**Me have a traffic accident?**

**The effects of Core Self-Evaluations on the perceived likelihood and perceived undesirability of traffic accidents**

Florent LHEUREUX*

Colette CHARLOIS

Laurent AUZOULT

Jean-Pierre MINARY

*Laboratoire de Psychologie (EA3188), Université Bourgogne Franche-Comté, F-25000 Besançon, France*

*Corresponding author:
Postal address (all authors): Université de Franche-Comté, Laboratoire de Psychologie, 30-32 rue Mégevand, F-25030 Besançon Cedex, FRANCE.
Tel (all authors): +33 381 665 439.
E-mail adresses: florent.lheureux@univ-fcomte.fr (F. Lheureux), colette.charlois@univ-fcomte.fr (C. Charlois), laurent.auzoult@univ-fcomte.fr (L. Auzoult), jean-pierre.minary@univ-fcomte.fr (JP Minary).

*Abstract*

**Problem**: The aim of this article was to demonstrate the influence of “core self-evaluations” (CSE) on the perception which drivers have of the occurrence of a “traffic accident", in particular the evaluation of its likelihood, of the personal control exercised and its undesirability (attitude). More generally, this article introduces the concept of CSE in the field of driver psychology and discusses its relevance. **Method**: 201 French drivers replied to a questionnaire measuring CSEs, the perceived likelihood of having an accident, attitude and perceived personal control. **Results and discussion**: The more positively drivers evaluated themselves, the more they judged that they were in control and that accidents were unlikely. Drivers with a negative self-evaluation had an attitude more negative than drivers with positive CSEs solely when they judged the accident as unlikely. This positive correlation between attitude and perceived likelihood for drivers with negative CSEs could be viewed as the result of “wishful thinking” or “rationalisation” modes of reasoning. For these drivers a positive relationship was also observed between driving experience and perceived personal control, the latter thus cancelling out the effect of CSEs. This result suggest that with experience self-evaluation *as a driver* becomes positive and compensates for the effect of a negative general self-evaluation on perceived personal control and perceived likelihood. **Practical implications**: Using and adapting the Experience-Based Analysis technique for each group of drivers (positive or negative CSEs) is recommended, as well as implementing interventions that triggers drivers’ awareness of CSEs influence and that promote their self-regulating skills.

*Keywords:* core self-evaluations; traffic accident; attitude; perceived likelihood; risk

*Highlights*

- Introduces the Core Self-Evaluations (CSEs) concept in traffic psychology research
- CSEs are negatively linked to the perceived likelihood of accidents
- CSEs are positively linked to perceived personal control over accident occurrence
- This relationship is absent when drivers are experienced
- When the accident is perceived as likely CSEs and attitudes are negatively linked

## 1.1. Introduction

The aim of the study described in this article was to demonstrate the influence of "core self-evaluations" (CSE) on the perception which drivers have of the occurrence of a "traffic accident", in particular the evaluation of its likelihood, of the personal control exercised and its undesirability (attitude). More generally, this article introduces the concept of CSE in the field of driver psychology and discusses its relevance.

The concept of CSE refers to the fundamental evaluations which the individual has of themselves. Structurally, the concept of CSE is defined as a higher-order construct (Judge, Erez, & Bono, 1998) encompassing 4 personality traits: self-esteem, generalised self-efficacy, locus of control and emotional stability (absence of neuroticism). Both at theoretical and empirical level these authors report substantial similarities between these four traits and infer the existence of a second-order factor. For example, a review of 75 studies highlighted the fact that these 4 traits correlated on average to .60 which, according to them, is an indicator of an underlying evaluative factor, common to these 4 traits. Thus, this concept "captures the common variance to variables considered relatively cognitive (i.e., self-efficacy and locus of control) along with variables of a more affective or motivational nature (i.e., self-esteem and emotional stability)" (Judge & Kammeyer-Mueller, 2011, p. 118).

Through these four traits, the individual is said to make a general judgement of themselves which is more or less favourable or unfavourable. According to Judge and Kammeyer-Mueller (2011, p.332) "People who have positive core self-evaluations see themselves positively across a variety of situations, and approach the world in a confident, self-assured manner. They believe that they are capable of solving problems (high self-efficacy), are worthy of respect and regard (high self-esteem), are in control of and responsible for what happens to them (internal locus of control), and are prone to be

optimistic and free from doubts and worries (high emotional stability)".

The first studies of CSEs were conducted within the framework of occupational psychology. They demonstrated, for example, that having positive CSEs promotes assiduity, motivation and satisfaction at work (Judge et al, 1998), career success (Judge & Hurst, 2007) and professional performance (Erez & Judge, 2001). More recently, other studies have analysed the implications of CSEs in other fields, such as, amongst others, those of well-being and health (physical and psychological) (Tsaousis, Nikolaou, Serdaris, & Judge, 2007), decision-making (Di Fabio, Palazzeschi, & Bar-On, 2012) and business creation (Ahmetoglu, Leutner, & Chamorro-Premuzic, 2011), to quote only these examples. These studies illustrated the relevance of this concept beyond its initial field of study.

Having positive or negative CSEs influences the cognitive and affective functioning of individuals. They particularly influence the manner in which individuals interpret events, information and situations in their everyday life, which are then perceived in accordance with a perspective which is to a greater or lesser extent optimistic or pessimistic. In this regard, Judge, Erez and Bono (1998, p. 171) have stated that "optimism is closely related to core self-evaluations". This idea was taken up and developed by Oreg and Bayazit (2009) for whom individuals with very negative or very positive self-evaluations are more disposed to biases in the perception of events, such as over or under confidence, the illusion of control or learned helplessness or unrealistic optimism or pessimism. Indeed, an individual convinced of being capable of succeeding in the actions which they undertake and of having control over their life are likely to have a tendency to judge undesirable events as unlikely and desirable events as rather likely, as they are convinced of being able to prevent the occurrence of the former and to promote that of the latter. Likewise, the idea that a negative event could occur is inconsistent with their low propensity to negative emotions and the positive image which

they have of themselves. The inverse reasoning is entirely applicable to an individual with a negative self-evaluation.

At the same time, it can be expected that individuals with an unfavourable judgement of themselves are quicker to pay attention to the potential negative consequences of events, whereas individuals judging themselves positively are more sensitive to the positive consequences. Thus, the former would be *a priori* prone to having a more unfavourable attitude with regard to forthcoming events than the latter.

