Chapter

Cognitive Profile of Optimistic Offender Drivers Affected by Psychological Interventions for a Sustainable and Safer Driving's Behavior

Carlos Hugo Criado del Valle and Parichehr Scharifi

Abstract

An empirically verified fact is that the majority of traffic accidents occur as a result of risky behaviours that drivers assume, more or less, voluntarily. Drivers are not aware of the perception of risk and the subjective perception of control that we believe we have. We have delimitated the characteristics of a group of optimistic offender drivers, which reveal, on the hand, a great lack of understanding of the true impact that external factors can have on driving and; on the other hand, they tend to overestimate their abilities and overconfident in their ability to avoid accidents. In addition, these drivers do not usually experience negative emotions when they fail. All this, together is what increases the probability of suffering an accident. The consideration of the different cognitive profiles in the perception of the risk or challenge when facing potential traffic situations may provide us with a better understanding of the true nature of offending drivers. The need to carry out experimental studies using new assessment instruments (i.e. Eye tracking, Bio-Feedback, evoked potentials, etc.) can facilitate a better understanding of the cognitive processes that explain the attitudes and behaviors of drivers; and therefore, achieve a lower rate of car accidents.

Keywords: optimism, prefactual thinking, contrafactual thinking, road safety, offender drivers

1. Introduction

Improving smarter transportations systems making journeys safer and faster with new mobility types shared cars and green mobility need new intervention methods which are affecting the behavior of drivers and mobility users along with the classical educational courses for offender drivers.

Of course the question of how to improve road safety, year after year, requires considering carefully the human factors that guide behaviors such as motivations, risk perception or culture. In fact, technological developments of cars and infrastructures, including road signs and pavement markings, have already reached a very high level. Moreover, some new developments are forecasted to be developed

or even generalized: alcohol interlocks (that prevents drink driving), Intelligent Speed Assistance (that prevents speeding), and even autonomous cars (that prevent driving). Despite the considerable efforts of car engineers, and the crucial role of traffic laws to increase road safety with licensing and enforcement conditions, there will always be someone in the car that will have to make some decisions and inappropriate behaviors are often considered as contributing for a large part to accidents [1].

Traffic accidents currently represent one of the biggest health problems in the world. According to the World Health Organization [2], the number of road traffic deaths continues to rise steadily, reaching 1.35 million in 2016. There has also been more progress in reducing the number of road traffic deaths among middle- and high-income countries than low-income countries. There has been no reduction in the number of road traffic deaths in any low-income country since 2013. According to the World Health Organization [3], based on motorization in the developed world, traffic accidents are expected to become the fifth leading cause of death in the world by 2030.

There are numerous causes that can explain traffic accidents and their severity. These can range from external factors such as infrastructure (i.e. road maintenance or design), the weather or those related to the vehicle (i.e. age) to human factors. Our interest is focused on human factors, not so much in the physiological characteristics of the driver (i.e. age, gender, ...), but as in the psychological processes that could explain their behavior.

An empirically verified fact is that the majority of traffic accidents occur as a result of risky behaviors that drivers assume, more or less, voluntarily. Drivers are not aware of the perception of risk, cognitive overload and the subjective perception of control that we believe we have. We wrongly estimate the probabilities of obtaining a desired result. On many occasions, we are unable to learn from failures since we attribute failures to external factors. Awareness of how this cognitive process works and involvement in driving could favor the modification of risk behaviors.

We start from the study of the driver's personality traits, specifically optimism and pessimism [4]. Scheier and Carver [5] have characterized optimism as a powerful predictor of behavior. Optimistic people can pursue risky goals, where the chances of success are minimal and have many factors against them; as long as they believe that in their case they can achieve what they want (i.e., perceived controllability) [6]. These drivers predict future events, and therefore anticipate what results they may obtain. They explain in a reasoned way about their intentional behavior and plan their behaviors to achieve the desired results [7–9]. Our interest starts from the study of a type of thoughts (i.e., prefactuals and counterfactuals) that reflect the intention of the person, based on the causal inferences that are established; and how these thoughts play a prominent role in decision-making.

