro-mobility in Bergen. *Environ. Innov. Soc. Transitions* **2021**, *40*, 461–473. [CrossRef]
83. Sky tg 24. Muore Dopo Caduta Da Monopattino a Sesto San Giovanni, Accertamenti SU Mezzo E Dinamica. 2021. Available online: https://sgq.io/l/hsmzaEWM (accessed on 28 October 2020).
84. Rai News. Casco e Limiti di Velocità per i Monopattini a Sesto San Giovanni Dopo la Morte del Tredicenne. 2021. Available online: https://www.rainews.it/dl/rainews/articoli/Sesto-San-giovanni-casco-e-limiti-di-velocita-per-i-monopattini-dopo-la-morte-del-tredicenne-Fabio-Mosca-29a89fdf-6bfa-4c13-b710-f4067801598f.html (accessed on 4 April 2022).
85. Osservatorio Monopattini: I Primi Otto Mesi Con I Dati Asaps Al 17 Settembre Sono 10 Le Vittime Accertate. 2021. Available online: https://www.asaps.it/73412-_osservatorio_monopattini__i_primi_otto_mesi_con_i_dati_asaps_al_9_settembre_son.html (accessed on 4 April 2022).
86. Qureshi, A.I.; Huang, W.; Khan, S.; Lobanova, I.; Siddiq, F.; Gomez, C.R.; Suri, M.F.K. Mandated societal lockdown and road traffic accidents. *Accid. Anal. Prev.* **2020**, *146*, 105747. [CrossRef]
87. Chiu, J.; Robinovitch, S.N. Prediction of upper extremity impact forces during falls on the outstretched hand. *J. Biomech.* **1998**, *31*, 1169–1176. [CrossRef]
88. Mayhew, L.J.; Bergin, C. Impact of e-scooter injuries on Emergency Department imaging. *J. Med. Imaging Radiat. Oncol.* **2019**, *63*, 461–466. [CrossRef]
89. Mitchell, G.; Tsao, H.; Randell, T.; Marks, J.; Mackay, P. Impact of electric scooters to a tertiary emergency department: 8-week review after implementation of a scooter share scheme. *Emerg. Med. Australas.* **2019**, *31*, 930–934. [CrossRef] [PubMed]
90. Shichman, I.; Shaked, O.; Factor, S.; Weiss-Meilik, A.; Khoury, A. Emergency department electric scooter injuries after the introduction of shared e-scooter services: A retrospective review of 3331 cases. *World J. Emerg. Med.* **2022**, *13*. [CrossRef] [PubMed]
91. English, K.C.; Allen, J.R.; Rix, K.; Zane, D.F.; Ziebell, C.M.; Brown, C.V.R.; Brown, L.H. The characteristics of dockless electric rental scooter-related injuries in a large U.S. city. *Traffic Inj. Prev.* **2020**, *21*, 476–481. [CrossRef] [PubMed]
92. Beck, S.; Barker, L.; Chan, A.; Stanbridge, S. Emergency department impact following the introduction of an electric scooter sharing service. *Emerg. Med. Australas.* **2019**, *32*, 409–415. [CrossRef]
93. Vernon, N.; Maddu, K.; Hanna, T.N.; Chahine, A.; Leonard, C.E.; Johnson, J.-O. Emergency department visits resulting from electric scooter use in a major southeast metropolitan area. *Emerg. Radiol.* **2020**, *27*, 469–475. [CrossRef]
94. Barker, M.; Pepper, T.; Dua, R.; Fan, K. Electric scooters: Convenient transport or ED headache? *Br. J. Oral Maxillofac. Surg.* **2020**, *60*, 199–200. [CrossRef] [PubMed]
95. Lavoie-Gagne, O.; Siow, M.; Harkin, E.W.; Flores, A.R.; Politzer, C.S.; Mitchell, B.C.; Girard, P.J.; Schwartz, A.K.; Kent, W.T. Financial impact of electric scooters: A review of injuries over 27 months at an urban level 1 trauma center (cost of e-scooter injuries at an urban level 1 trauma center). *Trauma Surg. Acute Care Open* **2021**, *6*, e000634. [CrossRef]
96. Tischler, E.H.; Tsai, S.H.L.; Wolfert, A.J.; Suneja, N.; Naziri, Q.; Tischler, H.M. Orthopedic fracture hospitalizations are revving up from E-Scooter related injuries. *J. Clin. Orthop. Trauma* **2021**, *23*. [CrossRef]
97. Ptak, M.; Fernandes, F.A.O.; Dymek, M.; Welter, C.; Brodziński, K.; Chybowski, L. Analysis of electric scooter user kinematics after a crash against SUV. *PLoS ONE* **2022**, *17*, e0262682. [CrossRef]
98. Badeau, A.; Carman, C.; Newman, M.; Steenblik, J.; Carlson, M.; Madsen, T. Emergency department visits for electric scooter-related injuries after introduction of an urban rental program. *Am. J. Emerg. Med.* **2019**, *37*, 1531–1533. [CrossRef]
99. E-Scooter Ride-Share Industry Leaves Injuries and Angered Cities in its Path—Consumer Reports. Available online: https://www.consumerreports.org/product-safety/e-scooter-ride-share-industry-leaves-injuries-and-angered-cities-in-its-path/ (accessed on 28 October 2021).
