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Sleep-related car crashes: Risk perception and decision-making processes in young drivers

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Abstract

The aim of the present study is to analyse factors affecting worries, coping strategies and decisions of young drivers regarding the risk of sleep-related car crashes. Furthermore, the study also analyses whether framing the same information about sleepiness in two different linguistic forms influences: (1) the evaluation of the level of risk associated to a specific level of drowsiness (Attribute Framing problem); (2) the willingness to enact strategies to "prevent" sleepiness before night-time driving (Goal Framing problem); (3) the choice between two different ways, both of equal expected efficacy, of lowering drowsiness (Risky decision-making Framing problem).

Six hundred and ninety-five young drivers [(57.6% females, 42.4% males); mean age 20.85 years (S.D. = 1.2)] answered questions on drive risk perception and sleepiness, on nocturnal driving experience and on the strategies to deal with driver sleepiness, responding to one of the two different versions of the framed problems. A sub-sample of 130 participants completed the framed problems in both versions. The results show that experiences of sleep attacks and nocturnal driving frequency in the past 6 months affect both risk perception and the preventive strategies adopted. Furthermore, the manipulation on two out of the three problems (attribute and risky decision-making frames) significantly affected the respondents' evaluation.

Keywords: Driver sleepiness; Risk perception; Young drivers; Framing effects

1. Introduction

Sleepiness is often a contributory factor in car crashes, but the lack of a set of standard criteria means that there is no agreement between different studies geared to estimating the human and financial costs of sleep-related car accidents (Zulley et al., 1994; Leger, 1995; Pack et al., 1995; Webb, 1995; Horne and Reyner, 1995a; Lyznicki et al., 1998). Connor et al. (2002) suggested that a significantly increased risk is associated with (1) drivers who identified themselves as sleepy (Stanford sleepiness score 4–7 versus 1–3); (2) drivers who reported 5 h or less sleep in the previous 24 h; (3) driving between 2 a.m. and 5 a.m. compared with other times of day. The relevance of the latter aspect is emphasised in several studies (Prokop and Prokop, 1955; Langolis et al., 1986; Mitler et al., 1988; Zomer and Lavie, 1990; Summala and Mikkola, 1994; Pack et al., 1995; Folkard, 1997).

Drivers under 30 years of age (especially men) are particularly prone to sleep-related accidents in the early morning (Horne and Reyner, 1995b; Lyznicki et al., 1998; McConnell et al., 2003), even when alcohol is ruled out as a causal factor (Akerstedt et al., 1994). Akerstedt and Kecklund indicated that young drivers (18–24 years) had 5–10 times higher risk of being involved in an accident late at night than in the forenoon (Akerstedt and Kecklund, 2001). The main reason for the high incidence of crashes involving young people during the early hours of the morning is that these drivers are the most prevalent road users at this time of the day (Horne and Reyner, 1995b). Furthermore, data indicate that drivers under 30 years accumulate a greater sleep debt prior to long holiday trips (Philip et al., 1996). It is also reasonable to assume that drivers in this age range have less experience and knowledge of how to cope with fatigue (Summala and Mikkola, 1994).

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Despite the growing body of evidence indicating that young drivers are an at-risk population for nocturnal car accidents caused by sleepiness, they usually tend to consider it a rather trivial matter instead of a serious risk in terms of safety (Dinges, 1995). Carskadon (2002), considering drivers between 16 and 20 years, highlighted that a large number of them (67% of the sample considered) report having driven while impaired by sleepiness. Several studies have also reported that young novice drivers (18–21 years) are characterised by perceiving relatively low levels of risk in specific driving situations compared to other groups of drivers (e.g. Sivak et al., 1989; Deery, 1999). Young drivers (18–24 years) often underestimate potential hazards in the environment and overestimate their driving ability (Gregersen, 1996).

