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The relation between mortality salience, traffic locus of control, and risky driving behavior

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ABSTRACT

This study evaluated the direct relationships between mortality salience (MS), traffic locus of control (T-LOC), and risky driving behavior. The sample included 170 drivers. They completed scales measuring T-LOC, then they were randomly divided into one of the three condition groups: MS condition, traffic accidents MS condition, and the control condition. At the end, the participants completed a scale for measuring risky driving behavior. The results showed that MS interacts with the relevance of driving for self-esteem and with external T-LOC in determining risky driving. The implications of these results for safety and future research are discussed.

Introduction

Many previous studies attempt to explain what are the factors related to risk-taking tendencies, given the fact that many persons adopt risky behaviors on a daily basis. One of the most frequent types of risky behavior is risky driving (Fergusson, Swain-Campbell, & Horwood, 2003), with important negative consequences for health and well-being. In order to encourage safety driving, different studies tried to identify the factors associated with the tendency to take risks in traffic. Moreover, different educational programs and campaigns promote safety attitudes and behaviors on the road (King & Reid, 1990). Usually, these campaigns use fear-arousal appeals, based on reminders about one's possible death (Taubman Ben-Ari, Florian, & Mikulincer, 2000). Quite unexpectedly, there is little empirical evidence for the effectiveness of safety driving campaigns. That is, some studies reported no effect (King & Reid, 1990) or, even worse, the opposite of the expected effect (Kohn, Goodstadt, Cook, Sheppard, & Chan, 1982; Taubman Ben-Ari et al., 2000). Specifically, death reminders and threat appeals lead drivers who evaluate driving as relevant to their self-esteem to adopt more risky driving behaviors (i.e. faster driving) and to report more favorable attitudes toward risky driving. Thus, messages used in safety road campaigns, based on death reminders, should not be unequivocally applied to all drivers and the target populations should be

segmented based on individual factors associated with risky driving.

One of these factors is traffic locus of control (T-LOC), that has been linked with risky driving in previous studies (e.g. Măirean, Havârneanu, Popușoi, & Havârneanu, 2017; Warner, Özkan, & Lajunen, 2010), although only two studies assessed its moderating role in the relation between mortality salience (MS) and risky driving (Alper & Özkan, 2015; Miller & Mulligan, 2002). Therefore, more studies are needed in order to bring further evidence for the relation between these variables. Moreover, few studies attempt to explain the relation between reminders of personal death and risky driving (e.g. Alper & Özkan, 2015; Taubman-Ben-Ari, 2000). In order to fill a gap in the literature, the aim of this study is to assess the relation between death salience, T-LOC, and risky driving. Beyond their theoretical implications, our findings may be useful for designing effective road safety campaigns, adapted for different segments of the target population, identified based on the individual differences on locus of control (LOC) in traffic.

Mortality salience and risky driving

MS, defined as the awareness of one's eventual death, was found to influence a wide range of human behaviors and attitudes, in different domains, like religion, politics, interracial conflict, violence, or driving

(Burke, Martens, & Faucher, 2010; Iverach, Menzies, & Menzies, 2014; Pyszczynski, Greenberg, Solomon, & Maxfield, 2006). The studies that examined the implications of activating thoughts about one's death for risky behavior revealed, contrary to intuition, that this activation increases the tendency to adopt risky behavior (Hirschberger, Florian, Mikulincer, Goldenberg, & Pyszczynski, 2002). The same pattern of results was found when examining the relation between MS and risky driving (Taubman-Ben-Ari, Florian, & Mikulincer, 1999; Taubman-Ben-Ari, 2000). These results are exactly the opposite of what is expected by anti-speeding campaigns, which are based on the assumption that reminders of personal mortality will reduce risk taking on the road. Such an effect may be counterintuitive, because MS should cause a person to appreciate their own life more, which is expected to lead to more preventive practices in order to avoid losing it (Huang & Wyer, 2015). A theoretical framework that can explain the relation between MS and the tendency to engage in risky driving behavior is terror management theory (Greenberg, Arndt, Schimel, Pyszczynski, & Solomon, 2001; Greenberg et al., 1990).

The dual-defense model of terror management theory suggests that conscious thoughts about death lead to proximal and distal defenses (Pyszczynski, Greenberg, & Solomon, 1999). Proximal defenses are activated immediately after thinking about mortality and they involve the suppression of death-related thoughts out of conscious awareness, as well as the denial of one's vulnerability. Distal defenses occur when thoughts of death are not in focal attention anymore but are highly accessible in the preconscious mind. They serve the goal of bolstering the belief systems and feelings of self-worth (Pyszczynski et al., 1999). The MS hypothesis, a component of terror management theory, states that activating thoughts of personal mortality increase the need for self-esteem enhancement. As a result, a person will adopt behaviors that play an important role in increasing self-esteem. Based on this theoretical perspective, if risky driving is evaluated as a way of validating self, a person would tend to drive in a reckless way, despite the possible negative consequences (Taubman Ben-Ari et al., 1999). Among the benefits of risky driving that contribute to self-esteem validation are the fact that it can be a source of excitement, may increase the sense of mastery, self-control, and self-worth, may improve social prestige and recognition (Evans, 1991). Due to these positive evaluations about the benefits of dangerous driving, people may ignore potential dangers

and may engage in risky driving (Alper & Özkan, 2015). However, we should note that very few studies assessed these assumptions. In order to bring new evidence for the implication of death reminders for traffic behavior, the first aim of this study is to assess the relation between MS and risky driving behavior.

Based on previous findings, we hypothesize that activating thoughts about one's death will lead to a higher tendency to report the engagement in risky driving, when the participants evaluate driving as relevant for their self-esteem. We also wanted to test if the exposure to death, without mentioning the cause, is related to risky driving in a different way compared to the exposure to death caused by a traffic accident. There is some evidence that the effects of death-related information on behavior extend to situations unrelated to those used to activate death thoughts (Huang & Wyer, 2015). According to this assumption, it would be expected to not find significant differences between the two conditions. However, there is a conceptual difference between the traditional MS manipulation that focuses on the inevitability of death and the traffic mortality prime that focuses on one specific and potentially avoidable cause of death. Studying the differences between the two types of MS induction is important given the fact that inducing thoughts about one's death caused by a traffic accident is more closely related to the images and messages used in road safety campaigns, based on the consequences of risky driving for one's life.