The studies looking into risk perception (exposure and severity) have indirectly corroborated these points of view. For example, the studies by DeJoy (1989) and Glendon, Dorn, Davies, Matthews and Taylor (1996) observed that drivers considered their driving skills and competence to be better than their peers. The more they felt in control the less likely they judged themselves to be involved in a traffic accident. Similarly, Klein and Helweg Larsen (2002) reported a rather important link between LOC and comparative optimism (.34 correlation, based on 3 studies). In the same vein, Stone (1994) observed that the higher individuals considered their personal self-efficacy to be, the more that encouraged them to overestimate their chances of success in a performative task. Thus, for example, the existence of a bias referred to as optimism or overconfidence can be noted, when individuals have "highly skewed, positive views of the self" (Taylor & Brown, 1988, p. 195). Finally, Helweg-Larsen and Shepherd (2001) observed that being disposed to negative emotions reduced this propensity to optimism, as well as the perceived control of the situation.

In addition, numerous studies have more generally illustrated the importance of the four personality traits concerned, in connection with the psychology of transport and driving. This was the case notably for the LOC (e.g. ; Arthur, Barrett & Alexander, 1991 ; Gidron, Gal & Desevilya, 2003 ; Holland, Geraghty & Shah, 2010 ; Ozman & Sumer, 2011 ; Rudin-

Brown & Parker, 2004 ; Sarma, Carey, Kervick & Bimpeh, 2013), but also for self-efficacy, self-esteem and neuroticism (e.g. Huang & Ford, 2011 ; Machin & Sankey, 2008 ; Morrisset, Terrade & Somat, 2011 ; Taubman-Ben Ari, Mikulincer & Gillath, 2004 ; Vollrath, Knoch, & Cassano, 1999).

Although none of these studies referred to the concept of CSE, nor took into account the group of four constitutive traits, they support the idea that this concept is relevant when it comes to understanding the perception of risks on the road. In particular, they make the general hypothesis plausible according to which CSEs considered together influence the perception which drivers have of their potential involvement in a traffic accident. Our study was original in that beyond the specific effect of these variables, we make the hypothesis that the second-order factor which unites them influences this perception. More specifically, the theoretical elements mentioned allowed us to formulate the following hypotheses:

*Hypothesis 1: the higher a self-evaluation a driver has of themselves, the less they foresee the possibility of having an accident (i.e. negative correlation between CSE and the perceived likelihood of an accident).*

*Hypothesis 2: the higher a self-evaluation a driver has of themselves, the more they feel able to control the occurrence of accidents (i.e. positive correlation between CSE and perceived control in preventing accidents).*

*Hypothesis 3: the higher a self-evaluation a driver has of themselves, the less they fear/dread having an accident (i.e. positive correlation between CSE and attitude with regard to a potential accident). In other words, the more positive a driver's CSEs are the less extreme is their negative attitude.*

**2.2. Method**

*2.1. Participants and procedure*

Several managers working in diverse organisations (two public administrative bodies, a company, a hospital, and several social and cultural associations) were contacted and authorised to distribute the survey within their organisation. The students and staff of the university to which the research team belonged were also approached. The questionnaire was created in a web-based format and distributed via the emailing lists of these organisations using the Limesurvey® programme. The participants thus received a message presenting the theme of the study to them and the context of its production, guaranteeing them that their responses would remain anonymous and confidential.

201 volunteer French drivers took part. This sample was made up of 108 women and 93 men, with an average age of 34 years and 8 months (*SD* = 15.48), 82 of whom had at least one child. On average these drivers covered between 15,000 and 20,000 km per year and had 16 years driving experience (*SD* = 15). They were all car drivers, and 19 were also motorcyclists or moped riders. 95 of these drivers had had experience of a traffic accident, 10 of whom had had three accidents or more. Moreover, 3 of these drivers had been involved in a fatal accident, 7 drivers had suffered serious consequences for their health, 9 of these people had been involved in an accident with serious consequences for the health of another person and 35 of them felt psychologically “marked” by an accident which only had material consequences.

*2.2. Material*

The different variables measured were presented in counterbalanced order with a view to controlling a possible halo effect. Half of the participants responded first to the Core Self-Evaluations Scale (CSES), the other half began with questions related to the theme of traffic

accidents and to driving in general; this division was made randomly. The input of personal information always came at the end. Details of all the questions are available from the authors on request.

*2.2.1. The CSES*

Drivers responded to the CSES, a scale created by Judge, Erez, Bono and Sorensen (2003). 12 statements were presented, 6 expressing a positive self-evaluation (e.g. “I determine what will happen in my life”, “Overall, I’m satisfied with myself”) and 6 a negative self-evaluation (e.g. “I am filled with doubts about my competence”, “There are times when things look pretty bleak and hopeless to me”), these two types of statement being presented alternately. Each person had to indicate their level of agreement or disagreement on a 5 point scale (ranging from 0 "strongly disagree" to 4 "strongly agree") ($\alpha = .82$).

*2.2.2. Perceived likelihood and attitude towards involvement in a traffic accident*

The theme of road accidents was introduced, then the drivers were invited to reply to 20 questions, 5 measuring the perceived likelihood of being involved in a traffic accident in the coming months ($\alpha = .88$), and 15 measuring their attitude with regard to this idea ($\alpha = .92$). These two types of questions were presented in counterbalanced order and randomly presented to the participants.

With regard to perceived likelihood, the drivers had to respond on an 11 point scale for each question (ranging from 0 = "no likelihood" to 10 = "maximal likelihood"). The first question was the following: "overall, what in your opinion is the likelihood of you having a traffic accident in the coming months?” Presented in the same form, the other four questions specified the "type" of accident; two of them distinguished the accident in accordance with its cause (the participants themselves or the environment), the two others distinguished it in

accordance with its severity (fatal accident and/or with serious consequences for health, or minor accident, without consequences for health).

For attitude, these five items were repeated and adapted (for example: "being the cause of a road accident in the coming months for me would be…"). Each time, the drivers replied to three 11 point scales ranging from 0 to 10 (the first ranging from "extremely harmful" to "extremely beneficial", the second from "extremely unpleasant" to "extremely pleasant" and the last from "extremely negative" to "extremely positive").