2. Optimism and pessimism in road safety

In the study of the human factor and road safety, a key component are the driver's own personality traits. Like Hampson [10], we consider personality processes to analyze how personality manifests itself in the thoughts, feelings, and behaviors of people to give rise to consequent results. Different investigations have focused on personality traits, such as optimism and pessimism [4]. From the theory of the self-regulation of behavior proposed by Scheier and Carver [11], it is contemplated that optimistic people are the ones who believe they can achieve a desirable outcome, and strive to do so. Pessimists, on the other hand, consider that the outcomes are unattainable, and either give up or do not commit to the actions that would lead

to the desired outcome. The self-regulation process is activated when the person compares their current state with the desired one, where the resulting behavior is the reflection of the feedback control [12]. This process involves continuous adjustments and corrections to achieve the established objective. Even when the person pursues multiple objectives simultaneously, it helps them focus their attention and efforts on those priority objectives, and reduce their participation in those that are not yet a priority [13, 14].

Obviously, both groups differ in how they process information from the environment and in how they maintain their expectations for the future, since they construct future scenarios in a different way [15]. Sharot et al. [16] have found that people tend to maintain an optimistic bias, even though the evidence is showing them contrary information. This effect is due to the fact that people update their beliefs more in response to positive information about the future than to negative information. Sometimes optimistic people will carry out extremely risky projects, where the chances of success are minimal and have many factors against them; as long as they believe that in their case they can achieve what they want. Furthermore, they are convinced of it, because when optimists imagine possible scenarios, they focus on the short-term consequences because when optimists imagine the possible scenarios, they do so in greater detail and see it closer in time. In contrast to negative scenarios, where apart from being more unspecific in the details, they distance them in time [15, 17].

In traffic psychology, optimistic biases and belief in the illusion of control may be two determining variables to explain risk factors in driving [18–20]. Therefore, it is necessary to approach the concept of perceived controllability and the perception of risk in drivers, as described below.

3. Perceived controllability

In road safety, it is the driver's own behavior, more or less voluntary, that causes traffic accidents in most cases [21]. The role of perceived controllability is decisive, since drivers, on the one hand, frequently underestimate the probability that they may experience negative events; and on the other hand, they tend to overestimate that they experience positive events, especially when they believe they have sufficient personal resources to face situations or challenges [22]. A theoretical model focused on the field of driving, such as the Task–Capability Interface (TCI) model [23], analyzes the relationships established between the driving task and the capability of the driver. The model indicates that both elements interact to determine task difficulty and the outcome for the driver in terms of whether control is maintained or lost. Azjen [24] specifically insisted in the driver's control beliefs. So, he contemplates that, "Perceived control is determined by control belief concerning the presence or absence of facilitators and barriers to behavioral performance, weighted by their perceived power (impact of each control factor to facilitate or inhibit the behavior)".

This control belief is what can have a direct relationship with the intention of the driver. In this regard, Montaño and Kasprzyk, [25] give a determining role to perceived control in the Theory of Planned Behavior (TPB) and the Theory of Reasoned Action (TRA), which assumes that the best predictor of action is intention. When a person has the intention of taking an action, and believes that they control the process to carry it out, the chances of that intention turning into action are very high. Furthermore, Like Harris [26], we think that perceived controllability is a powerful and robust psychological variable that can help predict behavior, as it reflects the intentions of the driver.