Contrary to most previous studies that assessed the intention to engage in future behaviors (e.g. Alper & Özkan, 2015), we asked participants to retrospectively report the frequency with which they generally engage in risky driving behaviors. It is well known that when people are made aware of behaviors they have typically exhibited in the past, these behaviors can influence their future behavioral decisions in a congruent manner (Albarracin & Wyer, 2000). A few previous studies also asked participants to look back on their lives and to report retrospectively the tendency to engage in different behaviors or the extent to which they were good at performing different behaviors, after MS manipulation. These studies showed that compared with a control condition, participants primed with death thoughts reported higher levels of dissociation during a prior traumatic event (Kosloff et al., 2006) and higher appraisals of social behaviors (e.g., initiating relationships and disclosing personal information) (Taubman-Ben-Ari, Findler, & Mikulincer, 2002). Other studies used global evaluations of different periods from the past or individual

differences, as the main dependent variables after MS manipulation, which also require retrospective reports. The results showed that participants in the MS condition reported fewer regrets about their past (Rudert, Reutner, Walker, & Greifeneder, 2015), described their recent experience in a more positive manner (Landau, Greenberg, Sullivan, Routledge, & Arndt, 2009), report less dispositional desire for control when they were high in neuroticism (Arndt & Solomon, 2003), or increased their endorsement rate for positive traits and decreased their endorsement rate for negative traits (Paulhus & Levitt, 1987). Concerning driving, Rosenbloom (2003) also asked participants to retrospectively report the frequency of performing different risky driving behaviors like speeding and drunk driving, after activating thoughts about one's death. The results showed that MS interacted with individual differences (i.e., sensation seeking) in determining risky driving. Reminders of mortality increase discomfort when people evaluated past behaviors in a manner that violated their worldview (Greenberg, Porteus, Simon, Pyszczynski, & Solomon, 1995). As a consequence, peoples' need to protect their self-esteem increases and, further, the tendency to distance themselves from behaviors that represent a threat to their self-esteem was enhanced (e.g. Goldenberg, McCoy, Pyszczynski, Greenberg, & Solomon, 2000). Thus, MS not only influences judgments and estimates for future behaviors, but also exerts an ongoing influence on automatized cognitions and behaviors.

The interaction between traffic locus of control (T-LOC) and MS in determining risky driving

Because a threat appeal may lead people to engage in risky driving, not to avoid these kind of behaviors (Alper & Özkan, 2015), it is important to assess the factors that may account for the relation between MS and risky driving. Previous studies showed that the relation between MS and risky driving is moderated by some variables, like gender, age, sensation seeking, and self-esteem. Specifically, reminders of personal death are positively related with risky driving when the drivers are men, young, have a high level of sensation seeking, or consider driving a relevant activity for self-esteem (Burke et al., 2010; Rosenbloom, 2003; Taubman Ben-Ari et al., 2000). Another less frequently studied buffering factor that can mitigate the effect of thinking about one's death is LOC (Alper & Özkan, 2015; Miller & Mulligan, 2002).

LOC represents the tendency to consider self or other people and the circumstances responsible for

different positive and negative life situations (Rotter, 1954). It enables us to distinguish drivers with a high probability of engagement in fatal motor crashes from drivers with a low probability (Huang & Ford, 2012). Previous studies found that internal LOC is related to highly cautious driving and a low risk of being involved in car accidents (Măirean et al., 2017; Rudin-Brown & Parker, 2004), whereas external LOC is associated with less careful driving and the tendency to be involved in car accidents (e.g. Holland, Geraghty, & Shah, 2010 review). However, other studies found that internal T-LOC is positively associated with more dangerous driving (Ozkan & Lajunen, 2005; Warner et al., 2010), whereas external T-LOC is negatively associated with risky driving behavior (Alper & Özkan, 2015; Carpentier et al., 2014; Măirean et al., 2017; Warner et al., 2010). Finally, there were studies that reported no relationship between LOC and risky driving (Arthur & Doverspike, 1992; Iversen & Rundmo, 2002).

As far as we know, only two previous studies assessed the interaction between LOC and MS in determining risky driving and revealed different results (Alper & Özkan, 2015; Miller & Mulligan, 2002). Miller and Mulligan (2002) found that MS is positively associated with the tendency to adopt risky behaviors for individuals with external LOC, whereas MS decreased risk taking for individuals with internal LOC, consistent with their assessment of the level of risk involved. This study used a general scale for measuring LOC, not a traffic specific scale. Some studies found that the effects of MS on risky driving were independent of a person's global characteristic (i.e. self-esteem), but they also vary according to specific traffic variables (i.e. the relevance of driving for self-esteem) (Taubman Ben-Ari et al., 1999). Similarly, a specific measure of LOC, adapted to traffic conditions, may be more sensitive to detect which people may engage in risky driving after threat appeals.

More recently, Alper and Özkan (2015) also assessed the interaction between LOC and MS in determining risky driving, using a traffic specific LOC scale. Contrary to the previous study (Miller & Mulligan, 2002), they found that MS leads to a low tendency to adopt risky behaviors for persons with an external T-LOC. The authors explained their results based on the fact that drivers with an external T-LOC are less confident in their driving skills and become more cautious, after MS. Individuals with an internal T-LOC tend to engage in risky driving due to their overconfidence in their ability to control traffic situations and to prevent dangerous events. Given the

contradictory results reported by these two studies (Alper & Özkan, 2015; Miller & Mulligan, 2002), the second goal of this study is to assess the interaction between MS and T-LOC, focusing on its effect on two types of risky driving behavior (i.e., speeding and drunk driving). Based on previous results, we expect that MS will be differently associated with risky driving, depending on the individual T-LOC. The mixed empirical findings cannot support a specific directional hypothesis.

