Safety Science 70 (2014) 29–40

Contents lists available at ScienceDirect

Safety Science

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

Traffic safety culture among bicyclists – Results from a Norwegian study

Tor-Olav Nævestad *, Beate Elvebakk, Torkel Bjørnskau

Institute of Transport Economics, Gaustadalléen 21, NO-0349 Oslo, Norway

ARTICLE INFO

Article history:
Received 20 February 2013
Received in revised form 29 April 2014
Accepted 30 April 2014

Keywords:
Traffic safety culture
Safety culture
Traffic safety
Bicycle
Bicyclists
Bicycle safety culture

ABSTRACT

This paper reports results from a study of traffic safety culture (TSC) among bicyclists ($N = 231$) in Oslo, Norway. The aims of the study are to examine whether respondents' TSC in relation to bicycling is related to the TSC of their peers, and whether respondents' TSC influences their bicycle accident risk. The study measures TSC among bicyclists as a set of interrelated bicycle safety behaviours and – attitudes that are shared in groups. This study focuses on peer groups, which are operationalized as respondents' closest friends and colleagues. Results indicate that respondents' TSCs are associated with those that they ascribe to their peers, and that respondents' bicycle safety behaviours predict their bicycle accident risk. As respondents' bicycle safety attitudes not predicted their bicycle accident risk, the role of bicycle safety attitudes as a component of TSC is discussed. Although we have only measured TSC that respondents ascribe to their peers, the study could indicate that TSCs related to bicycling are shared in peer groups. Although more research is needed, the study suggests that the TSC perspective can be applied to non-professional road users in general, and specifically vulnerable road users like bicyclists. Implications for traffic safety interventions are discussed.

1. Introduction

Traffic accidents represent a serious public health problem. 1.3 million people die worldwide each year as a result of injuries from traffic accidents, while approximately 50 million people are injured (IRTAD, 2010). Studies show that the accident risk related to bicycling is considerably higher than it is for car drivers and pedestrians (Bjørnskau, 2005, 2011). Several bicycle accidents are not reported to the police. However, according to Statistics Norway, police reports indicate that 509 people were injured and that 12 people were killed in bicycle accidents in Norway in 2012. Still, bicycle risk in Norway is low compared to most countries, being similar to the risks in the safest bicycle countries, The Netherlands and Denmark (Pucher and Buehler, 2008; Bjørnskau, 2003, 2008).

Research also shows that one of the most important factors predicting cyclists' accident risk is their bicycle safety behaviours (Bjørnskau, 2001, 2005).

It has been argued that new approaches are required to further reduce the number of road accidents and injuries. Although safety culture traditionally applies to organizations, recent research suggests that the safety culture perspective may have great potential for improving traffic safety, (cf. AAA Foundation for Traffic Safety, 2007; Johnston, 2010; Ward et al., 2010). The context of non-professional road users is, however, different from the organizational context, as non-professional road users are not culturally bonded by organizational units.

In a previous study we therefore set out to examine whether the (traffic) safety culture perspective can be applied to other analytical units than organizations (Nævestad and Bjørnskau, 2012). Three alternative analytical units were discussed: (1) local communities, (2) nations, and (3) peer groups. We concluded in favour of applying the traffic safety culture (TSC) perspective to peer-groups, as suggested by Ward et al. (2010) (Nævestad and Bjørnskau, 2012).

The present paper applies the TSC perspective to peer-groups, focusing on bicyclists. The study reports results from a study of TSC among bicyclists ($N = 231$) in Oslo, Norway. The aims of the study are to examine whether respondents' TSC in relation to bicycling is related to the TSC of their peers, and whether respondents' TSC influences their bicycle accident risk.

Most definitions of organizational safety culture specify it as safety relevant behaviours and/or attitudes that are shared in groups (Antonsen, 2009; Nævestad, 2010). Thus, this study measures TSC in relation to bicycling as a set of bicycle safety behaviours with associated bicycle safety attitudes, which are shared in groups. Bicycle safety behaviour items were based on bicycle safety behaviours found to predict accident risk in previous studies (Bjørnskau, 2001, 2005). Bicycle safety attitudes were defined as perceptions of hazard and responsibility related to some of these behaviours. Indexes are constructed for both behaviours and

* Corresponding author. Tel.: +47 22573800; fax: +47 22609200.
E-mail address: ton@toi.no (T.-O. Nævestad).

http://dx.doi.org/10.1016/j.ssci.2014.04.020
0925-7535/

attitudes. Peer-groups/peers are operationalized as respondents' closest friends/colleagues.

In accordance with previous research, we first expect background variables like e.g. age, sex and education to be associated with bicycle safety behaviour, bicycle safety attitudes and bicycle accidents involvement (Bjørnskau, 2005). Second, we expect car use, i.e. years of car license and regular car use to be associated with bicycle safety behaviours, -attitudes and accident risk, as these variables involve comprehensive traffic training and -experience (Bjørnskau, 2005). Third, we also expect bicycle type and cycling frequency to be associated with bicycle safety behaviour, bicycle safety attitudes and bicycle accidents involvement (Jaques, 1994; Bjørnskau, 2005).