The issue of risk perception of novice drivers was addressed by several studies (for a review, see Rothengatter, 2002). Only a few studies on risk perception included women drivers (e.g. Harré, 2000). DeJoy (1992) found that young males (18–24 years) considered risky behaviour less likely to result in an accident than did young females. Regardless of gender, different models (Kuiken and Twisk, 2001; Fuller, 2000; Summala, 1997) and studies (Groeger, 2000) suggest that the overestimation of driving ability and the underestimation of the risk of car crashes in young drivers increase with the increase in the practice of driving. Unfortunately, to the best of our knowledge, no systematic study analysed whether gender and past driving experience are related to the specific risk perception of sleep-related crashes in young drivers. Nevertheless, some studies did focus on coping strategies for sleepiness: young drivers usually report they can remain alert during times of endogenous pressure for sleep by means of a compensatory effort, even if the data indicate that this strategy is not successful in avoiding periods of poor, inefficient and variable performance (Johnson, 1982; Dinges and Kribbs, 1991; Dinges, 1992). According to Jennings et al. (2003), sleep pressure impairs attention processes that guide and control actions, and particularly the effort to cope with sleepiness do not appear to be expended readily after sleep deprivation.

The evaluation of how the risk of sleepy driving is perceived by young drivers and the analysis of factors associated to risky decision-making could be addressed in the framework of the Prospect Theory (Kahneman and Tversky, 1979), which is probably the most influential theoretical model linking risk perception to the willingness to take risks. In its original form, Prospect Theory was developed to account for the behaviour of decision-makers who face a choice between two alternatives, one of them providing certainty of a given outcome and the other providing a more convenient but uncertain outcome. The latter alternative is defined as "risky option" because individuals who chose it risk loosing the certain benefits of the former alternative. Being rooted in economics, the term "risky" in Prospect Theory refers to the degree of uncertainty involved in the options of a decision problem and not to the positive/negative valence of the outcomes themselves. In this light, a specific option in a decision-making problem is assumed to be "risky" if its consequences – either positive or negative – are conditional on some probability. During the past decades, the increased popularity of this model has led researchers in different fields to numerous insights by showing that decision-makers respond differently to different but objectively equivalent descriptions (i.e., framing) of the same situation. The term "framing effect" is used to describe the bias in judgements and decisions resulting from the different semantic valence attributed to the problems. Levin et al. (1998) also developed a typology to distinguish the classical *Risky choice* framing from *Attribute framing* and *Goal framing*, based on substantial dissimilarities.

So-called *attribute framing* occurs if the overall assessment of an element changes when it is described with reference to positive or negative connotations. For example, a level of drowsiness associated with a "moderate" risk of making mistakes when driving may be described as being greater with respect to the optimal no-risk condition or lower if compared to worse conditions of high risk. Studies show that evaluations are usually negative when the description is worded negatively. This evaluative bias (Levin et al., 1998) is a replicated phenomenon and the underlying process is thought to be the anchoring of judgement to the positive or negative valence of the extremes.

Goal framing occurs if a certain persuasive message varies in effectiveness when it emphasises the benefits of a certain behaviour or the negative consequences of not enacting that behaviour. Although the results of studies on the effects of goal framing are controversial (Levin et al., 1998), in those studies in which it has been verified the negative version of the message leads to higher persuasion rates compared to the positive version. It is hypothesised (Levin et al., 1998) that the underlying process is that of loss aversion, so that the utility of obtaining an advantage is lower in absolute terms than the disutility of obtaining a comparable loss (Kahneman and Tversky, 1979).

The *framing of risky decisions* occurs when risk propensity is affected by the way the consequences of the two options are described. The framing of risky decisions is the most studied and understood kind of framing (Tversky and Kahneman, 1981), hypothesising that decisions are taken evaluating the outcome for each option in terms of gains or losses instead of in terms of absolute quantities. Typically, by stressing losses, there is an increased risk propensity in terms of a higher rate of choices for the option with uncertain consequences (Levin et al., 2002).

Over the last 20 years, there have been several studies on the framing effects linked to evaluations and decision-making in the health promotion field (e.g., Rothman and Salovay, 1997). However, no study has investigated the risk of night-time road accidents linked to driving in conditions of great drowsiness. Studies of this type would help establish the most effective way to present information in awareness-raising programmes for young drivers.

The aim of the present study is two-fold. The first aim is to examine whether *gender*, *the frequency of night-time driving and the past experience of driving while impaired by sleepiness* are associated to risk perception and worries about night-time car crashes in young drivers. The most common strategies of coping with sleepiness were also analysed. The second aim is to assess whether the way information concerning the relationship