Method

Participants

A total of 170 drivers took part in this study (52.90% were women). The participants' mean age at the time of the study was 27.23 ($SD = 6.09$) and they had been driving for 7.67 years on average (range 0–27 and $SD = 4.36$ years). During their lifetime, the participants reported that they had been involved on average in 0.15 active accidents (range 0–4 and $SD = 0.51$), and in 0.43 passive accidents (range 0–4 and $SD = 0.76$).

Instruments

The traffic locus of control scale-Romanian version (T-LOC-RO, Măirean et al., 2017), a 41-item scale measured T-LOC in five dimensions: self (i.e. causes of accidents attributed to oneself; 5 items), other drivers (i.e. causes of accidents attributed to other drivers; 6 items), vehicle and environment (i.e. causes of accidents attributed to vehicle or to the environmental factors, such as the weather, road characteristics, etc.; 6 items), fate (i.e. causes of accidents attributed to fate or bad luck; 16 items), and religiosity (i.e. the external attribution that God can convey protection against accidents; 8 items). The items are rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). For this study, two scores were computed: for internal T-LOC and for external T-LOC (by averaging the scores for the four dimensions that measure external T-LOC) (Măirean et al., 2017). Cronbach's alpha coefficients for this current sample are 0.89 for internal T-LOC and 0.93 for external T-LOC.

Risky driving behavior was measured using two scales (Iversen, 2004; Ulleberg & Rundmo, 2003). From the two scales, nine items were selected, measuring two classes of risky behavior: speeding (six items) and drunk-driving (three items). The participants rated the frequencies of manifesting different types of behaviors, using a 6-point scale from 0 (never) to 5 (very often). Total scores were computed

with high scores indicating a high level of risky driving behaviors. The confirmatory factor analysis (CFA) supports our decision to compute the two factors. The model fit the data in a satisfactory degree (Hu & Bentler, 1999): $\chi^2 (15) = 17.48$, $p = .291$; comparative fit index (CFI) = 0.99; NFI = 0.97; root mean square error of approximation (RMSEA) = 0.03, 90% CI: [0.00–0.08]. In our sample, the Alpha Cronbach coefficients were 0.82 for speeding and 0.85 for drunk driving.

Positive and Negative Affect Scale (PANAS, Watson, Clark, & Tellegen, 1988) was used as a filler task in order to divert the conscious attention from death (Alper & Özkan, 2015). This instrument is frequently used as a filler task in terror management studies (Greenberg, Martens, Jonas, Eisenstadt, Pyszczynski, & Solomon, 2003). The scale consists of 10 items for measuring positive affect (PA) and another 10 items scale measuring negative affect (NA). Participants used a 5-point Likert-type scale ranging from 1 (very slightly or not at all) to 5 (extremely) to indicate how well each of 20 adjectives described how they felt "in this moment" time frame. Coefficient alphas of the positive and negative scales are 0.81 and 0.87, respectively.

Driving as relevant to self-esteem scale (DRS, Taubman Ben-Ari et al., 1999) is a 15-item self-report scale measuring the perceived benefits and costs of driving to self-esteem (e.g., driving allows me to feel worthy). Participants were asked to rate the extent to which they agree with each item, using a seven-point scale, ranging from 1 (not at all) to 7 (very much). Higher scores reflect higher perception of driving as having implications for self-esteem. Cronbach's alpha coefficient in the current sample is 0.81.

The demographic questionnaire asked participants to report their age, gender, and driving experience (the number of years since obtaining the driving license).

To induce MS, participants were randomly allocated to one of the three study conditions and were asked to perform a mental simulation task, similar to that employed in previous research on MS (e.g. Alper & Özkan, 2015). In the mortality priming condition ($N = 62$, $Mage = 24.95$, $SD = 4.69$, and 61.30% women), participants were told to "imagine, as vividly as you can, what will happen to you physically as you die and once you are physically dead and try to feel the emotions that the thought of your own death arouses in you." For the second condition ($N = 57$, $Mage = 29.22$, $SD = 7.36$, and 50.90% women), the message was the same, but it was mentioned that the

cause of the death is a traffic accident. In the control condition ($N = 51$, $Mage = 27.78$, $SD = 5.18$, and 45.10% women), participants were asked to think about what they feel when they watch television (Miller & Mulligan, 2002).

Procedure

The participants signed an informed consent after they were informed that participation is voluntary and the information provided will be kept confidential. The only inclusion criteria consisted in having a valid driving license. The participants were asked to complete the scales for measuring T-LOC and the relevance of driving for their self-esteem. Next, they were randomly divided into one of the three groups (two experimental conditions and a control condition). In the experimental conditions, MS was used as the experimental manipulation. Since there is empirical evidence that the effects of MS did not occur immediately after the imagination task (Greenberg, Arndt, Simon, Pyszczynski, & Solomon, 2000; Pyszczynski et al., 1999), we used an unrelated filler task (i.e. completing PANAS) after the MS manipulation. At the end, the scale measuring risky driving behaviors and a demographic questionnaire were completed.

Results

Overview of the statistical analyses

First, preliminary analyses were conducted in order to compare the positive and the negative affective state between the three experimental conditions and to examine whether demographic variables are associated with risky driving behaviors. Second, the correlations between the study's variables were computed. Third, to test the direct effects of MS on risky driving, and also to estimate the moderating role of the relevance of driving for self-esteem and T-LOC we used a structural equation model framework in AMOS Graphics 22 (Arbuckle, 2013). The categorical variables MS was transformed in two dummy variables, using the control condition as the reference category. The two dummy variables are called MS and mortality salience accident (MSA) condition. The continuous independent variables were standardized before entering in the model and before computing the interaction terms. For the evaluation of the overall model fit, four different fit indices were used: the chi-square statistic (χ^2), the Tucker-Lewis coefficient (TLI), CFI, and the RMSEA. A $RMSEA < 0.05$, $\chi^2/df < 3$, NFI and $CFI > 0.90$ indicate a very good model fit (Hu &

Table 1. Means, standard deviations, minimum and maximum values of the main study variables, and $N = 170$.