100. Study: Electric Scooter Riders Are Going to the Emergency Room with Head Injuries, Sprains. Available online: https://eu.heraldmailmedia.com/story/news/2019/01/25/study-electric-scooter-riders-are-going-to-the-emergency-room-with-head-injuries-sprains/44262535/ (accessed on 28 October 2021).
101. Are Scooters Safe? Government Scientists Studying Health Risks. Available online: https://eu.usatoday.com/story/news/2018/12/13/dockless-scooters-austin-cdc-study-health-risk/2298911002/ (accessed on 28 October 2021).
102. Stigson, H.; Malakuti, I.; Klingegård, M. Electric scooters accidents: Analyses of two Swedish accident data sets. *Accid. Anal. Prev.* **2021**, *163*, 106466. [CrossRef] [PubMed]
103. Bekhit, M.N.Z.; Le Fevre, J.; Bergin, C.J. Regional healthcare costs and burden of injury associated with electric scooters. *Injury* **2019**, *51*, 271–277. [CrossRef] [PubMed]
104. Farley, K.X.; Aizpuru, M.; Wilson, J.M.; Daly, C.A.; Xerogeanes, J.; Gottschalk, M.B.; Wagner, E.R. Estimated Incidence of Electric Scooter Injuries in the US From 2014 to 2019. *JAMA Netw. Open* **2020**, *3*, e2014500. [CrossRef] [PubMed]
105. Cohen, L.L.; Geller, J.S.; Yang, B.W.; Allegra, P.R.; Dodds, S.D. Pediatric injuries related to electric scooter use. *J. Pediatr. Orthop. B* **2021**. [CrossRef]
106. Blomberg, S.N.F.; Rosenkrantz, O.C.M.; Lippert, F.; Christensen, H.C. Injury from electric scooters in Copenhagen: A retrospective cohort study. *BMJ Open* **2019**, *9*, e033988. [CrossRef]

107. Cicchino, J.B.; Kulie, P.E.; McCarthy, M.L. Injuries related to electric scooter and bicycle use in a Washington, DC, emergency department. *Traffic Inj. Prev.* **2021**, *22*, 401–406. [CrossRef]
108. MacArthur, J.; Kobel, N.; Dill, J.; Mummuni, Z. Portland State University Evaluation of an Electric Bike Pilot Project at Three Employment Campuses in Portland. *Oregon Transp. Res. Educ. Cent.* **2017**. [CrossRef]
109. Edge, S.; Dean, J.; Cuomo, M.; Keshav, S. Exploring e-bikes as a mode of sustainable transport: A temporal qualitative study of the perspectives of a sample of novice riders in a Canadian city. *Can. Geogr.* **2018**, *62*, 384–397. [CrossRef]
110. Plazier, P.A.; Weitkamp, G.; Berg, A.E.V.D. The potential for e-biking among the younger population: A study of Dutch students. *Travel Behav. Soc.* **2017**, *8*, 37–45. [CrossRef]
111. He, Y.; Sun, C.; Huang, H.; Jiang, L.; Ma, M.; Wang, P.; Wu, C. Safety of micro-mobility: Riders' psychological factors and risky behaviors of cargo TTWs in China. *Transp. Res. Part F Traffic Psychol. Behav.* **2021**, *80*, 189–202. [CrossRef]