On the other hand the results of some studies show reveal that the possession of smart car technologies influences on drivers' perception of control and attachment. While the previous studies have dealt with perceived control as a predictor of the traffic safety behavior, new studies [27] examines it as one of the 'effects' of smart car technology. This is because the extent to which a driver feels easy or difficult to perform the function of driving will vary depending on the degree of possession and use of smart car technology. Recent studies show contradictory results on this issue. For example, Alliani et al. [28] have found that parking becomes easier under a smart parking system based on vehicle-to-vehicle communication. Birrell and Fowkes [29] have verified that the use of smartphone applications during vehicle operation is very informative rather than visually distractive. It has also been shown that context-based or simulation technologies such as head- 6 up displays and in-vehicle information systems contribute to driving space recognition and information acceptance [30, 31]. These studies support that smart car technology helps drivers feel easier to control the vehicle than before. As many advertisements claim, smart car technologies enhance driving pleasure and control by reducing the driver's cognitive effort in manipulating the vehicle.

The motivational cognitive theoretical models within the Traffic Psychology model have focused especially on the study of risk perception and decision-making. Ajzen [24] incorporated the construct of perceived control over the performance of the behavior, to the Theory of Planned Action, to explain the risks assumed by the driver. In some cases, perceived control may be linked to situations of assumed risk, in which the driver behaves prudently, safely, etc., as predicted by the Zero Risk Model. This model incorporates motivational factors in driver's decisions making [32]. In other cases, when they face risky situations, they drive showing mastery, skill, technique, etc. These skills are determined by the driver's subjective perception of the risk of suffering a road accident (i.e., perceived risk) and by the level of risk willing to accept or tolerate (i.e., perceived risk level), as detailed in the Theory of Homeostasis of the Risk [33].

We previously noted that, cognitive biases in optimism and risk perception. Now, we have contemplated how perceived control can be understood as a generalized belief (i.e., illusion of control) related to one's own person. From the theory of self-regulation of behavior proposed by Scheier and Carver [11], commented previously. The conception of perceived controllability is also integrated. Either the intention or/and behavior would show a direct relation with the feedback control. Where the perceived control would be a generalized belief more related to oneself than to a specific situation. In contrast to the expectations of self-efficacy [34], which would be related to specific beliefs about one's ability to successfully perform a task in a given situation.

In the context of driving, perceived high control can overstate your own ability. This leads us to consider that both optimism and the perceived controllability of the event are closely related [35, 36]. In fact, people manifest their optimistic biases in their perception of personal risk [37, 38], and when they have an accident, they tend to attribute it to external factors (eg, rain, a blowout, etc.), and not to internal factors related to driving [39, 40]. This is because drivers show a tendency to think that they are more skilled than other drivers [41–43]. In addition, they think that they are more likely to obtain the desired results, regardless of the tasks they have to perform [44]. McKenna [22] pointed out how drivers believe they are less likely, in relation to others, to suffer a traffic accident, if they are the ones who drive (i.e, personal control). But if they were passengers, the chances of suffering an accident would be equal to those of the rest of the people. It is the illusion of control that leads them to attribute the successes of driving to their own ability and not to the influence of external factors [19, 45].

On the other hand, there are also studies that show that smart car technology does not affect or even reduce control. Rajaonah et al. [46] conducted an experimental study, but did not reveal the relationship between driving assistance and the driver's confidence. Larsson [47] shows the more the driver uses ADAS, the more (s) he perceives the limits of the device itself. Stanton and Young [48] also explain that vehicle automation can help in situational awareness, but does not affect control over the vehicle. In a situation where the smart car technology is not yet complete and the driver is not assimilated enough, the smart car technology may cause a burden of cognitive overload or hyper-connection. The fatigue of the operation of the media device may interfere with the control of the vehicle. Featherstone [49] emphasizes the emergence of new risks as the degree of dependence on software is increased, mentioning the driver needs to constantly manage various technical devices and information, like an airplane pilot. Different autors [50–52] also suggest that manipulating a smartphone or a digital device attached to the vehicle during operation increases the accident rate. Concerns about malfunctioning of smart car technology [53] can also weaken the sense of control over automobiles.