*2.2.3. Evaluation of personal control*

Two items measuring the level to which the driver thought themselves able to control the (non-) occurrence of an accident were then proposed ($r$ = .46, $p$ <.0001): "Do you feel yourself able to control the fact of having or not having a traffic accident in the coming months?"; "The fact of having or not having a traffic accident in the coming months depends on me, on my decisions and on what I do". For the first item, the response modalities ranged from "no, absolutely" (0) to "yes, absolutely" (10). In the second they ranged from "strongly disagree" (0) to "strongly agree" (10).

*2.2.4. Offending and/or dangerous behaviours: frequency of adoption and perceived risk*

The drivers also indicated the frequency with which they adopted thirteen offending and/or dangerous behaviours (e.g. speeding, driving while telephoning, dangerous overtaking, drinking and driving) on a scale ranging from "never" (0) to "extremely frequently" (6) ($\alpha$ = .77). They also evaluated the risk associated with each behaviour on a scale ranging from "not risky" (0) to "very risky" (3) ($\alpha$ = .73).

*2.2.5. Past experiences of accidents*

The drivers also specified whether they had already been involved in a traffic accident in the

past (responses proposed: "yes" or "no, never"). When the response was "yes", they had to specify the number of these accidents. Likewise, they had to specify whether they had had (1) a fatal accident, (2) an accident with serious consequences for their health, (3) an accident with serious consequences for the health of another person, and (4) if they had had an accident with material consequences only which had particularly "marked" them. Each time, they had to answer "yes" or "no". Based on these responses, the severity of the accident experiences was estimated with a score ranging from 0 (no experience) to 4 (had at least one experience and replied "yes" to all additional questions).

*2.2.6. Personal information*

At the end of the questionnaire, the drivers indicated their gender, age, if they had one or several children, the average number of kilometres covered per year (6 response modalities ranging from "less than 10,000 km/year" to "more than 30,000 km/year") and the number of years they had been driving (from the date they obtained their driving licence).

## 3. Results

### *3.1. Main analyses*

#### *3.1.1. Descriptive statistics and correlations between variables and linear regressions*

Table 1 below presents the means, standard deviations and main correlations between variables. On average the individuals questioned had a median evaluation of themselves ($M$ = 2.22). Perceived likelihood was judged on average to be rather low ($M$ = 3.74) and, unsurprisingly, attitude was for the majority of the time very negative ($M$ = 1.03). The evaluation of personal control was median on average ($M$ = 4.90). Overall drivers judged offending and/or dangerous behaviours as risky ($M$ = 2.27) and declared that they engaged in them infrequently ($M$ = 0.82). The severity of past experiences of accidents was on average

rather low ($M$ = 0.88).

Table 1

*Descriptive statistics and main correlations between variables*

| | *M* | *SD* | Core Self-Evaluations | Perceived personal control | Gender [a] | Parent [b] | Age | Driving experience (in years) | Kilometres covered annually | Frequency of offending | Perceived risk of offending | Severity of accident experiences |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core Self-Evaluations | 2.22 | 0.55 | / | .20 | -.19 | .14 | .08 | .11 | .02 | -.06 | .14 | .07 |
| Mean likelihood | 3.74 | 1.36 | -.23 | -.22 | -.04 | .14 | .16 | .19 | .23 | .23 | .07 | .08 |
| Overall likelihood accident | 3.82 | 1.60 | -.16 | -.16 | -.07 | .13 | .10 | .13 | .31 | .23 | -.07 | .13 |
| Likelihood DATC accident | 3.07 | 1.59 | -.15 | -.08 | -.04 | .13 | .15 | .20 | .14 | .22 | .07 | .14 |
| Likelihood DNATC accident | 4.31 | 1.71 | -.20 | -.29 | -.02 | .04 | .05 | .06 | .20 | .22 | .01 | .03 |
| Likelihood serious accident | 3.31 | 1.71 | -.20 | -.20 | -.06 | .24 | .30 | .31 | .16 | .19 | .14 | .05 |
| Likelihood minor accident | 4.19 | 1.73 | -.25 | -.19 | .02 | .05 | .07 | .06 | .12 | .10 | .14 | .02 |
| Mean attitude accident | 1.03 | 1.02 | .10 | .10 | -.04 | -.07 | -.04 | -.03 | -.08 | .04 | -.15 | -.08 |
| Overall attitude accident | 1.16 | 1.45 | .17 | .12 | -.01 | -.07 | -.11 | -.11 | -.05 | -.02 | -.11 | -.08 |
| Attitude DATC accident | 0.53 | 0.95 | .09 | .11 | -.06 | .04 | .09 | .10 | -.02 | .05 | -.12 | -.02 |
| Attitude DNATC accident | 1.23 | 1.53 | .08 | .09 | -.07 | -.09 | -.04 | -.04 | -.06 | -.01 | -.16 | .02 |
| Attitude serious accident | 0.25 | 0.63 | .14 | .06 | -.10 | .06 | .12 | .13 | .06 | .08 | -.04 | -.10 |
| Attitude minor accident | 1.99 | 1.73 | -.01 | .03 | .01 | -.11 | -.07 | -.05 | -.16 | .08 | -.13 | -.13 |
| Perceived personal control | 4.90 | 2.24 | .20 | / | -.07 | .11 | .10 | .15 | -.06 | .01 | -.02 | .14 |
| *Mean (M)* | / | / | 2.22 | 4.90 | / | / | 34.7 | 15.8 | 2.71 | 0.82 | 2.27 | 0.88 |
| *Standard Deviation (SD)* | / | / | 0.55 | 2.24 | / | / | 15.5 | 15 | 1.40 | 0.53 | 0.29 | 1.17 |

*NOTE:* [a]: Man = 1. Woman = 2; [b]: Yes = 1. No = 0; for $r \geq |.14|$, $p < .05$; DATC = Driver As The Cause, DNATC, Driver Not As The Cause

Self-evaluation was negatively correlated with mean likelihood (-.23) and also with all items considered separately (correlations ranged from -.15 to -.25). It was significantly and positively correlated with attitude when accidents were referred to in a general (i.e. unspecified) manner (.17) and with attitude with regards to involvement in a serious accident (.14). It will also be noted that the more likely they judged having a serious accident to be the more negative was their overall attitude toward having an accident (-.15, correlation not present in Table 1). Thus, these correlations suggest that the more favourably drivers judged themselves the less they judged involvement in an accident as being likely (and this whatever its type) and the less they were prone to fear this event. The positive and significant correlation obtained between self-evaluation and perceived personal control (.20) was convergent with this observation, as it confirmed that the more positively an individual evaluated themselves the more they considered themselves as being able to control the occurrence of accidents. Moreover, this evaluation of control was negatively correlated with the mean likelihood of an accident (-.22, $p < .01$), the maximal correlation being for an accident for which the driver was not the cause (-.29, $p < .01$) and the minimal correlation for an accident for which the driver was the cause (-.08, *ns*).

