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Study of drivers' salient beliefs and intention to comply with speed limits on urban roads

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ABSTRACT

Many drivers select their driving speed based mainly on their perceptions of conditions that make them feel safe but which do not always correspond to reality. Consequently, it is of fundamental importance to identify the most commonly held beliefs and the drivers' intention regarding the speed limit to define policies which efficiently and effectively reduce the number of traffic accidents and their severity. Against that background this paper presents a study of drivers' salient beliefs and intention to comply with the legal speed limit on urban roads, based on a sample of 914 licensed drivers in the Federal District, Brazil. The Theory of Planned Behavior (TPB) was used together with an expanded number of explicative variables for intention. The research showed that, in the situation analyzed, intention is explained by constructs of attitude towards the behavior, perceived behavioral control, and prior behavior (with and without the respective interactions) and also by the variables driver age and gender. Two analyses investigated the strength of drivers' beliefs in explaining each one of the TPB constructs. Analysis 1 considered belief factors that were specific for attitude, subjective norm and control constructs. Analysis 2 grouped all the beliefs analyzed into general factors capable of explaining the variability of the TPB constructs. The results showed that the factors obtained from Analysis 2 provide a better explanation of the variations observed in the direct measurements of the TPB constructs than those obtained from Analysis 1.

1. Introduction

Traffic violence is a major public health problem faced by societies the world over imposing a high socioeconomic cost on the nations. According to the World Health Organization, over 1.2 million people die in traffic accidents every year and low- and middle-income countries present much higher fatality rates than high-income countries (WHO – World Health Organization, 2015). In 2013, these fatality rates in low and middle – income countries were equal to 24.1 and 18.4 road traffic deaths per 100,000 population, respectively, whereas the corresponding rate was 9.2 for high-income countries. Naturally, the fatality rates vary among the nations belonging to each income group. For the high-income countries, for example, this rate in 2013 was of 2.9 in the United Kingdom and 10.6 in the United States (WHO, 2015).

Brazil is classified by WHO (World Health Organization) as a middle-income country, but its WHO estimated fatality rate was 23.4 deaths per 100,000 population, which is closer to the average rate related to low-income countries. However, road safety conditions vary significantly among Brazilian states. For instance, the fatality rate for the Federal District was 19.4

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deaths per 100,000 population in 2013, decreasing to 16.1 in 2015, as calculated based on MS – Ministry of Health of Brazil (2018) and IBGE – Brazilian Institute of Geography (2018). These figures show that Federal District safety road conditions are compatible with those of middle-income countries and, therefore, much more hazardous than those of high-income countries.

Many factors combine to produce the circumstances that cause a traffic accident and, generally speaking, they can be grouped into human, road and vehicular factors (GAO – U.S. Government Accountability Office., 2003). In some cases, over 90% of the factors contributing to the occurrence of accidents are human factors, which are typically mistakes, lapses or violations committed by the driver (Reason, Manstead, Stradling, Baxter, & Campbell, 1990). They materialize in the form of acts such as excessive speed, the use of drugs or alcohol, or failure to respect the road signs (Velloso & Jacques, 2012). Specifically in regard to excessive speed, Elliott, Thomson, Robertson, Stephenson, and Wicks (2013), based on a literature review, report that it is a common behavior among drivers and, according to Taylor, Lynam, and Baruya (2000), one that boosts other factors that contribute towards the occurrence of accidents or towards aggravating their severity. Thus, while traffic accidents are complex events with multiple causes, they are also closely related to the question of speed in terms of the elementary laws of physics. Imposing speed limits is an attempt to mitigate the destructive effects of those accidents (Campbell & Stradling, 2003; Finch, Kompfner, Lockwood, & Maycock, 1994; WHO, 2008).