Variables	Mean	SD	Minimum	Maximum
1. Internal T-LOC	16.45	6.00	5	25
2. External T-LOC	24.95	5.68	15	42.75
3. Relevance of driving for self-esteem	47.71	11.74	19	79
4. Speeding	15.66	4.92	1	27
5. Drunk driving	2.94	3.01	0	13
6. Age	27.23	6.09	19	50
7. Driving experience	7.67	4.36	0	27

Bentler, 1999). To examine the nature of the significant interactions term, we used the method based on graphically display the interaction proposed by Coster and Leistico (2007).

Preliminary analysis

The means and standard deviations of the main variables are displayed in Table 1.

In order to assess the changes in affective states after MS induction, we conducted a one way analysis of variance comparing the participants' means on positive and negative affective states, from the three conditions. The results showed no significant differences between groups concerning positive affective state ($F_{(2, 169)} = 1.53$ and $p = .218$), but participants from the MS condition ($M = 19.11$ and $SD = 7.43$) reported more NA compared to the participants from the condition where death is provoked by a traffic accident ($M = 16.85$ and $SD = 3.76$) and the control condition ($M = 10.98$ and $SD = 2.21$). Moreover, participants from the MS condition induced by a traffic accident reported more NA compared to the participants from the control condition ($F_{(2, 169)} = 36.46$ and $p < .001$).

The driving experience (i.e. years of driving) is positively related to speeding and drunk driving (see Table 2). We also conducted independent samples t -tests comparing the male and female participants' means on the frequency of risky driving behaviors. The results showed that there were significant gender differences in speeding, $t(168) = 5.90$, $p < .001$, and drunk driving, $t(168) = 6.26$, $p < .001$. Women reported lower scores on speeding ($M = 13.76$ and $SD = 4.96$) and drunk driving ($M = 1.68$ and $SD = 2.08$) compared to men ($M = 17.80$ and $SD = 3.92$; $M = 4.36$ and $SD = 3.26$, respectively).

The relations between the main study variables

To assess the relations between the study variables, Pearson correlations were computed. The results showed that speeding and drunk driving positively correlated with external T-LOC. Moreover, drunk

Table 2. Pearson correlations between all the study variables.

	1	2	3	4	5	6	7	8	9
1. MS	1	–	–	–	–	–	–	–	–
2. MSA	–.53***	1	–	–	–	–	–	–	–
3. Internal T-LOC	–.11	–.02	1	–	–	–	–	–	–
4. External T-LOC	.06	.03	–.20**	1	–	–	–	–	–
5. Driving self-esteem	.11	–.00	–.05	.24**	1	–	–	–	–
6. Speeding	.08	–.09	–.12	.15*	.22**	1	–	–	–
7. Drunk driving	.09	.01	–.21**	.21**	.16*	.53***	1	–	–
8. Age	–.28***	.23**	–.08	.20**	–.02	.14	.24**	1	–
9. Driving experience	–.32***	.14	–.03	.16*	.01	.31***	.34***	.80***	1

MS: mortality salience condition; MSA: mortality salience induced by a traffic accident

* $p < .05$,

** $p < .01$, and *** $p < .001$.

driving negatively correlated with internal T-LOC. Thus, drivers reported a higher frequency of drunk driving when they also reported a high level of external T-LOC and a low level of internal T-LOC. Moreover, participants reported a higher frequency of speeding, when they also reported a high level of external T-LOC. Further, the relevance of driving for self-esteem positively correlated with speeding and drunk driving (see Table 2).

Testing for direct effects and moderation

Finally, we tested the main effects of MS conditions on risky driving. We also assessed the moderated role of the relevance of driving for self-esteem, and T-LOC on the relation between MS conditions and risky driving. The following variables were introduced into the model: MS condition, MSA condition, the relevance of driving for self-esteem, internal T-LOC, and external T-LOC, as well as the interaction terms of MS and MSA condition and the relevance of driving for self-esteem, internal T-LOC, and external T-LOC, as independent variables. The dependent variables were speeding and drunk driving. Gender and driving experience were entered in the model as controlled variables. We also included covariances among NA and the two dummy variables (MS condition and MSA condition). The fit for our overall model is very good: $\chi^2(75) = 84.97$ and $p = .202$; TLI = 0.98; CFI = 0.99; RMSEA = 0.02 (CI: 0.00, 0.05). Standardized path coefficients are presented in Figure 1.

MS condition positively predicted drunk driving, while MSA did not predict risky driving behaviors. Further, MSA did not interact with the relevance of driving for self-esteem or with T-LOC in determining risky driving. However, our results showed that MS interacted with the relevance of driving for self-esteem ($b = 1.58$ and $p = .045$) and with external T-LOC ($b = 0.30$ and $p = .039$) in determining speeding. Participants from the MS condition reported higher

frequency of speeding only when they also reported that driving is relevant for their self-esteem. When driving was evaluated as being low in relevance for self-esteem, participants from the control condition reported more risky driving (i.e. speeding) compared with the participants from the MS condition. These results are presented in Figure 2.

Further, the participants from the MS condition reported more speeding than the participants from the control condition, when they also reported a high level of external T-LOC (see Figure 3).

Internal T-LOC did not interact with MS in determining risky driving.

Discussions

This study investigated the relations of MS with two types of risky driving behaviors – speeding and drunk driving. Further, we explored whether the relevance of driving for self-esteem and T-LOC interact with MS in determining risky driving.

Our results showed a positive relation, in the path analysis, between the MS condition and drunk driving, while MSA condition was not related to risky driving. The fact that MS did not affect speeding is similar to the results of previous studies that also found that salience of death does not automatically affect risky driving (Alper & Özkan, 2015; Miller & Mulligan, 2002; Taubman-Ben-Ari et al., 1999, 2000). Moreover, terror management theory argues that MS manipulation would lead to more reports of risky behaviors because it increases the need for self-esteem enhancement (Burke et al., 2010). Therefore, MS induction is expected to influence the self-reports of risky driving for the participants who consider driving as relevant for their self-esteem.