Other correlations reached the significance threshold (|.14|). For example, driving experience (in number of years) was positively correlated with the mean likelihood (.19) or, more highly, with the perceived likelihood of having a serious accident (.31) and with perceived personal control (.15). As other examples, the mean frequency of engagement in offending behaviours and the mean number of kilometres covered annually were positively correlated with the mean perceived likelihood (.23).

*3.1.2. Hierarchical multiple linear regression analyses*

Table 2 below presents the results of three multiple hierarchical linear regression analyses,

one for each dependent variable (likelihood, attitude and control). As age, driving experience and the fact of being or not being a parent are strongly linked ($r > .74$), only driving experience was included in these analyses.

Table 2. Results of multiple hierarchical linear regression analyses (β)

| | Mean likelihood | | Mean attitude | | Perceived personal control | |
|---|---|---|---|---|---|---|
| | Step 1 | Step 2 | Step 1 | Step 2 | Step 1 | Step 2 |
| Gender [a] | .08 | .03 | -.06 | -.03 | -.04 | .00 |
| Parent [b] | -.02 | .02 | -.08 | -.10 | .01 | -.02 |
| Driving experience (years) | .15 | .13 | .11 | .13 | .17 | .19 |
| Mean annual distance covered (km) | .17* | .16* | -.10 | -.10 | -.14† | -.13 |
| Mean frequency of offences | .29** | .28** | -.01 | -.01 | -.01 | .00 |
| Mean perceived risk of offending | .16† | .19* | -.18* | -.20* | -.07 | -.10 |
| Severity of accident experiences | .02 | .04 | -.09 | -.10 | .12 | .11 |
| Core Self-Evaluations | | -.26** | | .13† | | .19* |
| $R^2$ | .14 | .20 | .04 | .06 | .06 | .09 |
| $\Delta R^2$ | .14** | .06** | .04 | .02† | .06 | .03* |

*NOTE:* a: Man = 1. Woman = 2; [b]: Yes = 1, No = 0; † $p < .08$; * $p < .05$; ** $p < .001$

Generally speaking, independent variables had a moderate impact ($R^2 < .21$). Nevertheless, the addition of CSEs significantly increased the explained variance of mean perceived likelihood (β = .-26, $\Delta R^2 = .06$, $p < .001$) and perceived personal control (β = .19, $\Delta R^2 = .03$, $p < .05$). The additional explained variance for mean attitude approached significance (β = .13, $\Delta R^2 = .02$, $p < .08$). Annual distance travelled (km) (β = .16, $p < .05$), the frequency of driving while offending (β = .28, $p < .001$) and the perceived risk of offending (β = .19, $p < .05$) were the other predictors of perceived likelihood. As far as attitude was concerned, only the mean perceived risk had a significant effect (β = -.20, $p < .05$). For evaluation of control, only CSEs had a significant effect (β = -.20, $p < .05$).

*3.2. Additional analyses*

*3.2.1. Correlations between perceived likelihood, attitude and perceived personal control among drivers with positive or negative CSE*

These results revealed that CSEs were less connected with attitude than with perceived likelihood. A possible explanation is that attitude to accidents also depended on their perceived likelihood, in interaction with self-evaluation. In line with this possibility, the sample was split, with on one side the drivers with a negative self-evaluation (score lower than or equal to 2, $n$ = 82) and on the other those with a positive self-evaluation (score higher than 2, $n$ = 119). Next, the correlation matrix between variables for each group was examined. This examination revealed several phenomena.

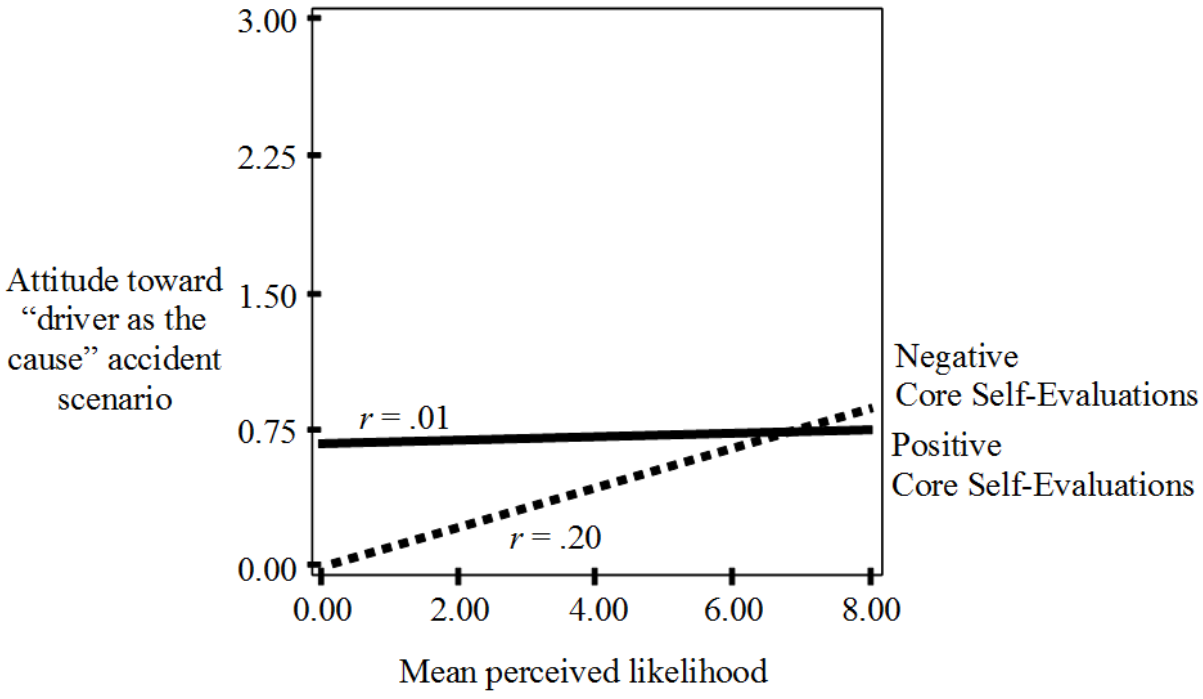


*Figure 1a*. Relationship between the mean likelihood of being involved in an accident and the attitude expressed with regard to an accident where the driver was the cause in accordance with the positive or negative evaluations which drivers have of themselves.

