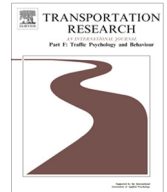




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Effects of psychological inoculation on indirect road hostility and simulated driving

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ABSTRACT

Traffic accidents (TA) are a leading cause of morbidity and mortality worldwide. Psychological risk factors, whether traits or states, are important predictors of dangerous driving and of TA. However, educational and awareness campaigns often have little impact on such factors since they do not provide social resistance skills or cognitive restructuring, to change cognitive distortions which may underlie such factors. This research tested the effects of psychological inoculation (PI), a cognitive method that challenges and modifies cognitive distortions and teaches social resistance skills, on road hostility tendencies, using an indirect measure (Studies 1 and 2), and on simulated driving (Study 3). We preliminarily validated an indirect measure of road hostility tendencies, using a semi-projective test, not relying on interpretation or self-report. In Study 1, 59 Belgian students were assessed for indirect road hostility tendencies, before and immediately after PI or an awareness control. Indirect road hostility tendencies significantly decreased only in the PI group. In Study 2, 59 Israeli police cadets received PI or driving safety education (control) in groups. Levels of road hostility tendencies were significantly lower in the PI group than in controls, only immediately after the intervention, but not two weeks later. In Study 3, 40 male students were observed for brief PC-based simulated driving with social pressure, before and after PI or safety education (control). Only PI led to reduced accidents and touching/passing sidewalks from pre- to post-intervention. These relatively consistent results support the effectiveness of PI for reducing road hostility tendencies and accidents in simulated driving. Future studies need to test the long-term impact of PI on actual driving behavior. The ease of administering PI en-masse and its effects on road hostility tendencies and on simulated driving behavior may have important implications for accident prevention.

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1. Introduction

Worldwide, traffic accidents (TA) are among the top 10 causes of death (Murray & Lopez, 1997) and are on the rise (Lozano et al., 2012). TA are also a leading cause of post-traumatic stress disorder in the west (Norris, 1992). Causes of TA are multiple and must not be viewed in a uni-dimensional simplistic manner. They can be divided into environmental factors (road quality, weather, etc.), vehicle adequacy (wheels, braking and feedback systems, etc.) and human factors,

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which are the focus of this research. As the role of environmental and vehicle factors in TA decreases due to improvements in these domains, the relative weight of human factors is expected to increase. Often, the emphasis of governments or policy makers concerning the human factor is on driving education and awareness campaigns. However, a review of nine high school driver education programs found no evidence for their effectiveness in reducing young drivers' TA, and in fact a tendency toward the opposite effect was observed (Vernik et al., 1999).

Multiple human factors contribute to the risk of TA and include various traits and states. Contributing traits include impulsiveness and risk taking, hostility, Type-A behavior, external locus of control and general slow attention switching, to name but a few examples (Avolio, Kroeck, Galen, & Paul, 1985; Danciu, Popa, Micle, & Preda, 2012; Gidron, Gal, & Syna Desevilya, 2003; Norris, Matthews, & Riad, 2000; Petridou & Moustaki, 2000). States such as fatigue, stress, poor health, visuo-spatial errors and temporary inattentiveness, also contribute to TA (e.g., Taylor & Dorn, 2006). The first two studies in this research focus on one particular human factor, namely road-hostility tendencies. Following the definition of Barefoot (1992) where hostility is the stable tendency to behave antagonistically, think cynically and feel anger, we conceptualized road hostility as the tendency to behave antagonistically toward other drivers (rude gestures, revenge, etc.), think cynically about other drivers' intentions (hostile driving attributions), and experiencing angry feelings in many driving situations. Norris et al. (2000) found in a prospective study that trait hostility significantly predicted future TA over a 4-year follow-up. The advantage of their study was that it used a prospective design. Gidron et al. (2003) found that road hostility correlated with reported dangerous driving behavior, while internal locus of control moderated this relationship. Though they used a cross-sectional design, their study revealed the interplay between psychological risk factors and has implications for reducing dangerous driving in high-hostile drivers. A related concept is road rage or aggressive driving, which includes verbal expressions of annoyance and using one's vehicle for a direct confrontation with other drivers. In a nationally representative American sample, aggressive driving has been found to correlate with dangerous driving and TA (Wells-Parker et al., 2002).

While recognition of the role of human factors and more specifically of road hostility, in contributing to TA has increased, little research has been done to test the effects of interventions aimed at reducing this risk factor, on driving. Deffenbacher, Filetti, Lynch, Dahlen, and Oetting (2002) found that both a relaxation and cognitive-relaxation intervention reduced various aspects of road anger and increased constructive manners for expressing road anger. However, while effective, such an intervention may not be feasible for mass-intervention at a national level. Furthermore, since road anger and road hostility are mild forms of hostility, they may be more prevalent than aggressive driving, and thus require greater attention. Hence, brief alternative interventions are needed to try to combat this risk factor of TA, applicable to the population at large.

A more focused and rapid method is "psychological inoculation" (PI). PI aims to help people resist external social pressures (e.g., friends encouraging a driver to speed) and can help to alter internal cognitive biases (e.g., incorrectly attributing hostile intentions to other drivers), which otherwise can contribute to a risky behavior such as road hostility. In PI, people are exposed to challenging sentences (the "vaccine"), which reflect exaggerated forms of such social pressures and internal cognitive biases, which they then need to systematically refute (the "antibody" response; Duryea, Ransom, & English, 1990). This is relevant to road hostility, since various cognitive distortions such as hostile attributions or perceiving others as less friendly, can underlie hostile behavior (Smith & Gallo, 1999). In the context of driving, cognitive distortions can include incorrectly attributing aggressive intentions to a driver approaching one's car, or overgeneralizing about the driving ability of subgroups of drivers (e.g., women, elderly). PI was found to prevent smoking and joining a driver who drank alcohol, better than health education (Duryea et al., 1990; Evan, Rozelle, & Maxwell, 1981). Furthermore, PI was found to help reduce barriers for condom use, while health-education did not (Olley, Abbas, & Gidron, 2011). However, to the best of our knowledge, PI was not used to reduce road hostility prior to this research nor was it tested in relation to driving behaviors. This study tested the effects of PI on road hostility tendencies (Studies 1 and 2) and on aberrant driving and accidents in simulated driving (Study 3). Furthermore, to partly overcome reporting biases, we used an indirect measure of road hostility tendencies, developed and preliminarily validated for this research. We hypothesized that PI would reduce road hostility tendencies and dangerous (simulated) driving, better than an education control (EC).

2. Study 1

2.1. Participants

This study included 59 Belgian students of management in various programs, of whom 31.7% were males, and 68.3% were females. Their mean age was 21.2 (± 3.3 years). The study was completely voluntary, and students were informed of their full right not to participate if they choose to. The study was given as part of their studies of Introduction to Psychology or as part of an advanced course in job stress management and prevention, where students learned to use psychological inoculation.

2.2. Measures

Students provided background information including age, gender, whether they held a driving license, years with a driving license, and weekly driven kilometers. Students completed an indirect questionnaire of road hostility tendencies. This test was a semi-projective test which followed the same projective pattern of the Rosenzweig Pictorial Frustration test (Rosenzweig, 1978). The scale in the present study included 6 pictures depicting road situations, mostly provoking or

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