When assessing the interaction between MS and the relevance of driving for self-esteem, the results showed that the participants from the MS condition reported more speeding compared to the participants from the control condition, when they also consider

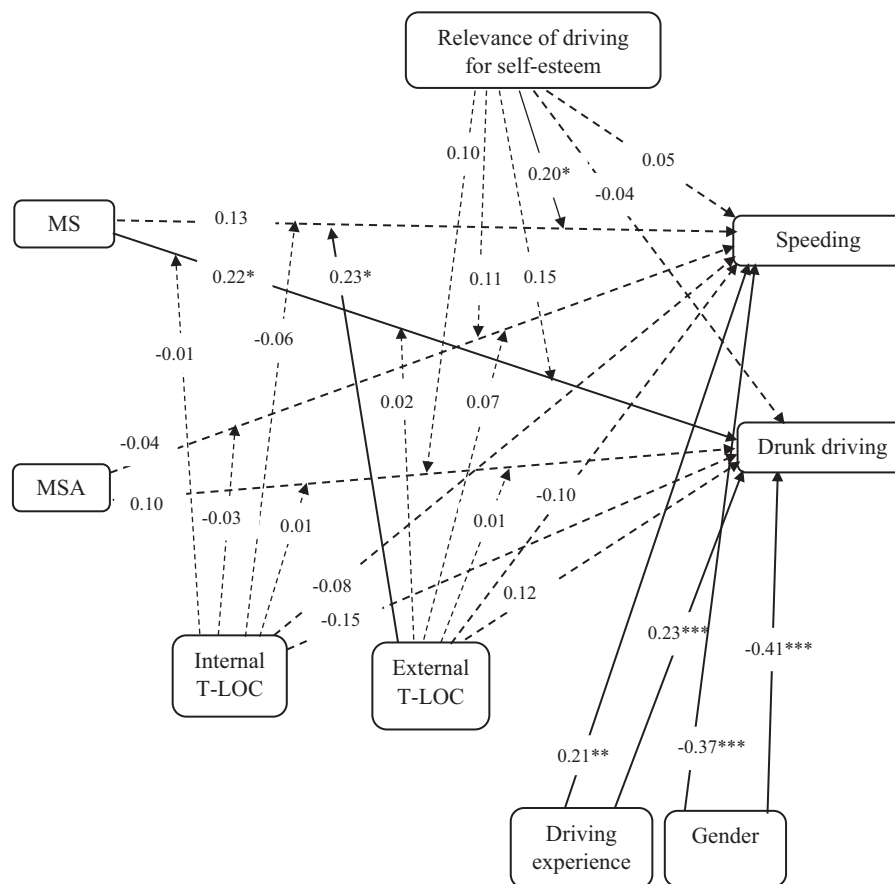


Figure 1. Structural equation model and path analysis of the relation between mortality salience and risky driving moderated by the relevance of driving for self-esteem, internal T-LOC, and external T-LOC. Non-significant paths are indicated with dotted lines. Standardized path coefficients are reported. * $p < .05$; ** $p < .01$; *** $p < .001$.

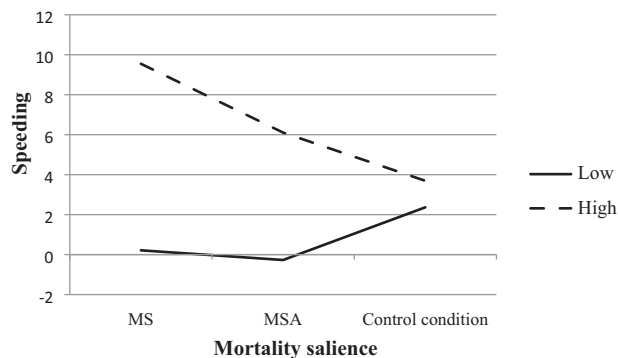


Figure 2. Speeding as a function of mortality salience and the relevance of driving for self-esteem.

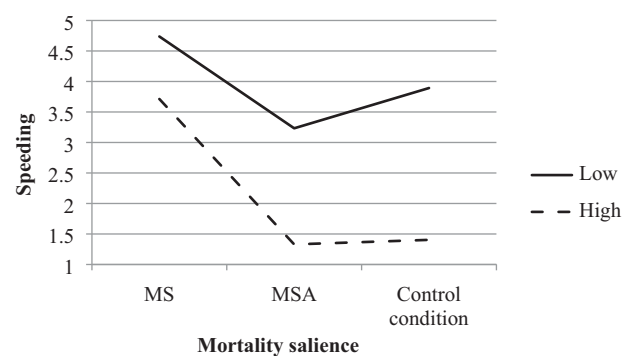


Figure 3. Speeding as a function of mortality salience and external T-LOC.

driving as relevant for their self-esteem. Thus, the present results support the MS hypothesis, from terror management theory that involves the fact that when thoughts of death are highly accessible in the preconscious mind, distal defenses occur, and bolster the feelings of self-worth (Pyszczynski et al., 1999). Therefore, if speeding is evaluated as a way of validating self-esteem, a person would tend to evaluate that

he/she drives in a reckless way, in order to increase his/her self-esteem (Taubman Ben-Ari et al., 1999). Moreover, our results showed that this effect is not valid for all types of risky behaviors. In our study, MS did not influence drunk driving for the participants who consider driving as relevant for their self-esteem. Probably, drunk driving is considered a more dangerous and immoral behavior, therefore the participants

tend to avoid reporting it. The tendency of social desirability may be more pronounced in relation to drunk driving, because this type of behavior is more blamed by the society. Therefore, if speeding may increase self-esteem, drunk driving is less likely to improve social prestige and self-image, being associated with negative attitudes (Martinussen, Petranca, & Sømhovd, 2018). Moreover, previous studies showed that MS causes people to punish those who transgress norms of their cultural worldview (e.g. Florian & Mikulincer, 1997). Future studies should attempt to evaluate how relevant different driving behaviors are for self-esteem and also how morally wrong they are perceived to be by the participants. This perception may also moderate the impact of MS on risky driving.