As illustrated by Figure 1a above, for drivers with a positive self-evaluation, no significant correlation was observed between perceived likelihood and attitude. Inversely, for drivers with a negative self-evaluation, attitude with regards to involvement in a serious accident was positively correlated with its perceived likelihood (.36, $p$ <.001) and, more generally, with the mean likelihood of an accident (.33, $p$ <.001). In other words, the more these drivers were convinced that having an accident was likely the more they minimised its negativity. A similar phenomenon was observed for the scenario where the driver was the cause of the accident (see on-line supplementary material for Figure 1b). The more this type of accident was judged likely the less negative was the attitude expressed (.22, $p$ <.05); an analogous correlation was observed with the mean likelihood of involvement in an accident (.20, $p$ <.07).

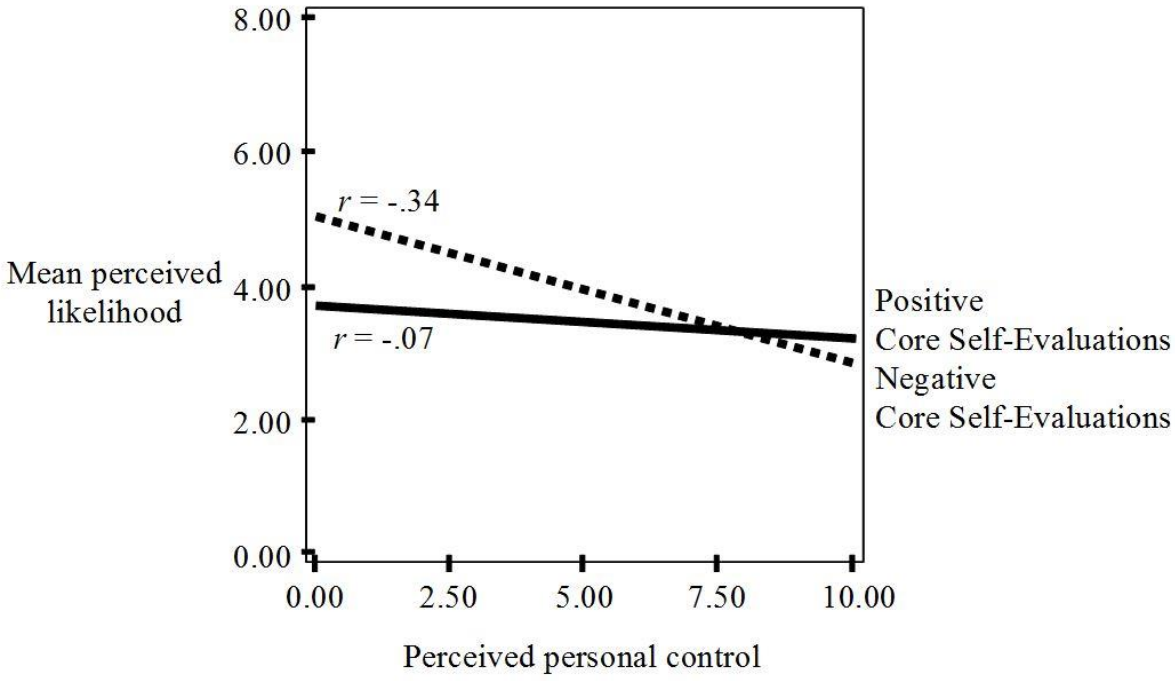


*Figure 2*. Relationship between perceived personal control and the mean likelihood of being involved in an accident for drivers in accordance with the positive or negative evaluations which drivers have of themselves.

Another interesting phenomenon was also identified in this regard (see Figure 2). Perceived personal control had a significant effect on the mean likelihood of an accident only for drivers with a negative self-evaluation (-.34, $p$ <.01). For drivers with a positive self-evaluation the correlation was non-significant (-.07, *ns*). The fact of considering themselves to have little control did not therefore have an impact on the perceived exposure to the risk of an accident for drivers with a positive self-evaluation, whereas for drivers with a negative self-evaluation the perceived absence of control was actually associated with a higher perceived likelihood of an accident. In other words, CSEs influenced the perceived likelihood of having accident when perceived personal control was low; when perceived personal control was high, judgements of likelihood were equivalent whatever evaluation the drivers had of themselves. And so, considering themselves to be in control of this event seemed to compensate for a negative self-evaluation and therefore reduced the perceived exposure to the risk of an accident.

