Accident Analysis and Prevention 121 (2018) 94–100

Contents lists available at ScienceDirect

Accident Analysis and Prevention

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

The relationship between the demographic, personal, and social factors of Malaysian motorcyclists and risk taking behavior at signalized intersections

Muhamad Nazri Borhan[a,b,*], Ahmad Nazrul Hakimi Ibrahim[b], Affan Aziz[b], Muhamad Razuhanfi Mat Yazid[a,b]

[a] Civil Engineering Programme, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, UKM, Bangi, Selangor 43600, Malaysia
[b] Smart and Sustainable Township Research Centre, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, UKM, Bangi, Selangor 43600, Malaysia

ARTICLE INFO

Keywords:
Risk-taking behavior
Motorcyclists
Motorcyclists' behavior
Signalized intersection
Demographic factor
Social factor

ABSTRACT

In the context of road safety, risk-taking is undoubtedly one of the main contributory factors in road accidents. The actual forces which influence individuals to take such risks, nevertheless, are still not fully understood. To address this, this study was therefore conducted to investigate the relationship of the demographic, personal, and social factors of motorcyclists, with a specific focus on their risk-taking behavior at signalized intersections in Malaysia. This study adopted the quantitative method using cross-sectional questionnaire surveys and involved 251 respondents. The demographic factors were analyzed using the *t*-test and an ANOVA Scheffe Post-Hoc test, while the motorcyclists' personal and social characteristics were analyzed with multiple linear regression. The findings indicate that the individuals who were greater risk takers at signalized intersections were teenage motorcyclists (16–25 years old) who had finished their education before taking their high school diploma, and who also received a lower than average monthly income from private sector firms. The actual experience of accidents was also shown to be positively related to this risk-taking behavior. In addition, in term of personal and social factors, results showed that, for these individuals, there was a significant difference between the strength of peer influence and that of parental and spouse guidance. However, there was no significant difference in the risk-taking behavior of Malaysian motorcyclists riding at signalized intersections for the following factors: between genders, in terms of accident involvement, in terms of enforcement of traffic regulations, and prevention steps and confidence level after being involved in an accident.

1. Introduction

Currently, road accidents are, universally, a major cause of injury-related fatalities (Hongsranagon et al., 2011). Statistics show that while approximately two million people around the world die every year, as many as 3000 people die daily because of road accidents (Dapilah et al., 2016). The World Health Organisation (WHO) (2004) reported that 85% of this daily tragedy occurs in low and middle-income countries. According to Masuri et al. (2012), accidents are not caused by a single factor, but are the results of a combination of several factors, among which are environmental elements (Bergel-Hayat et al., 2013; Edwards, 2002; Theofilatos and Yannis, 2014), characteristics of infrastructure (Coevering et al., 2016; Vieira Gomes, 2013), type of vehicle (Haque et al., 2010), and human behavior (Chen, 2009; Edwards, 2002).

Following rapid economic growth and motorization, the motorcycle has become the main mode of transportation in Southern Asian countries such as Indonesia, Singapore, Thailand, and Malaysia (Susilo et al., 2015). Both Chen (2009) and Susilo et al. (2015) noted that the motorcycle had become a popular mode of transportation mainly because of its flexibility, low cost, and maneuverability in heavy traffic conditions which are typical of this region. This is no different in Malaysia, where the popularity of the motorcycle is clearly evident, albeit at the cost of an excessively high number of accidents which cause injuries and deaths. Statistics reported by the Malaysian Institute of Road Safety Research (MIROS) (see Fig. 1) show that the number of accidents involving motorcyclists is very high compared to accidents involving other modes of transportation, including the bus, car, lorry, and the bicycle. Currently, more than 50% of the road accident fatalities in Malaysia involve motorcyclists (Abdul Manan and Várhelyi, 2015).

The increasing number of accidents involving motorcycles has

* Corresponding author at: Smart and Sustainable Township Research Centre, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, UKM, Bangi, Selangor 43600, Malaysia.
E-mail address: mnazri_borhan@ukm.edu.my (M.N. Borhan).

https://doi.org/10.1016/j.aap.2018.09.004
Received 12 May 2017; Received in revised form 27 July 2018; Accepted 4 September 2018

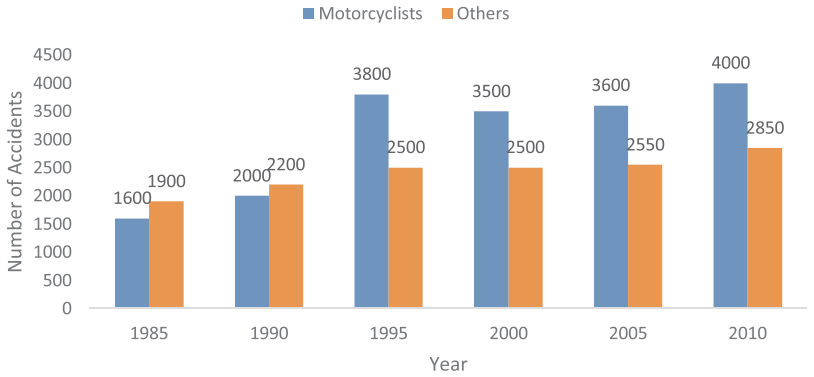

Fig. 1. Road accidents involving motorcyclists and other road users between 1985 and 2010.
Source: MIROS 2011