We have commented that most traffic accidents are due to risky behaviors that drivers assume, more or less, voluntarily. Drivers are generally unaware of the perception of risk and the subjective perception of control during driving. They erroneously estimate the probabilities of obtaining a desired result and, at these times, are unable to learn from failures as they attribute failures to external factors, beyond their control. Next, we will focus on a type of factual thoughts that capture the intentionality of the drivers.

4. Prefactual and counterfactual thoughts

The ultimate goal of any study focused on the human factor within Road Safety, is to be able to explain or predict what a driver could do in the future. As in previous sections, we continue to focus on intention as a predictor of action. At this moment, we incorporate thinking as an explanatory variable. We believe, like Malle and Tate [54], that the best way to explain a future event is based on reasoned explanations of intentional behavior. In our daily life, we continuously anticipate and predict what possible results we could obtain, and with this we plan what we must do to achieve our objectives [8, 9]. Similarly, thoughts about what could have been or what could have been done are frequent, especially after disappointing results [55]. The thoughts that we simulate before the event are called "prefactual", and those alternative thoughts that appear after the event has occurred or that the results have already been obtained, are known as "counterfactual" [56–60].

On the one hand, prefactual thoughts focus on predicting behavior and have to do with intentions to take future action. These types of thoughts appear before taking an action and, the subject can generate various alternatives to achieve the objective (eg, "If it were at the established speed, then it would avoid a fine"). It is important to note that, at the time the thought is generated, neither the alternatives nor the results have been carried out, and may or may not be carried out in the future [61]. On the other hand, counterfactual thoughts are important because they imagine changing aspects of the mental representation of reality. In this cognitive process, different alternatives are generated and compared with the results obtained [55]. Therefore, counterfactual thinking focuses on those thoughts about what might have been, if other actions had been different [62–64].

In these types of thoughts, the subject's intentionality is reflected in the subjective perception of control it shows, in the choice of alternatives and the probability of achieving the proposed objectives. Under the structure of a conditional

proposition ("If ..., then ..."), a causal relationship is established between an action and a result that, currently is not occurring, but that may (or may not) occur in the future [56, 61, 65, 66].

We can differentiate two components in the structure of this type of thinking. One, showing the different action alternatives (i.e., antecedents); another, the achievements of possible outcomes (i.e., consequent). In the example, "If I were cautious, then could avoid having an accident", we can establish a contingency between "cautious" and "avoid an accident". Petrocelli et al. [65] point out that the concept of "Prefactual Potency" contemplates the relationship between antecedents and consequents in this type of thinking. They point out that there is a possibility of the antecedent occurring (i.e., cautions) and that the probable outcome (i.e., avoid an accident) is due to the antecedent indicated. There is also the possibility that the antecedent is perceived as probable, but not the desired result, since whether to have an accident does not depend entirely on me. However, as a general norm, when an individual considers a specific antecedent probable, they consider that the alternative outcome may occur [67]. In such a way that, the fact of establishing a causal relationship can be the basis for activating the behavioral intention "I to be careful, to avoid accidents". As we are commenting, these types of thoughts help us to know how the driver selects the significant information and establishes the implicit causal relationships, which for him have a high adaptive value in the environment.

In a more detailed analysis of the structure of this type of thinking, we can analyze the subject's perception of control. Thus, we can identify the alternatives or actions that the subject uses to achieve the results. Thus, the perception of control, both in prefactual and counterfactual thoughts, can be explained by external factors (e.g., opportunity for action, obstacles, time, cooperation, etc.) or internal (e.g., perception of ability or skills to perform the task) that facilitate or hinder execution. In such a way that, when a person believes they have the opportunities or resources to carry out a certain behavior, it is more likely that they also have the intention of carrying it out [24]. On the contrary, if the person does not believe they have these opportunities or resources, it is highly unlikely that the intention to carry out the behavior will arise. This approach includes the central concept of the theory of behavioral self-regulation [11], which we have been developing. Therefore, we return to contemplate the personality traits (i.e., optimism, pessimism) indicated at the beginning of the chapter.