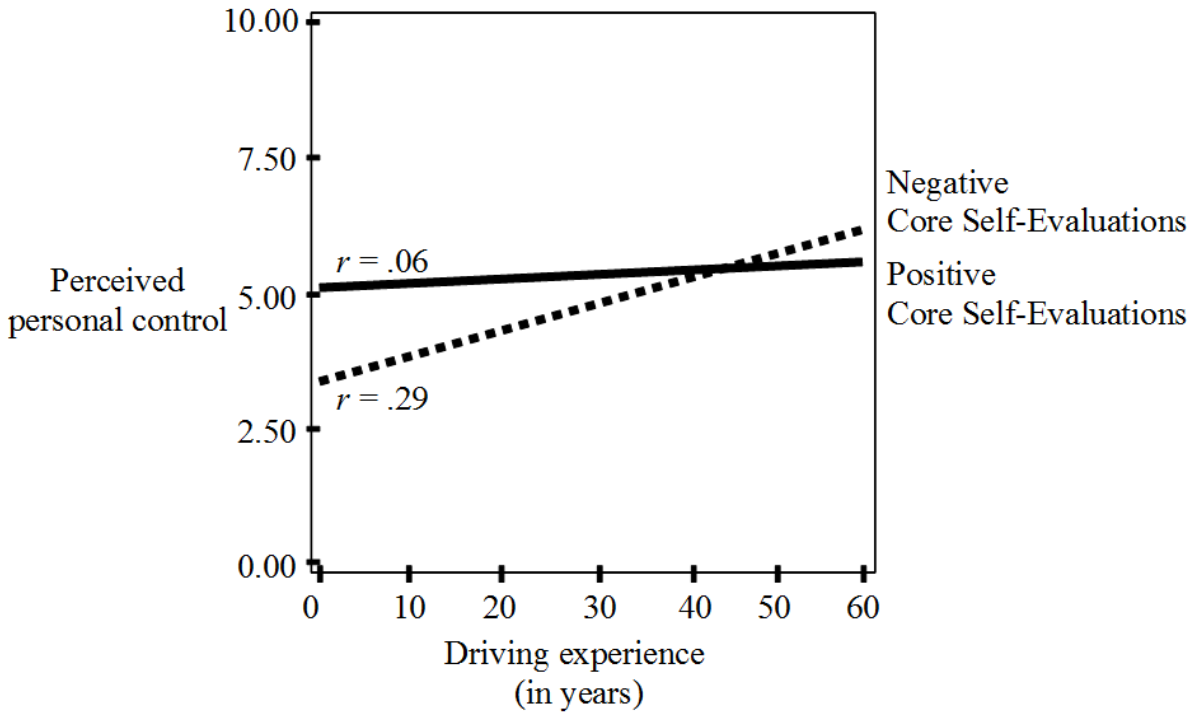


*Figure 3a*. Relationship between driving experience (in years) and perceived personal control in accordance with the positive or negative evaluations which drivers have of themselves.

The factors leading these drivers to consider themselves in a situation of control was related to driving experience: the number of driving years (Figure 3a) and the severity of past experiences of accidents (see on-line supplementary material for Figure 3b). In effect, these two variables significantly influenced the perceived personal control of drivers with a negative self-evaluation ($r$ = .29 and .24) but not that of drivers with a positive self-evaluation (.06 and .05). More specifically, independently of their experience of driving and accidents, drivers with a positive self-evaluation considered themselves to be in control. Inversely, for drivers with a negative self-evaluation, personal control was dependent on these experiences. The more significant these experiences were the more the drivers had the feeling of being in control of the (non-) occurrence of this event, consequently compensating for their generally more negative self-evaluation (i.e. cancelling it out).

*3.2.2. Repeated measures analyses of variance*

In addition, perceived probabilities and attitudes with regards to different "types" of accident (varying with respect to their cause or severity) were analysed by means of a repeated measures ANOVA. This notably consisted of highlighting any possible interaction between CSEs with the type of accident or of confirming its interaction with the type of evaluation of the latter (likelihood or attitude). A first ANOVA was performed with self-evaluation as between-subject variable (positive or negative), and the type of evaluation (likelihood or attitude) and the type of accident (driver as the cause/responsible, driver not the cause, with serious or minor consequences) as within-subject variables, the effects of the other variables having been controlled. Four additional ANOVAs were performed next with the aim of estimating the effect of the cause of the accident (driver or environment) on its perceived likelihood (analysis 1) and on attitude (analysis 2), and the effect of the severity of the accident (serious or minor) on its perceived likelihood (analysis 3) and on attitude (analysis

4), while controlling each time the effect of the other variables.

The first ANOVA revealed an interaction effect (Wilk's $\lambda = .94$, $p < .001$, $\eta^2p = .064$) between the CSEs and the type of evaluation of the accident (likelihood vs. attitude). Individuals perceiving themselves negatively judged likelihood higher ($M = 4.11$) and had a more negative attitude ($M = 0.82$) than individuals with a positive self-evaluation, their responses concerning likelihood ($M = 3.56$) and attitude ($M = 1.07$) being less extreme. No other effect of CSEs was discerned. The other ANOVAs showed that being the cause of an accident was perceived on average as less likely ($M = 3.12$) and more negative ($M = 0.50$) than not being responsible which was then judged likelier ($M = 4.37$, Wilk's $\lambda = .69$, $p < .0001$, $\eta^2p = .32$) and less negative ($M = 1.19$, Wilk's $\lambda = .79$, $p < .0001$, $\eta^2p = .21$). They also confirmed that being involved in a serious accident was perceived on average as less likely ($M = 3.37$) and more negative ($M = 0.23$) than being involved in a minor accident, which was then judged as likelier ($M = 4.26$, Wilk's $\lambda = .78$, $p < .0001$, $\eta^2p = .22$) and less negative ($M = 1.98$, Wilk's $\lambda = .45$, $p < .0001$, $\eta^2p = .55$).

## 4. Discussion

### *4.1. Main results*

Overall the results supported the hypotheses at the origin of the study. As expected (hypothesis 1), the perceived likelihood of having a traffic accident was negatively associated with the positivity of the CSEs. The more positively the driver evaluated themselves, the less credible they thought being involved in an accident was. On the contrary, the drivers who were the most inclined to judge this event as likely were those who evaluated themselves negatively. The second hypothesis was also corroborated by our observations, in the sense that the drivers' feeling of being in control of the occurrence of a possible accident was all the

stronger if they had a positive evaluation of themselves. The results relative to the effect of CSEs on attitude only partially validated hypothesis 3. It seems in fact that CSEs had had an influence, but partly dependent on the perceived likelihood and this for two types of accidents in particular: serious accidents (fatal and/or with serious consequences for health) and accidents of which the driver was the cause.

