Accident Analysis and Prevention 50 (2013) 499–511

Contents lists available at SciVerse ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Perception of safety of cyclists in Dublin City

Anneka R. Lawson [a,*], Vikram Pakrashi [b], Bidisha Ghosh [a], W.Y. Szeto [c]

[a] Department of Civil, Structural and Environmental Engineering, Trinity College Dublin, Ireland
[b] Department of Civil and Environmental Engineering, University College Cork, Ireland
[c] Department of Civil Engineering, The University of Hong Kong, Hong Kong

ARTICLE INFO

Article history:
Received 26 September 2011
Received in revised form 11 May 2012
Accepted 23 May 2012

Keywords:
Perceived safety
Multi-modal transportation network
Urban cycling
Questionnaire survey

ABSTRACT

In recent years, cycling has been recognized and is being promoted as a sustainable mode of travel. The perception of cycling as an unsafe mode of travel is a significant obstacle in increasing the mode share of bicycles in a city. Hence, it is important to identify and analyze the factors which influence the safety experiences of the cyclists in an urban signalized multi-modal transportation network. Previous researches in the area of perceived safety of cyclists primarily considered the influence of network infrastructure and operation specific variables and are often limited to specific locations within the network. This study explores the factors that are expected to be important in influencing the perception of safety among cyclists but were never studied in the past. These factors include the safety behavior of existing cyclists, the users of other travel modes and their attitude toward cyclists, facilities and network infrastructures applicable to cycling as well as to other modes in all parts of an urban transportation network. A survey of existing cyclists in Dublin City was conducted to gain an insight into the different aspects related to the safety experience of cyclists. Ordered Logistic Regression (OLR) and Principal Component Analysis (PCA) were used in the analysis of survey responses. This study has revealed that respondents perceive cycling as less safe than driving in Dublin City. The new findings have shown that the compliance of cyclists with the rules of the road increase their safety experience, while the reckless and careless attitudes of drivers are exceptionally detrimental to their perceived safety. The policy implications of the results of analysis are discussed with the intention of building on the reputation of cycling as a viable mode of transportation among all network users.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

There has been an increasing dependency of society on motorized vehicles in Dublin City over the past number of decades. This has raised significant concerns regarding growing traffic congestion, harmful vehicle emissions and associated public health problems. In 2005, the cost of congestion alone to the Greater Dublin Area was €2.5 billion (Dublin Chamber of Commerce, 2005). This is a huge threat to the competitiveness of Dublin as a city trying to attract investments. To combat these problems, non-motorized modes of transportation, like walking and cycling, are gaining attention from policy makers in recent years. Increased mode share of these sustainable modes of travel are expected to reduce vehicle numbers on the roads within the city, thereby reducing traffic congestion, vehicle emissions, and health problems associated with these vehicle emissions. In 2009, the Department of Transport published Ireland's first National Cycle Policy Framework (NCPF) (Department of Transport, 2009), which aims at increasing the bicycle commuter mode share to 10% by 2020. At the time of publication of the NCPF, the mode share in Ireland stood at 1.9%. The cycling mode share in Dublin City stood at 3.2% in 2006 (Central Statistics Office, 2006; McMorrow and Ghosh, 2011). This is higher than the average percentage in Ireland, but remains far below the 2020 target set out in the NCPF. In comparison with other cycling friendly countries and cities in Europe, the mode share is extremely low. Cycling mode shares in countries like the Netherlands, Denmark and Germany are on an average between 10% and 26% with some cities reaching 35–40% (Ministerie van Verkeer en Waterstaat, 2009).

A significant obstacle to achieving this targeted mode share in Dublin City is the fact that cycling is perceived as an unsafe mode of travel. Studies have shown the risks of accident or injury due to cycling are much higher than while driving (Aultman-Hall and Kaltenecker, 1999; Zegeer, 1994). A study of the attitudes of cyclists and drivers in Dublin found that 21% of drivers do not cycle because they feel it is "too dangerous because of traffic" (Keegan and Galbraith, 2005). A report from the Irish Road Safety Authority (RSA) (Road Safety Authority, 2010) states that between 1998 and 2008 there were 144 cyclists (43 in County Dublin) fatally injured and 335 (115 in County Dublin) seriously injured

* Corresponding author.
E-mail address: lawsona@tcd.ie (A.R. Lawson).

0001-4575/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.aap.2012.05.029

on Irish roads. Despite the percentage of fatalities among cyclists contributing only 3.5% of all road fatalities between these years in Ireland, cycling remains a low preference mode of travel. This may be due to a large number of minor accidents unreported to authorities. The RSA report does not distinctly address minor injuries due to cycling accidents, although the RSA does recognize that cyclists are the most vulnerable road users (Road Safety Authority, 2010). Due to limited information, it is not possible to gauge the actual number of minor cycling accidents in Dublin. Many studies have estimated the extent to which underreporting of cycling accidents and underreporting of the severity of reported accidents occur across Europe (Waldman, 1977), Canada (Doherty et al., 2000) and the USA (Stutts and Hunter, 1998).