112. Hosseinzadeh, P.; Devries, C.; Saldana, R.E.; Scherl, S.A.; Andras, L.M.; Schur, M.; Shuler, F.D.; Mignemi, M.; Minaie, A.; Chu, A.; et al. Hoverboard injuries in children and adolescents: Results of a multicenter study. *J. Pediatr. Orthop. B* **2019**, *28*, 555–558. [CrossRef] [PubMed]
113. Goldhaber, N.H.; Goldin, A.N.; Pennock, A.T.; Livingston, K.; Bae, D.S.; Yen, Y.M.; Shore, B.J.; Kramer, D.E.; Jagodzinski, J.E.; Heyworth, B.E. Orthopedic Injuries Associated with Hoverboard Use in Children: A Multi-center Analysis. *HSS J. Musculoskelet. J. Hosp. Spéc. Surg.* **2019**, *16*, 221–225. [CrossRef]
114. McIlvain, C.; Hadiza, G.; Tzavaras, T.J.; Weingart, G.S. Injuries associated with hoverboard use: A review of the National Electronic Injury Surveillance System. *Am. J. Emerg. Med.* **2018**, *37*, 472–477. [CrossRef] [PubMed]
115. Sobel, A.D.; Reid, D.B.; Blood, T.D.; Daniels, A.H.; Cruz, A.I. Pediatric Orthopedic Hoverboard Injuries: A Prospectively Enrolled Cohort. *J. Pediatr.* **2017**, *190*, 271–274. [CrossRef] [PubMed]
116. Monteilh, C.; Patel, P.; Gaffney, J. Musculoskeletal Injuries Associated with Hoverboard Use in Children. *Clin. Pediatr.* **2017**, *56*. [CrossRef] [PubMed]
117. Weingart, G.S.; Glueckert, L.; Cachaper, G.A.; Zimbro, K.S.; Maduro, R.S.; Counselman, F. Injuries Associated with Hoverboard Use: A Case Series of Emergency Department Patients. *West. J. Emerg. Med.* **2017**, *18*, 993–999. [CrossRef] [PubMed]
118. Robinson, T.; Agarwal, M.; Chaudhary, S.; Costello, B.E.; Simon, H.K. Pediatric Hoverboard Injuries. *Clin. Pediatr.* **2016**, *55*, 1078–1080. [CrossRef]
119. Schapiro, A.H.; Lall, N.U.; Anton, C.G.; Trout, A.T. Hoverboards: Spectrum of injury and association with an uncommon fracture. *Pediatr. Radiol.* **2017**, *47*, 437–441. [CrossRef]
120. Larson, S.; Green, R.E.; Sims, D.; Bopp, M.; Colgan, J. An Examination of the Influences on Active Commuting among a Sample of Parents. *J. Phys. Act. Res.* **2017**, *2*, 124–129. [CrossRef]
121. Charter of Fundamental Rights of The European Union. Available online: https://www.europarl.europa.eu/charter/pdf/text_it.pdf (accessed on 27 March 2022).
122. Gössling, S. Integrating e-scooters in urban transportation: Problems, policies, and the prospect of system change. *Transp. Res. Part D Transp. Environ.* **2020**, *79*. [CrossRef]
123. Daniels, S.; Brijs, T.; Nuyts, E.; Wets, G. Injury crashes with bicyclists at roundabouts: Influence of some location characteristics and the design of cycle facilities. *J. Saf. Res.* **2009**, *40*, 141–148. [CrossRef] [PubMed]
124. Lusk, A.C.; Furth, P.G.; Morency, P.; Miranda-Moreno, L.F.; Willett, W.C.; Dennerlein, J. Risk of injury for bicycling on cycle tracks versus in the street. *Inj. Prev.* **2011**, *17*, 131–135. [CrossRef] [PubMed]