And so, it would seem that the drivers questioned did not implement the same evaluative mechanisms with regard to accidents, depending on the perception which they had of themselves (positive or negative). On the one hand, having a positive self-evaluation was, it seemed, conducive to a more confident and optimistic perception. Pushed to the extreme, it can be considered that this optimism exposes these individuals to a bias of overconfidence and the illusion of being in control, accompanied by a lesser fear of the event. On the other hand, having a negative self-evaluation seems to have induced other forms of reactions. Although on average these drivers more easily acknowledged that having an accident was likely, however, the more they acted in this way, the more they relativised its undesirability (probably by minimising its potential consequences or by avoiding thinking about it). Inversely, the more they expressed the idea that this event was totally undesirable, the less they recognised its likelihood. In other words, drivers with a negative self-evaluation were more disposed to evaluate accidents as likely *or* very undesirable, without however thinking the two at the same time (likely *and* very undesirable), this mode of thinking being probably too aversive to be adopted. The fact that this phenomenon was particularly observed for the two scenarios “serious accident” and “accident where the driver was the cause” supports this interpretation. This interpretation is also in line with the work of McGuire and McGuire (1991) and their Thought Systems Theory. According to these authors (p.5) when an individual evaluates a potential event, they may face up to it “by promoting a hedonically

gratifying congruence either by adjusting thoughts about the event's likelihood (and therefore about the promotiveness of its antecedents) towards its judged desirability or by adjusting thoughts about the core event's desirability (and therefore about the pleasantness of its consequences) [towards its judged likelihood]". The first mode of reasoning corresponds to what they refer to as "wishful-thinking" whereas the second refers to what they call "rationalisation". These two modes of reasoning (or of coping as they call it) lead individuals to evaluate events as undesirable and unlikely or as desirable and very likely. Observing a positive correlation between perceived likelihood and attitude (desirability) was therefore entirely in concordance with this approach and suggests the existence of other forms of "bias" in the evaluation of the possible accident, which would be more specific to individuals with a negative self-evaluation.

The results obtained also highlighted the fact that drivers with negative self-evaluations did not automatically have a lower perceived personal control than drivers with positive self-evaluations. In fact, the more experience the former had (number of years driving, experience of "serious" accidents) the more their feeling of control was similar to that of the latter. These last results are in agreement with, Morrisset, Terrade and Somat (2011), for example, who formulated the idea that self-efficacy in terms of driving increases the feeling of control which the individual has of the situation and that this has an impact on the feeling of safety (less perceived exposure to risk). In fact, it is possible that with experience, self-evaluation *as a driver* becomes positive, compensates for the effect of a negative general self-evaluation and promotes a higher feeling of control which, subsequently, reduces the perceived likelihood of having an accident.

*4.2. Research limitations*

The main limitations of this study were the simultaneous measuring of different variables

(cross-sectional design) and the non-consideration of certain relevant variables.

The fact of measuring CSEs and the evaluations of accidents and personal control at the same time may have caused an inflation of correlations between variables, as in this case, according to Feldman and Lynch (1988), “the respondent may use retrieved answers to earlier survey questions as inputs to response generation to later questions". They name this potential bias “self-generated validity”. Consequently, in addition to counter-balancing the order of measures, it would be more appropriate to separate them by a time interval sufficient to limit this potential artefact.

It will also be noted that the fact of having asked each driver to reply on behalf of themselves without asking them to do the same on behalf of another (e.g. for a driver of the same age and sex, DeJoy,1989; Glendon et al.,1996) does not allow the presence of the “biases” mentioned previously to be proved.

Furthermore, we did not take into account all of the personality factors involved in the perception of the risk of road accidents. Especially, sensation seeking was identified as influencing the perception of risks and of one's capacity to overcome or avoid them (González-Iglesias, Gómez-Fraguela, & Luengo, 2014; Ravert, Schwartz, Zamboanga, Kim, Weisskirch, & Bersamin, 2009) and again as being implicated in risky behaviours (Chen, 2009; Özmen & Sümer, 2011; Schwebel, Ball, Severson, Barton, Rizzo & Viamonte, 2007; Schwebel, Severson, Ball, & Rizzo, 2006). It thus appears necessary, in this regard, to consider the importance of the positive feelings linked to risky behaviour (sensations) in the perception (biased) of the likelihood/desirability of accidents and above all, to see the if CSEs retain their effects in the presence of this factor.

Additionally, it would be relevant to include in future research a measure of the self-

evaluation each individual has of themselves *as a driver*, given that it could be influenced by CSEs, driving experience, and the severity of past experiences of accident. To that end, the use of the self-assessment of driving ability questionnaire developed by Tronsmoen (2008) appears to be especially appropriate.

Complementarily, the study of Tronsmoen (2010) suggests to take into account the effect of the type of driving education that young drivers have received. He observed that the more a young driver received a 'formal' education (i.e. with a professional instructor) the less they evaluated themselves positively as a driver. Inversely, he observed that the more they received an 'informal' education (i.e. with a lay instructor) the more their self-evaluation as a driver was positive. Thus, it would be relevant to study the possible interaction effects between CSEs and the type of education in that specific population of drivers.

These observations encourage us to conduct new studies with two measurement times, including perception of the risk of an accident for another person and introducing additional explanatory variables (e.g. sensation seeking, self-evaluation as a driver, type of education received). Despite these limitations, this study corroborates the idea that CSEs influence the perception of the risk of accidents, argues in favour of the consideration of this concept in the field of driver psychology and, more generally speaking, the perception of risks.

### *4.3. Practical implications*

The results obtained illustrated that CSEs intervene in the perception of the "accident" as an event, and, in doing so, suggest that interventions dealing with exposure to this risk and its severity (e.g. mass-media campaign) are perceived accordingly. In other words, credibility and the processing of preventive messages aiming to raise awareness of the risks of accidents and the necessity to regulate driving habits are probably dependent on CSEs. Consequently,

this study is an encouragement to adapt the messages delivered to their addressees, by anticipating the modes of reasoning which the evaluation which they have of themselves leads them to adopt. And so, for drivers with positive CSEs one would seek above all to reduce their likely tendency to illusory optimism (or over-confidence) by emphasising the external factors influencing the occurrence of an accident, out of their control, and necessitating the observance of the rules as well as driving skills/abilities. For drivers with a negative self-evaluation, it would be above all a question of reinforcing their feeling of control in terms of driving through experience.

In this regard, an intervention inspired by Experience-Based Analysis (Mbaye & Kouabenan, 2013), which would involve re-analysing past experiences with a view to reducing existing perceptive biases and influencing perceived personal control, appears to be perfectly appropriate. Another possible application derives from the work of Paaver and collaborators (2013). They successfully used in traffic schools an intervention designed to reduce impulsive risk-taking behaviours of young drivers. This intervention consisted of a lecture which aimed to raise awareness of their impulsive tendencies (origins, identification of personal tendencies and of situational factors that triggers their impulsivity on road) and to promote self-monitoring and self-regulation strategies. They observed a significant reduction of speeding behaviours of drivers included in the intervention group in comparison with a control group one year later. Thus, their study illustrated the usefulness of interventions that focus on personal psychological risk factor (e.g. impulsivity). Hence, such type of interventions could be used to reduce the influence of CSEs on accident appraisal.