As we have commented, the analysis of this type of thinking facilitates access to the causal relationships that the subject contemplates. it also informs us of how the subject searches for and selects information to make decisions about what actions to carry out.

5. Offender drivers profile

An important advance in Road Safe would be to establish differential profiles between those drivers who behave in a risky or challenging way and those who conduct themselves prudently. In Spain, drivers can lose points on their driver's license, when they commit offenses such as speeding, driving under the influence of alcohol, etc. The withdrawal of points depends on the severity of the infraction. In such a way that, the Spain's Directorate General for Traffic [DGT – Dirección General de Tráfico] can suspend your driver's license. With this, we want to point out that the withdrawal of the license is not due to minor penalties for lack of information or circumstantial infractions. The withdrawal of the license is due to a series of serious infractions or various penalties that can be repeated and accumulate over time, which can lead to the total loss of points. Offender drivers have the chance

to recover their driving license points by attending rehabilitation courses. These courses are referred to as "Intervention, awareness and road re-education courses in the licence points system of Spain's DGT". These differ if the offender drivers have lost any of the points (i.e., partial lost) or all points (i.e., total loss).

In Spain, different studies have been carried out with drivers, who have lost their driving licences [68–71]. Del Valle et al. in different studies [72–74], have compared the profiles of offender drivers with non-offender drivers. This last group of drivers has not had any points deducted from their licenses. They are drivers who attend refresher courses. In addition, they are trained to know those personal and situational factors that lead them to perfect their driving in different situations. In our studies, we focus on a group of optimistic offender drivers and on the analysis of the role of causal attributions in prefactual and counterfactual thinking and emotions under conditions of induced control. The study of thoughts of this nature focuses on the subjective perception of control that drivers think they have. In turn, it could explain why individuals drive dangerously in a more or less voluntary manner. Awareness of how this cognitive process works and its impact on driving could foster a change in dangerous driving habits.

We have conducted different studies to analyze this type of thoughts under different conditions of induce control. In Del Valle, [72] we set ourselves the objective was to analyze to what extent optimistic offender drivers differ from dispositional pessimists in their prefactual thoughts generated under different conditions of induced control. We found that drivers believe that they have a certain ability to influence events, and these types of thoughts we can identify intentions about future action. When analyzing the type of prefactual thoughts that optimistic offender drivers show, we have observed that they do not consider that the errors committed are due to personal failures, they usually make an external attribution of the causes of the errors. In the event, that these drivers generate thoughts about how they could achieve better results, they consider that if certain external factors come into play they could achieve a better result. This leads us to consider that these drivers show great confidence in their abilities. If they considered possible alternatives, in this case unwanted, they would attribute their cause to external factors, such as bad luck, for example.

As is derived from the above, a direct reference is being made to the perceived controllability or illusion of control that these drivers believe they have. These types of drivers may have greater problems to identify difficult or impossible targets [75]. We think that, at these moments they maintain an unjustified optimism, based on an illusion of control, where they believe they control the uncontrollable [76–78].

We especially see this fact, when drivers drink alcohol. In the study Del Valle and Sucha [73], we found the drivers showed greater confidence in their abilities, and they believe that they have greater abilities than others [79]. There are several reasons that may justify these biases in the perception of control. Among these reasons are those reported by drivers who have previous experience of driving under the influence of alcohol and have experienced no negative consequences (e.g. a citation, arrest, crash, etc.). In this case, these drivers experience success in their illegal behavior, since they avoid punishment, and this acts as reinforcement in the perpetuation of their behavior [80]. Obviously, this fact generates expectations of self-efficacy in the driver under the influence of alcohol [81] and explains the lower perception of risk [82, 83].