Our results expand previous results, by showing the absence of an effect of activated thoughts about one's death caused by a traffic accident on risky driving. Given the fact that road safety campaigns use images and messages based on traffic accidents as a cause of losing one's life, this result should attract researchers' attention in future studies, in order to understand under what circumstances activating thoughts about one's death caused by a traffic accident did not affect risky driving, although activating thoughts about one's death without mentioning the cause can have an effect. The types of messages used may explain the lack of effectiveness of anti-speeding campaigns (King & Reid, 1990). The illusion of invulnerability in traffic may also explain the fact that the participants did not react to the activation of thoughts about one's death caused by a traffic accident. We should also mention that this study used a subtle written message in order to activate thoughts about one's death caused by a traffic accident whereas most safety campaigns use rather intense and graphic visual images to prime the danger of risky driving. Thus, the generalization of the present results in real life situations with implications for road safety campaigns requires further research.

When analyzing the interaction between MS and T-LOC in determining risky driving, the results showed that participants from the MS condition reported more risky driving compared to the participants from the control condition, and this difference is larger when they also believe that traffic accidents are determined by external, uncontrollable factors. Therefore, when activating thoughts about their own death, people who consider traffic accidents as caused by other drivers or by circumstances (e.g. vehicle, environment, and fate) tend to report more engagement in speeding. These results did not confirm those

reported by Alper and Özkan (2015), sustaining that MS leads to lower tendency to engage in speeding, for persons with an external T-LOC. These different results may be explained by the different approach used to measure the dependent variables. The dependent variable implies an orientation to the future in Alper and Özkan (2015) (i.e. their intention to comply with the speed limits) and a retrospective report in our study (e.g. the frequency of engaging in driving behaviors). However, our results are similar with those reported by Miller and Mulligan (2002), that also found that MS led to risky behavior for individuals with an external LOC. Miller and Mulligan (2002) consider that engaging in risky behavior is a way of buffering the anxiety generated by the perception that events in your life (e.g. traffic accidents) are outside personal control. Being reminded of one's own death will increase the belief about the lack of personal control among individuals with an external LOC. Therefore, they would tend to report risky behaviors, believing that they will be invulnerable to possible consequences and this possible invulnerability diminishes their death anxiety (Crisp & Barber, 1995). Future studies should assess what particular dimensions of external T-LOC (e.g. other drivers, fate, vehicle, and environment) have stronger associations with risky driving and moderate the impact of MS on risky driving. This death anxiety is not generated in the control condition, when thoughts about personal death are not activated. For these individuals, perceiving the uncontrollability of possible negative events in traffic may cause them to report the tendency to avoid risky behaviors.

This study is not without limitations. First, our data relied on self-report measures of all studied variables; therefore, forgetting and under-reporting can represent sources of errors that can account for the collected responses. Second, we used a convenience sample in our study and a note of caution is required before generalizing our findings. Third, although our sample size mostly comprised young drivers, it has a mean age that is older than of most people who can benefit from educational programs designed to model the drivers T-LOC and to reduce risky driving. However, safety campaigns based on activation thoughts about one's death are designed for drivers from different age categories; therefore, our results can be used in order to increase the effectiveness of these campaigns.

Despite the limitations presented above, our results can have important implications. From a theoretical point of view, we analyzed a less studied relation

between MS and risky driving. The contribution of our study was to show the interaction between T-LOC and MS in determining risky driving. We also showed that activating thoughts about death caused by a traffic accident is not related to reports risky behavior, compared to the activation of thoughts about death, without mentioning the cause. Moreover, our results are the first to investigate how people report past and current risky driving behaviors in order to maintain self-esteem in the present, in context of activation thoughts about their own death.

From a practical point of view, the results can inform practitioners and researchers that aim to develop road safety campaigns and educational programs, given the fact that people take decisions about future behaviors based on their past behaviors (Albarracín & Wyer, 2000). This study indicates the fact that the common use of uniform messages in safety road campaigns is wrong, because these campaigns can have different effects depending on personal attributes and beliefs. Thus, eliciting fear of personal death caused by traffic accidents may not be the appropriate way to decrease risky driving behavior for all the drivers. Because the campaigns might prove to be ineffective in some cases, the target population can be segmenting based on people beliefs about having personal control on the road. Traffic safety campaigns that remind people of death need to ensure that the target public believes to a lesser extent that external factors are responsible for traffic accidents. Therefore, death reminders might be accompanied with reminders that human behavior is mainly responsible for traffic accidents, and not fate, vehicle or environment. Moreover, T-LOC can be changed through education (Huang & Ford, 2012), being a malleable factor. This should be done during trainings for drivers once licensed, by informing them that most of the accidents on the road are a consequence of human behavior, highlighting the necessity to take preventive measures. For these drivers, road safety campaigns based on fear-arousal appeals should be effective.

As a conclusion, this study supports the MS hypothesis, from terror management theory and shows that the participants from the MS condition reported more speeding, when they also consider driving as relevant for their self-esteem. Moreover, the MS manipulation interacted with external T-LOC in determining self-reported speeding on the road. Future studies are needed in order to further explain the relations between MS and risky driving, for drivers with different beliefs, attitudes, and driving style.