attracted the interest of transport engineers and researchers to investigate the causes of this phenomena (e.g. Goel and Sachdeva, 2016; Pai and Saleh, 2008). The causes of motorcycle accidents are complex (Masuri et al., 2012). A study conducted by Ulleberg and Rundmo (2003) found that 95% of traffic accidents are due to behavioral factors. Additionally, many studies have shown that the increasing number of accidents involving motorcyclists is due to the following: limited riding experience (Crundall et al., 2013), speed (Elliott, 2010), the motorcyclist's perception of hazard (Bellet and Banet, 2012; Rosenbloom et al., 2011), road geometry (Pai and Saleh, 2007, 2008), and risk-taking behavior (Chen, 2009; Chung and Wong, 2012; Hongsranagon et al., 2011).

Furthermore, road elements are also one of the factors which demonstrably contribute to road accidents (Papaioannou, 2007; Polders et al., 2015). Signalized intersections are the most common element of road networks. According to Abdel-Aty et al. (2004), intersections are the most crash-prone locations in street or road networks. A study by Shesterov, and Mikhailov (2017) on the accident rates at the signalized intersections of 25 main street intersections in St. Petersburg showed 25.4 (mean value) accidents by 10^7 vehicles crossing the intersection. A case study from Florida found that in 1999, one crash occurred every 5.5 min at a signalized intersection (Abdel-Aty et al., 2004). This phenomenon, claimed the authors, was possibly due to several conflicting movements, which resulted in complexity, an increase in the concentration of traffic volume, and a large variation in interactions between road users (Abdel-Aty et al., 2004; Polders et al., 2015). This culmination of a variety of factors represented an especially high risk to small vehicle user such as motorcyclists.

The level of safety at signalized intersections depends on several factors such as traffic volumes, phasing and the time settings of the traffic signal, the layout of the site, and road user behavior (Papaioannou, 2007). Road user behavior is considered one of the most influential factors in the genesis of accidents. Although the public has been clearly aware and concerned, this issue of motorcyclists' behavior at signalized intersections in Malaysia has not been given proper attention so far in the literature. Many studies have already focused on the more general effects of road user behavior at signalized intersections, but little is known of the exact factors which influence risk-taking behavior at signalized intersections. Therefore, this study explores the relationship between demographic factors such as age, gender, education level, employment status and sector, monthly income, type and duration of license, and road accident involvement, along with personal and social factors of motorcyclists towards risk-taking behavior at signalized intersections. This exploration will provide useful information and empirically-based conclusions, which might lead to effective preventative action by the authorities.

2. Motorcyclist behavior, factors related to motorcyclists behavior, and accidents

For several decades, many experts and researchers have focussed on motorcycle safety (Abdul Manan and Várhelyi, 2015; Dapilah et al., 2016; Pai and Saleh, 2007). The main reason for this interest is the gradually increasing number of accidents which cause serious injury and death which involve motorcyclists (Dapilah et al., 2016; Susilo et al., 2015). A study conducted by Hongsranagon et al. (2011) found that accidents involving motorcycles made up more than 80% of the road injuries sustained in Thailand.

It should be noted, however, that this pattern is not limited to developing countries. A study in one of the developed countries, Australia, showed that the death rate for Australian motorcyclists, compared to that of car occupants per distance traveled, is approximately 30 times higher (Haworth et al., 2009). Indeed, similar findings have been reported in other developed countries. For example, compared to the death rate for car passengers per distance traveled, the rate for motorcyclists is approximately 35 times higher in the United State of America (USA) and 25 times higher in the United Kingdom (UK) (Haworth et al., 2009). In the UK, the Department of Environment, Transport and the Regions (DETR 2000) reported that deaths or serious injuries involving motorcyclists per million vehicle kilometers are over 16 times higher than those of car occupants and twice that of cyclists. Haque et al.(2010) reported that motorcyclists are involved in 53% of all road injuries and 50% of all deaths in Singapore. They also reported that compared to other motor vehicles, the injury and death rates of Singaporean motorcyclists per registered vehicle are 7 and 13 times higher, respectively. As indicated previously, similar findings were made by Abdul Manan and Várhelyi (2015) and Masuri et al. (2012) in studies conducted in Malaysia, where more than 50% of deaths due to road accidents involved motorcyclists.

The causes of motorcycle accidents are subjective and involve multiple factors. Haque et al. (2010) and Hongsranagon et al. (2011) highlighted that the behavior of motorcyclists (either alone or in combination with other factors) is the overwhelming cause of 95% of all road accidents. Several studies have analyzed the extent to which the motorcyclists' behavior contributes to their injuries sustained in road accidents (Bellet and Banet, 2012; Lin et al., 2004; Liu et al., 2009; Savolainen and Mannering, 2007; Wong et al., 2010). For example, Haworth et al. (2009) reported that the increasing number of accidents involving motorcyclists in Australia is due to the motorcyclists' willingness to take risks by ignoring traffic regulations (including riding over the speed limit), riding unhelmeted, riding without a license, and riding while impaired by alcohol and drugs. Chang and Yeh (2006) found that a lack of experience and poor driver skills also contribute to road accidents. Furthermore, Chang and Yeh (2006, 2007) highlighted that young motorcyclists have a greater tendency to ignore motorcycle safety checks and potential risks. They also found that young male