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*FIGURES IN ONLINE SUPPLEMENTARY MATERIAL*

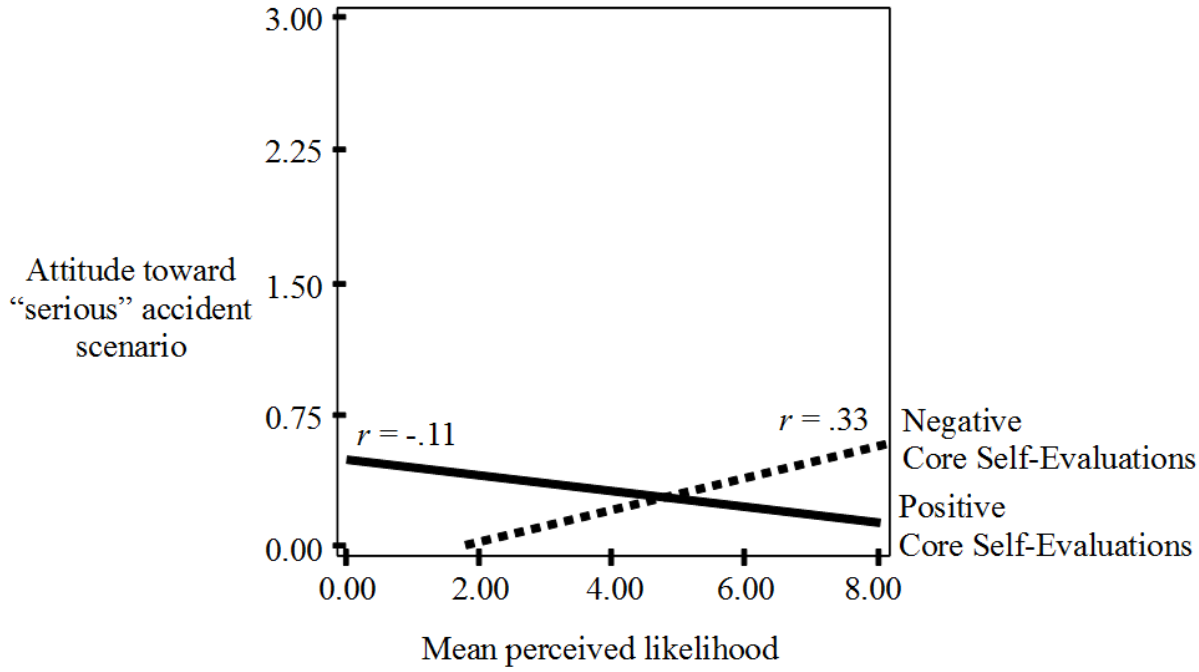


*Figure 1b*. Relationship between the mean likelihood of being involved in an accident and the attitude expressed with regard to a serious accident in accordance with the positive or negative evaluations which drivers have of themselves.

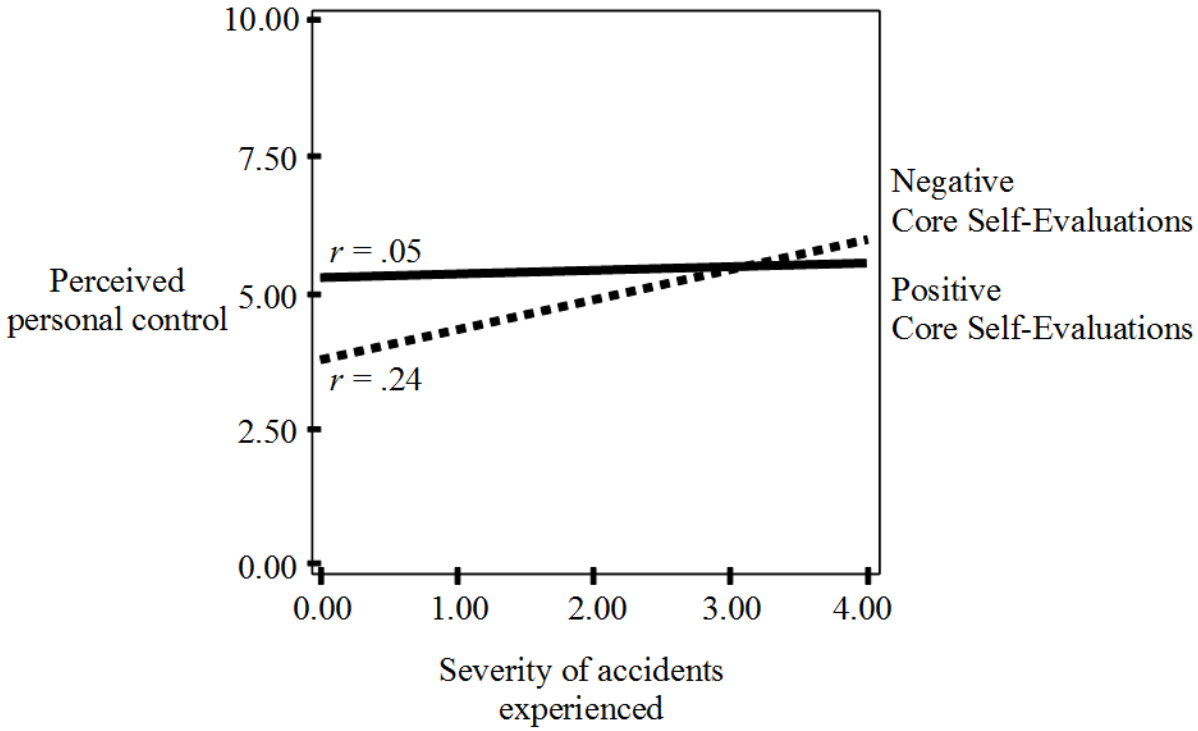


*Figure 3b*. Relationship between the severity of accidents experienced and perceived personal control in accordance with the positive or negative evaluations which drivers have of themselves.