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References

- Albarracín, D., & Wyer, R. S. Jr. (2000). The cognitive impact of past behavior: Influences on beliefs, attitudes, and future behavioral decisions. *Journal of Personality and Social Psychology*, 79(1), 5–22. doi:10.1037//0022-3514.79.1.5
- Alper, S., & Özkan, T. (2015). Do internals speed less and externals speed more to cope with the death anxiety? *Transportation Research Part F: Traffic Psychology and Behaviour*, 32, 68–77. doi:10.1016/j.trf.2015.05.002
- Arbuckle, J. L. (2013). *IBM® SPSS® Amos™ 22 User's Guide*. Chicago, IL: IBM.
- Arndt, J., & Solomon, S. (2003). The control of death and the death of control: The effects of mortality salience, neuroticism, and worldview threat on the desire for control. *Journal of Research in Personality*, 37(2), 1–22. doi:10.1016/S0092-6566(02)00530-5
- Arthur, W., & Doverspike, D. (1992). Locus of control and auditory selective attention as predictors of driving accident involvement: A comparative longitudinal investigation. *Journal of Safety Research*, 23(2), 73–80. doi:10.1016/0022-4375(92)90023-3
- Burke, B. L., Martens, A., & Faucher, E. H. (2010). Two decades of terror management theory: A meta-analysis of mortality salience research. *Personality and Social Psychology Review*, 14(2), 155–195. doi:10.1177/1088868309352321
- Carpentier, A., Brijs, K., Declercq, K., Brijs, T., Daniels, S., & Wets, G. (2014). The effect of family climate on risky driving of young novices: The moderating role of attitude and locus of control. *Accident Analysis and Prevention*, 73, 53–64. doi:10.1016/j.aap.2014.08.005
- Coster, J., & Leistico, A.M. (2007). *Graph of interaction between a categorical and a continuous IV designed by Jamie DeCoster & Anne-Marie Leistico* 02/11/2007. Retrieved from <http://www.stathelp.com/spreadsheets.html>
- Crisp, B. R., & Barber, J. G. (1995). The effects of locus of control on the association between risk perception and sexual risk-taking. *Personality and Individual Differences*, 19(6), 841–845. doi:10.1016/S0191-8869(95)00117-4
- Evans, L. (1991). *Traffic safety and the driver*. New York, NY: Van Nostrand Reinhold.
- Fergusson, D., Swain-Campbell, N., & Horwood, J. (2003). Risky driving behaviour in young people: Prevalence, personal characteristics and traffic accidents. *Australian and New Zealand Journal of Public Health*, 27(3), 337–342. doi:10.1111/j.1467-842X.2003.tb00404.x
- Florian, V., & Mikulincer, M. (1997). Fear of death and the judgment of social transgressions: A multidimensional test of terror management theory. *Journal of Personality and Social Psychology*, 73(2), 369–380. doi:10.1037/0022-3514.73.2.369

- Goldenberg, J. L., McCoy, S. K., Pyszczynski, T., Greenberg, J., & Solomon, S. (2000). The body as a source of self-esteem: The effect of mortality salience on identification with one's body, interest in sex, and appearance monitoring. *Journal of Personality and Social Psychology*, 79(1), 118–130. doi:10.1037/0022-3514.79.1.118
- Greenberg, J., Arndt, J., Schimel, J., Pyszczynski, T., & Solomon, S. (2001). Clarifying the function of mortality salience-induced worldview defense: Renewed suppression or reduced accessibility of death-related thoughts? *Journal of Experimental Social Psychology*, 37(1), 70–76. doi:10.1006/jesp.2000.1434
- Greenberg, J., Arndt, J., Simon, L., Pyszczynski, T., & Solomon, S. (2000). Proximal and distal defenses in response to reminders of one's mortality: Evidence of a temporal sequence. *Personality and Social Psychology Bulletin*, 26(1), 91–99. doi:10.1177/0146167200261009
- Greenberg, J., Martens, A., Jonas, E., Eisenstadt, D., Pyszczynski, T., & Solomon, S. (2003). Psychological defense in anticipation of anxiety: Eliminating the potential for anxiety eliminates the effects of mortality salience on worldview defense. *Psychological Science*, 14(5), 516–519. doi:10.1111/1467-9280.03454
- Greenberg, J., Porteus, J., Simon, L., Pyszczynski, T., & Solomon, S. (1995). Evidence of a terror management function of cultural icons: The effects of mortality salience on the inappropriate use of cherished cultural symbols. *Personality and Social Psychology Bulletin*, 21(11), 1221–1228. doi:10.1177/01461672952111010
- Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A., Veeder, M., Kirkland, S., & Lyon, D. (1990). Evidence for terror management theory II: The effects of mortality salience on reactions to those who threaten or bolster the cultural worldview. *Journal of Personality and Social Psychology*, 58(2), 308.
- Hirschberger, G., Florian, V., Mikulincer, M., Goldenberg, J. L., & Pyszczynski, T. (2002). A terror management perspective on risky behavior: The moderating role of gender and self-esteem. *Death Studies*, 26(2), 117–141. doi:10.1080/074811802753455244
- Holland, C., Geraghty, J., & Shah, K. (2010). Differential moderating effect of locus of control on effect of driving experience in young male and female drivers. *Personality and Individual Differences*, 48(7), 821–826. doi:10.1016/j.paid.2010.02.003
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. doi:10.1080/10705519909540118
- Huang, J. L., & Ford, J. K. (2012). Driving locus of control and driving behavior: Inducing change through driver training. *Transportation Research Part F: Traffic Psychology and Behaviour*, 15(3), 358–368. doi:10.1016/j.trf.2011.09.002
- Huang, Z. T., & Wyer, R. S. (2015). Diverging effects of mortality salience on variety seeking: The different roles of death anxiety and semantic concept activation. *Journal of Experimental Social Psychology*, 58, 112–123. doi:10.1016/j.jesp.2015.01.008
- Iverach, L., Menzies, R. G., & Menzies, R. E. (2014). Death anxiety and its role in psychopathology: Reviewing the status of a transdiagnostic construct. *Clinical Psychology Review*, 34(7), 580–593. doi:10.1016/j.cpr.2014.09.002
- Iversen, H. (2004). Risk-taking attitudes and risky driving behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, 7(3), 135–150. doi:10.1016/j.trf.2003.11.003
- Iversen, H., & Rundmo, T. (2002). Personality, risky driving and accident involvement among Norwegian drivers. *Personality and Individual Differences*, 33(8), 1251–1263. doi:10.1016/S0191-8869(02)00010-7
- King, K. W., & Reid, L. N. (1990). Fear arousing anti-drinking and driving PSAs: Do physical injury threats influence young adults? *Current Issues and Research in Advertising*, 12(1–2), 155–175. doi:10.1080/01633392.1990.10504950
- Kohn, P. M., Goodstadt, M. G., Cook, G. M., Sheppard, M., & Chan, G. (1982). Ineffectiveness of threat appeals about drinking and driving. *Accident Analysis and Prevention*, 14(6), 457–464. doi:10.1016/0001-4575(82)90059-8
- Kosloff, S., Solomon, S., Greenberg, J., Cohen, F., Gershuny, B., Routledge, C., & Pyszczynski, T. (2006). Fatal distraction: The impact of mortality salience on dissociative responses to 9/11 and subsequent anxiety sensitivity. *Basic and Applied Social Psychology*, 28(4), 349–356. doi:10.1207/s15324834basp2804_8
- Landau, M. J., Greenberg, J., Sullivan, D., Routledge, C., & Arndt, J. (2009). The protective identity: Evidence that mortality salience heightens the clarity and coherence of the self-concept. *Journal of Experimental Social Psychology*, 45(4), 796–807. doi:10.1016/j.jesp.2009.05.013
- Măirean, C., Havărneanu, G. M., Popușoi, S. A., & Havărneanu, C. E. (2017). Traffic locus of control scale–Romanian version: Psychometric properties and relations to the driver's personality, risk perception, and driving behavior. *Transportation Research Part F: Traffic Psychology and Behaviour*, 45, 131–146. doi:10.1016/j.trf.2016.12.008
- Martinussen, L. M., Petranca, L., & Sømshovd, M. J. (2018). The relationship between explicit and implicit attitudes towards drunk driving. *PLoS One*, 13(10), e0206124. doi:10.1371/journal.pone.0206124
- Miller, R. L., & Mulligan, R. D. (2002). Terror management: The effects of mortality salience and locus of control on risk-taking behavior. *Personality and Individual Differences*, 33(7), 1203–1214. doi:10.1016/S0191-8869(02)00009-0
- Ozkan, T., & Lajunen, T. (2005). Multidimensional traffic locus of control scale (T-LOC): Factor structure and relationship to risky driving. *Personality and Individual Differences*, 38(3), 533–545. doi:10.1016/j.paid.2004.05.007
- Paulhus, D. L., & Levitt, K. (1987). Desirable responding triggered by affect: Automatic egotism? *Journal of Personality and Social Psychology*, 52(2), 245. doi:10.1037/0022-3514.52.2.245
- Pyszczynski, T., Greenberg, J., & Solomon, S. (1999). A dual-process model of defense against conscious and unconscious death-related thoughts: An extension of terror management theory. *Psychological Review*, 106(4), 835. doi:10.1037/0033-295X.106.4.835
- Pyszczynski, T., Greenberg, J., Solomon, S., & Maxfield, M. (2006). On the unique psychological import of the human awareness of mortality: Theme and variations.

