

# Cognitive Biases, Risk Perception, and Risky Driving Behaviour

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This study evaluated the relationship between drivers' cognitive biases (i.e., optimism bias, illusion of control) and risky driving behaviour. It also investigated the mediational role of risk perception in the relationship between cognitive biases and self-reported risky driving.

Keywords: optimism bias ; illusion of control ; risk perception ; risky behaviour

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## 1. Introduction

Risky driving includes behaviours that pose a threat to the driver and to other road users, such as speeding, red-light running, tailgating, not using safety belts, drunk driving, etc. <sup>[1][2][3]</sup>. A body of research suggests that an important determinant of risky judgment or driving is represented by cognitive biases related to personal driving skills evaluation, personal control and perceived vulnerability in traffic <sup>[4][5][6]</sup>. Two common types of biases are represented by the judgement that negative events are more likely to happen to others than to the self, also called optimism bias <sup>[7]</sup>, and the overestimation of personal control over events (i.e., illusion of control) <sup>[8]</sup>. A limited body of literature suggests that the biases in cognitive appraisal relating to control and optimism about future outcomes are likely to decrease risk perception and increase risky driving <sup>[4][9][10]</sup>. In order to be effectively targeted in safety campaigns and training programs, more insight is needed about the association of both optimism bias and illusion of control with driving behaviours.

The concept of optimism bias was first used by Weinstein <sup>[7]</sup> in the field of health psychology, to describe peoples' tendency to believe they are more invulnerable to negative events, compared with their peers. Later research has evaluated optimism bias as the perceived chances of experiencing future life events relative to the chances of peers and supported its presence in other life areas, like marriage, natural disasters, or road traffic <sup>[11][12]</sup>. Although optimism bias may improve self-esteem and motivation <sup>[13]</sup>, a greater sense of invulnerability may also have harmful consequences, by leading people to engage in risky behaviour or to fail to take adequate precautionary measures <sup>[14][15]</sup>. However, on the contrary, another study found no association between optimism bias and risk taking <sup>[16]</sup>.

Studies in traffic and transport psychology have shown that many drivers consider themselves less likely to expect a negative event in traffic (e.g., having a car crash, being fined, being injured or losing one's life) compared with their peers, e.g., <sup>[12][17]</sup>. Moreover, few studies confirmed positive yet weak relations between optimism bias and specific risky driving behaviours, such as not using the seat belt, driving under fatigue, or drunk driving <sup>[18][19]</sup>.

Illusion of control is another related cognitive bias. Individuals with high illusion of control present two types of false beliefs: (i) that one can control the desired outcomes through personal skills, and (ii) that these personal skills are sufficient to prevent negative outcomes, when actually they do not <sup>[6][8]</sup>. Like optimism bias, illusion of control has been linked to risky behaviours, particularly in the health area <sup>[7]</sup> and gambling research <sup>[20][21]</sup>. In the traffic safety domain, illusion of control has been shown to have links with aggressive <sup>[4]</sup> and risky driving behaviours <sup>[3]</sup>. While all these studies are based on self-report measures, one can acknowledge that risky driving behaviour can be studied through several other methods such as the analysis of crash statistics, the use of a driving simulator, or naturalistic driving (ND) which uses the advantages of real-world conditions on driver performance and behaviour in normal, impaired and safety-critical situations <sup>[22][23][24]</sup>.

The theoretical nature of these two cognitive biases concepts would point towards a relation between optimism bias, illusion of control and risky driving, but there is little or outdated empirical evidence for this relation. In addition, there is no clear understanding about how these two biases may jointly interact and make drivers take more risks. Moreover, although there is some evidence for the relations between optimism bias, illusion of control, and risky driving, there is a lack of understanding for the factors that may account for the relations between these cognitive biases and risky

behaviours in traffic. One mechanism that can explain the relation between cognitive biases and risky driving behaviour may be risk perception. Risk perception in traffic is a widely studied variable in relation to risky driving behaviour, e.g., [25][26]. Different theoretical models, like the theories of reasoned action and planned behaviour [27], claim that the decision to engage in risky driving behaviours occurs through evaluating the risks and benefits of a given action. Most empirical studies report negative associations between risk perception and risky driving, e.g., [25][28][29][30]. Moreover, previous research documented the mediating role of risk perception in the relation between personal factors (e.g., self-efficacy, time perspective) and risky driving behaviours [29][31].

## **2. Cognitive Biases, Risk Perception, and Risky Driving Behaviour**

The present study investigated the relations of optimism bias and illusion of control with risky driving behaviour. Further, it explored whether risk perception mediates the relation between these two types of cognitive biases and the risky behaviour of drivers.

The results revealed that optimism bias was negatively predicted, whereas illusion of control positively predicted risky driving behaviours. Thus, contrary to expectations (Hypothesis 1) and to previous research, e.g., [18][19], a high level of optimism bias was related to a low level of risky driving behaviour. This result suggests that drivers' belief that they are more invulnerable to negative events in traffic compared with their peers did not determine them to adopt risky driving behaviours. Perceived causal attributions for car crashes may moderate the relation between optimism bias and risky driving. Previous studies showed that optimism bias is more pronounced for events perceived as controllable (i.e., internal attribution) [2]. Further, perceived controllability is associated with desirable outcomes (see [32] for a review) and with a low tendency to engage in risky driving (e.g., [33]). It is possible that optimism bias cumulated with perceived controllability may be associated with positive outcomes, by facilitating safety goal attainment [13]. In other words, optimism bias may motivate drivers to take higher risks because they would feel less vulnerable; however, this may not be the case when drivers perceive the causes of a potential collision to be outside of their area of responsibility. Only if drivers evaluate themselves as having control over the situation and being responsible for traffic accidents, they may avoid risky driving, despite their optimism bias. However, future studies should assess this assumption and bring more evidence for the relation between optimism bias and risk taking in traffic by analysing the in-depth effects of perceived causal attributions.

Another interesting result of this study was that optimism bias is negatively related with risky driving, although it is positively related with risk perception in traffic. Therefore, drivers with a high level of optimism bias perceive low risks but do not engage in risky behaviours. Further, the results indicated an indirect effect of optimism bias on risky behaviour through risk perception, showing that risk perception acted as a suppressor variable for the negative relation between optimism bias and risky behaviour. This mediation suggests that optimism bias is negatively related with risk perception, and this perception suppressed the overall negative relation between optimism bias and risky driving behaviour. It is not the cognitive bias itself which determines risky driving; it is rather the perception about risks in different driving situations that emerges out of this bias which has an important role in driving behaviour. These findings confirm previous results that risk perception could be the specific way through which cognitive biases exert their influence on driving behaviour [17], and also extend previous literature by highlighting these relations in traffic psychology.

Concerning illusion of control, the findings are more straightforward. The results confirm the limited previous literature about its positive relation with risky driving [3]. As expected, a high illusion of control is related to a high tendency to engage in risky driving. Further, risk perception mediated the relation between illusion of control with risky behaviour. A high level of illusion of control is associated with a low level of risk perception, that is further associated with a high level of risky driving. Therefore, when participants present a high level of illusion of control, they are more prone to perceive low risk in different traffic situations, which further leads to a higher tendency to engage in risky behaviour. This type of cognitive bias should be addressed through safety campaigns and training, since literature shows that it generally appears when control is low (for a review, see [34]). The low level of control associated with low-risk perception and high engagement in risky driving behaviour may have detrimental consequences for traffic safety. Road safety campaigns and driver training programs could also target this particular scenario.

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