But, it is not only the great confidence in their abilities, but in a comparative processes with other drivers, they think they are more skilled than other people [84–88]. It is difficult to find a driver who recognizes that he drives very badly. In fact, drivers have a higher opinion of their skills, and they have a low perception of the risk of having an accident [40]. These drivers do not consider the possibility of an accident happening to them, if they can demonstrate their capacity and skills [89, 90].

In a current study, del Valle [74] analyzed whether there are differences between optimistic offender drivers and non-offender drivers in counterfactual thoughts and emotions, under induced control conditions. The functionality of counterfactual thoughts and negative emotions appears under situations with unfavourable outcomes, where more causal reasoning appears [91]. When optimistic offender drivers generate counterfactual thinking to explain the mistakes made. They may overestimate their abilities and seek different excuses, focusing on external aspects of the situation ("If it hadn't snowed, then I could have avoided the accident") to justify their unwanted results [65, 92]. With this justification, it would be possible to reduce the size of the problem, instead of considering other possibilities (i.e., lack of knowledge for driving in snow) [93]. Overestimating their abilities leads them to ignore, or at least underestimate, the negative feedback provided by the environment [65, 94].

In the study del Valle [74] optimistic offenders drivers recorded the lowest values of negative emotions (i.e., guilt and shame). When a person experiences shame, what they create is a desire to flee and disappear. Whereas, in guilt, the person tends to carry out an action that amends the generated result [95, 96]. Our interest is focused on the emotion of guilt. Echeburúa, Corral and Amor [97] point out that guilt is not an end in itself, but is a regulatory emotion that, in general, leads to repair and the avoidance of future damage. In investigations carried out by Tangney's team [98–100] have commented that emotions such as guilt depend on the person's negative judgement of their action. This emotion tends to appear in situations in which a failure is perceived, there is a perception of controllability in their actions and, therefore, the driver is attributed internal responsibility for it (e.g., "If I had not drunk, I would have avoided the accident"). Some authors [96] have commented that guilt can encourage actions to amend the result generated: on the one hand, these drivers do not feel guilt, and on the other, they attribute responsibility for the result to external aspects (e.g., "If the pedestrian had not crossed, I would have avoided the accident). Although we cannot reach a causal implication because we do not use a causal model, we do think these two separate sets of findings could be related.

6. Conclusion

it is a fact that highly skilled drivers, or those who believe they are, may be at greater risk due to their tendency to take risks on the road. In this chapter, we have delimitated the characteristics of a group of optimistic offender drivers, which reveal, on the hand, a great lack of understanding of the true impact that external factors can have on driving and; on the other hand, they tend to overestimate their abilities and overconfident in their ability to avoid accidents. In addition, these drivers do not usually experience negative emotions when they fail. All this, together is what increases the probability of suffering an accident. The consideration of the different cognitive profiles in the perception of the risk or challenge when facing potential traffic situations may provide the instructors on these courses with a better understanding of the true nature of those attending. It is not the same to draw attention to the limitations in terms of skills and capacity of someone who has a generally optimistic view of situations they perceive to be controllable, as to point out those limitations to someone with a generally pessimistic outlook regarding those self-same situations. The ability to restructure cognitive distortions and dismantle mistaken beliefs might be an important feature of courses of this kind, as well as in the instruction of new drivers. This should therefore be a priority to increase the effectiveness of driver rehabilitation courses following the withdrawal of points, and reduce the likelihood of a relapse, which would mean a further step forward in the prevention of road accidents.

However, underlying cognitive functioning or driving exposure have not been widely studied. To this end, we suggest future research should utilize the advances in neuroscience methods and clinical tests with relevant technologies (like Eye tracking, Bio-Feedback and modern devices) which can understand neuroscience signals and driving behaviors and attitudes more accurately to study how the cognitive profile of drivers will be affected and how cognitive functions may relate to improved driving abilities and therefore, fewer motor vehicle crashes. Developing these lines of research will allow investigators to understand the mechanisms which underlie safer driving behaviors in order to ultimately inform prevention and driver training programs.

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