Many drivers fail to obey the speed limit established by the traffic authority and make their own choice of speed. Such choices however, are not always the safest ones because, once they take over the wheel, the drivers may find it difficult to assess the effect of their behavior in relation to other road users, in relation to the road itself or in relation to the vehicle. They often underestimate the occurrence and severity of accidents or overestimate their own skills and that of other drivers (AUSTROADS, 2005; TRB, 1998). Furthermore, the driver tends to underestimate or misjudge the risks involved in driving that may well be increased in the case of excessive speed (TRB, 1998). That is because, insofar as he decides to increase the speed of the vehicle, the time available for perceiving and reacting to objects and dangerous situations present in the road goes down considerably.

Identifying mechanisms that influence driver behavior is an important element for defining measures designed to foster respect for the speed limit on the part of drivers (Elliott, Armitage, & Baughan, 2005). According to the theory of planned behavior (TPB; Ajzen, 1985), salient beliefs are directly related to the individual's intention to adopt a certain behavior. Thus gaining knowledge of salient beliefs associated to the intention to obey the speed limit makes it possible to propose measures that can contribute towards stimulating change in the behavior springing from that intention. Among such measures are educational campaigns, intensification of surveillance and inspection, improvement in driver training and to some extent, investing in road infrastructure.

Against that background, this research sets out to identify salient beliefs and how they relate to attitude, the subjective norm, the perceived control and the driver's intention to obey the speed limits on urban road in the Federal District, Brazil. It also seeks to evaluate the model proposed by Ajzen (1991) for forecasting drivers' intention to obey the speed limit based on the same constructs contemplated by the theory. Given that the basic TPB model is open to extension and refinement for the purpose of improving forecasting and explaining the determinants of behavior intention, so the present research seeks to evaluate the contribution of other variables such as demographic ones (age, sex and length of time as a license holder) and the prior behavior variable. Specifically, this research aims to: (i) identify the most commonly held beliefs of Brazilian Federal District drivers regarding obedience to speed limits; (ii) investigate how those beliefs relate to the constructs of the TPB intention model to explain the speed limit obedience on urban roads, evaluating whether or not each of them should be considered to affect only one construct; (iii) evaluate the capability of different variables to improve the basic TPB model for predicting the driver's intention to comply with speed limits on urban roads of the Federal District.

The choice of TPB (Ajzen, 1985, 1991) to develop the present research was based on the fact that it has been successfully used in several research projects for predicting behavior in traffic, such as research into driving under the influence of alcohol (Aberg, 1993; Beck, 1981); dangerous overtaking (Forward, 1997); driving close to another vehicle (Parker, Manstead, Stradling, & Reason, 1992a); and seat belt use (Simsekoglu & Z e Lajunen, 2008; Thuen & Rise, 1994). Those studies that have used TPB to explain driver behavior in regard to choice of speed, have adopted two distinct lines of investigation: the first seeks to understand factors associated to disobeying the speed limit (Forward, 2006, 2009; Warner & Åberg, 2008; Parker, Manstead, Stradling, Reason, & Baxter, 1992b; Elliott et al., 2013), while the second seeks to identify factors that lead to obeying the speed limit (Elliott, Armitage, & Baughan, 2003, 2007; Elliott et al., 2005). The present work chose to focus on obedience to the speed limit with a view to obtaining elements that could guide traffic authorities in defining measures that favor, according to the drivers themselves, this obedience (Velloso, 2014).

The TPB is renowned for its proposal of explaining behavior on the basis of attitude. In the light of the doubt as to whether individuals' future behavior can be predicted by attitude and intention (LaPiere, 1934), TPB appears as an evolution of the theory of reasoned action (Fishbein & Ajzen, 1975), distinguished from the latter by introducing the constructs of salient beliefs and perceived behavioral control. It is consequently considered to be more complete (e.g. Neiva & Mauro, 2011). It postulates that behavioral intention indicates how much an individual wishes to carry out a given behavior, and the effort the individual is prepared to make to achieve it (Ajzen, 1991). Behavioral intention is influenced by three independent constructs: attitude in relation to the behavior (referring to positive or negative evaluations of the performance of the behavior); the subjective norm (which is the perceived social pressure or pressure of significant people in regard to the behavior in question) and the perceived control (referring to the personal perception or skill to carry out the behavior). Those constructs can be obtained by direct measurement using administered questionnaires or they can be determined by measurements