- Psychological Inquiry*, 17(4), 328–356. doi:[10.1080/10478400701369542](https://doi.org/10.1080/10478400701369542)
- Rosenbloom, T. (2003). Risk evaluation and risky behavior of high and low sensation seekers. *Social Behavior and Personality: An International Journal*, 31(4), 375–386. doi:[10.2224/sbp.2003.31.4.375](https://doi.org/10.2224/sbp.2003.31.4.375)
- Rotter, J. B. (1954). *Social learning and clinical psychology*. Englewood Cliffs, NJ: Prentice-Hall.
- Rudert, S. C., Reutner, L., Walker, M., & Greifeneder, R. (2015). An unscathed past in the face of death: Mortality salience reduces individuals' regrets. *Journal of Experimental Social Psychology*, 58, 34–41. doi:[10.1016/j.jesp.2014.12.006](https://doi.org/10.1016/j.jesp.2014.12.006)
- Rudin-Brown, C. M., & Parker, H. A. (2004). Behavioural adaptation to adaptive cruise control (ACC): Implications for preventive strategies. *Transportation Research Part F: Traffic Psychology and Behaviour*, 7(2), 59–76. doi:[10.1016/j.trf.2004.02.001](https://doi.org/10.1016/j.trf.2004.02.001)
- Taubman-Ben-Ari, O. (2000). The effect of reminders of death on reckless driving: A terror management perspective. *Current Directions in Psychological Science*, 9(6), 196–199. doi:[10.1111/1467-8721.00093](https://doi.org/10.1111/1467-8721.00093)
- Taubman Ben-Ari, O. T., Florian, V., & Mikulincer, M. (1999). The impact of mortality salience on reckless driving: A test of terror management mechanisms. *Journal of Personality and Social Psychology*, 76(1), 35. doi:[10.1037/0022-3514.76.1.35](https://doi.org/10.1037/0022-3514.76.1.35)
- Taubman Ben-Ari, O. T., Florian, V., & Mikulincer, M. (2000). Does a threat appeal moderate reckless driving? A terror management theory perspective. *Accident Analysis and Prevention*, 32(1), 1–10. doi:[10.1016/S0001-4575\(99\)00042-1](https://doi.org/10.1016/S0001-4575(99)00042-1)
- Taubman-Ben-Ari, O., Findler, L., & Mikulincer, M. (2002). The effects of mortality salience on relationship strivings and beliefs: The moderating role of attachment style. *British Journal of Social Psychology*, 41(3), 419–441. doi:[10.1348/014466602760344296](https://doi.org/10.1348/014466602760344296)
- Ulleberg, P., & Rundmo, T. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science*, 41(5), 427–443. doi:[10.1016/S0925-7535\(01\)00077-7](https://doi.org/10.1016/S0925-7535(01)00077-7)
- Warner, H. W., Özkan, T., & Lajunen, T. (2010). Can the traffic locus of control (T-LOC) scale be successfully used to predict Swedish drivers' speeding behaviour? *Accident Analysis and Prevention*, 42(4), 1113–1117. doi:[10.1016/j.aap.2009.12.025](https://doi.org/10.1016/j.aap.2009.12.025)
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063. doi:[10.1037/0022-3514.54.6.1063](https://doi.org/10.1037/0022-3514.54.6.1063)