Previous research on cycling safety has mainly focused on the placement of cyclists within a multi-modal network and on the use of safety accessories such as helmets and light/reflectors. There are mixed opinions on the integration (Aultman-Hall and Hall, 1998b; Aultman-Hall and Kaltenecker, 1999; Forester, 1993; Moritz, 1997) or separation (Bíl et al., 2010; Hopkinson and Wardman, 1996; Parkin et al., 2007; Pucher, 2001; Tilahun et al., 2007; Wardman et al., 2007; Wegman et al., 2012) of cyclists from other road users. Separation within the road has been suggested as less safe for cyclists as drivers pay less attention and leave less space when overtaking (de Lapparent, 2005; Parkin and Meyers, 2010). There are studies which suggest that a well-connected network of various types of facilities is required to ensure cyclist safety (Dill, 2009; Pucher et al., 2010). There also exists much debate in relation to the use of safety accessories (Cameron et al., 1994; Depreitere et al., 2004; Ekman et al., 1997; McIntosh et al., 1998; Povey et al., 1999; Robinson, 2001; Scuffham et al., 2000; Scuffham and Langley, 1997; Welander et al., 1999). Recommending or making their use mandatory has been shown to be unsuccessful in encouraging their use among all cyclists (Ferguson and Blampied, 1991; Hagel et al., 2007; Osberg et al., 1998) and although their use decreases the risk of head injuries, enforcing mandatory use has had a detrimental effect on mode share which does not outweigh the health benefits of cycling.

Less research attention has been focused on investigating the perceptions of safety among cyclists. The majority of existing research conducted in this field is presented in Table 1, including variables collected as part of each study (not all variables were considered in the analysis of each study; not all analyzed variables were found significant). These studies have mainly been conducted in order to aid engineers and planners in the design, improvement and prioritization of road and intersection works to cater for cyclists. The majority of these studies asked cyclists to rate their overall risk perception of a route described by video-clips, simulations, survey or by completion of a test course. Each study examined a number of network geometry and operation specific variables in relation to the safety perceptions of cyclists which are listed as network specific variables in Table 1. Only two of the studies (Møller and Hels, 2008; Noland and Kunreuther, 1995) considered cyclist characteristics which are listed as cyclist specific variables in the table. Among the network specific variables, outside lane width, motorist speed and volume were considered by almost all studies mentioned in Table 1. The other popular operational variables considered in the literature include pavement surface quality, the trip generation potential of the surrounding area, the number of traffic lanes, the number of side roads, facility characteristics, turning vehicles and traffic mix at specific locations identified by the researchers. Parkin et al. (2007) uniquely considered the majority of the remaining operational variables as indicated in Table 1. Each of these analyses has tended to consider only a small number of variables and are usually specific to certain locations within the network, such as link segments, vehicle or bicycle crossings and roundabouts. The restricted nature of these previous researches establishes scope for the development of an exhaustive study on cyclist safety perceptions, containing all variables considered in previous research along with new variables which are expected to have an impact on cyclist safety perception and were not studied in the past.

This paper aims to investigate the overall perceptions of safety of cyclists in a multi-modal, signalized transportation network, rather than targeting specific locations within the network. The network agents explored include existing cyclists and road users of other transportation modes, facilities and network infrastructures applicable to cycling as well as to other modes. The new variables investigated in this study include safety accessory use, bus, taxi and car driver's behavior, cyclist experience and confidence, trip purpose, weather conditions, the presence of accident 'black spots', etc. In particular, through Ordered Logistic Regression (OLR) and Principal Component Analysis (PCA) based models, all the aforementioned variables are found to be significant and have an impact on cyclist safety perception. More importantly, both the compliance of cyclists with the rules of the road and uncooperative driver attitudes are found to have direct implications on cycling policy.In this study, a questionnaire based survey on the different aspects of the safety of cyclists in an urban transportation network has been conducted on a large number of existing cyclists in Dublin City, Ireland. The survey responses have been analyzed to explore the aspects of safety of the cyclists in three main categories; the current safety behavior of the cyclists, the perception of safety of the cyclists, and the interaction of the cyclists with the elements of the network within a multi-modal transportation system. Three models, namely the Safety Behavior Model, the Perceived Safety Model, and the Cyclist–Network Interaction Model, have been developed via PCA or OLR to explore the three aspects. The perceptions studied are based on the self-reported personal experiences of cyclists in the transportation network of Dublin city. This investigation is complex, yet interesting, since the transportation infrastructures along with the conditions for cycling vary widely throughout the city.

The next two sections of this paper depict the data and the methods respectively, followed by the analysis section employing the three aforementioned models. The discussion on the policy implications and the limitations of this study are provided next. Finally, a conclusion is given.

2. Data

This section presents the transportation network characteristics of the study region, Dublin city, Ireland. This is followed by a sub-section pertaining to the collection of data. The profile of the respondent cyclists and a description of the survey data collected are presented next in two subsections, respectively.

2.1. Study region

Dublin City is the capital of Ireland and the largest city in terms of area, residing and working population of the country (Central Statistics Office, 2006). The transportation network in Dublin City is primarily designed for the use of private vehicles. Other main modes of motorized transportation in Dublin City are Dublin Bus, Luas (tram), Dublin Area Rapid Transport (light rail) and Commuter trains (suburban railway networks). In 2006, nearly 16.4% of the commuter trips were made using non-motorized modes of transportation (McMorrow and Ghosh, 2011). However, the percentage of employees walking to their workplaces was much higher than that using bicycle as their preferred mode of commuter travel. The transportation network in Dublin City contains cycling facilities mainly in the form of cycle lanes; approximately 120 km of on-road cycle tracks, 50 km of shared bus–cycle lanes and 25 km of off-road cycle tracks exist in the network.

Download English Version:

https://daneshyari.com/en/article/6966906

Download Persian Version:

https://daneshyari.com/article/6966906

Daneshyari.com