Fourth, in accordance with previous research, e.g. the theory of planned behaviour (TPB) we also expect respondents' bicycle safety behaviours to be associated with their bicycle safety attitudes (Ajzen, 1991; Kakefuda et al., 2009), and peers' bicycle safety attitudes (Lajunen and Räsänen, 2001, 2004; Jaques, 1994). Moreover, in line with previous research like e.g. the social norms approach (Berkowitz, 2005) and other research on the normative influence on bicycle safety behaviour, we expect respondents' bicycle safety behaviours to be associated with their peers' bicycle safety behaviours (Lajunen and Räsänen, 2001, 2004; O'Callaghan and Nausbaum, 2006; Coron et al., 1996). This also applies to respondents' susceptibility to peers' opinions about their bicycling, which also has been referred to as "motivation to comply" (Kakefuda et al., 2009).

Fifth, we expect a relationship between bicycle safety attitudes and peers' bicycle safety attitudes (Kakefuda et al., 2009). Although we have not seen research on the issue, we also examine the association between bicycle safety attitudes, peers' bicycle safety behaviours and respondents' susceptibility to peers' opinions about their bicycling, to shed light on potential variables associated with bicycle safety attitudes.

Sixth, we also expect respondents' bicycle accident involvement to be associated with their bicycle safety behaviours (Bjørnskau, 2001, 2005). We also examine whether bicycle safety attitudes influence bicycle accident involvement, as this relationship has been focused on in studies of traffic accidents and traffic (Rakauskas et al., 2009). Although we have not seen research on the issue, we also examine the association between respondents' bicycle accident risk and their peers' bicycle safety attitudes and peers' bicycle safety behaviours.

The expected relationships are examined in regression analyses using three different dependent variables: traffic safety attitudes index, traffic safety behaviour index and bicycle accidents.

2. Theoretical approach

2.1. Organizational safety culture and -climate

The concept of organizational safety culture is usually traced to the 1986 Chernobyl disaster, which made the International Nuclear Safety Advisory Group (INSAG) conclude that an inadequate safety culture at the plant was an important cause of the accident (INSAG, 1991). In the years following the disaster, several major accident investigations have identified safety culture as a major contributing factor. The concept of safety climate is closely related to that of safety culture. Safety climate can be conceived of as "snapshots", or manifestations of safety culture (Cox and Flin, 1998). Safety culture is generally measured by means of safety climate questionnaires (Guldenmund, 2000).

2.2. Traffic safety culture

The concepts of safety culture and climate have only recently been applied in studies of professional drivers in road transport (e.g. bus drivers, taxi drivers, van drivers and truck drivers) (cf. DfT, 2004; Wills et al., 2005; Davey et al., 2006).

Studies of organizational safety culture and safety climate among professional (or work-related) drivers in road transport often combine organizational safety culture or climate questionnaires with questionnaires measuring self-reported driving behaviours (e.g. the Driving Behaviour Questionnaire-DBQ), perceptions of risky behaviours, attitudes to various traffic safety interventions targeting risky behaviours, self-reported accidents, and so forth (e.g. Davey et al., 2006). In these studies, a relationship between organizational safety culture, professional drivers' traffic safety behaviours and accident risk has been found (e.g. DfT, 2004; Davey et al., 2006).

The safety culture of non-professional drivers in road transport has also been given attention in recent years. This line of research also focuses on self-reported driving behaviours, perceptions of risky behaviours, and attitudes to traffic safety interventions (e.g. Rakauskas et al., 2009). Rakauskas et al. (2009) explain differences in regional accident risks in light of differences between rural and urban TSCs. Girasek (2013) assesses to what extent public attitudes and behaviours support traffic safety advancement in the United States, and she concludes that support for traffic safety is not uniform across topics or population subgroups. Page (2001 in Ward et al., 2010) explains differences in the traffic fatality rates of different countries in light of differences in national TSCs. In a US white paper[1] dedicated to TSC, Ward et al. (2010) states that:

> Traffic safety culture appears to be an intuitive and powerful concept with which to explain observed differences in international, regional and demographic crash risks, as well as the propensity to commit high risk behaviors. If it is possible to define and apply this concept within a relevant social psychological theory of behavioral choice, it may be possible to develop a new paradigm for traffic safety interventions. (Ward et al. (2010): vii)

Since non-professional road users are not culturally united by organizations, shared traffic safety behaviours, -perceptions and -attitudes must be ascribed to other social units than organizations. There is no consensus as to which groups this should be, but different alternatives have been suggested and examined, e.g. regions, nations, local communities, peer groups (Rakauskas et al., 2009; Ward et al., 2010; Wiegman et al., 2007).

2.3. Traffic safety culture applied to the analytical unit of peer groups

As noted, previous studies have suggested applying the concept of TSC to the social unit of peer groups (Ward et al., 2010; Nævestad and Bjørnskau, 2012). Accordingly, Ward et al. (2010) define TSC as:

> (...) perceptions people have about what behaviors are normal in their peer group and their expectations for how that group react to violations to these behavioral norms. In terms of traffic safety, this definition applies to behaviors that either increase risk (e.g. speeding) or are protective (e.g. wearing seatbelts), as well as behaviors related to acceptance or rejection of traffic safety interventions. (Ward et al., 2010: 4–5)

The Penguin dictionary of sociology (1994: 312) defines peer group as: "(...) any collectivity in which the members share some common characteristics such as age or ethnicity." The dictionary also stresses that peer group often refers to adolescent groups

[1] As part of an effort to develop a US National Strategy on Highway Safety, nine white papers were prepared to highlight key issues. The second white paper dedicated to traffic safety culture (Ward et al., 2010). This white paper is a draft dated July 7, 2010.