



Drivers' self-perceptions about being an eco-driver according to their concern for the environment, beliefs on eco-driving, and driving behavior



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ABSTRACT

Technological progress has allowed motorized transportation to make a step toward more sustainable mobility but remains one of the main causes of air pollution in France. One way to help reduce the detrimental impact of motorized road transportation is to lead drivers, particularly car-dependent ones, to adopt eco-driving. However numerous drivers do not abide by highway laws or display driving-anger behaviors, which are in opposition to eco-driving. Unfortunately, few people practice eco-driving and many new adopters often have trouble maintaining this driving style. What is more, most studies on this issue have focused on eco-driving gains, the ability of people to put it into effect, and/or the continuous decline in the number of people who practice eco-driving. They usually do not take into account people's self-perceptions about their driving style, nor the associated beliefs. The aim of the present self-report study was twofold: identify drivers' self-perceptions about being an eco-driver, and determine how these self-perceptions about being an eco-driver or not are linked to eco-driving-friendly behaviors, levers favoring eco-driving (concern for the environment), and brakes on eco-driving (driving anger and road violations), according to gender. An online survey was carried out with 300 French drivers (127 men) ages 19–83. In our sample, 11.3% of the drivers said they felt they were eco-drivers (G1); 50% said they feel trying to eco-drive (G2); 9.7% said they had never heard of eco-driving and 25% said they knew about eco-driving but didn't do it (G3, felt they were not eco-driver), and 4% said they felt they had abandoned eco-driving (G4). The differences between the first three groups (G1 vs. G2/G3) were in line with their eco-driving self-perceptions: G1 had higher scores on three eco-driving-friendly behavior scale components and on environmental conservation, and lower scores on one factor of the driving-anger scale. Also in line with the groups' eco-driving self-perceptions, G2's scores were higher than G3's scores on one eco-driving friendly behavior component. A gender-by-group interaction was found for G1 vs. G3 on one eco-driving friendly behavior component, with a larger increase in the men's than the women's scores on eco-driving self-perceptions. Finally, violation scores, once again, were higher for men than for women on the speed and anger subscales. The findings of this study are discussed with respect to improving eco-driving learning.

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1. Introduction

Technological progress has taken a necessary step toward attaining more sustainable motorized mobility (i.e. in 2012, an estimated 12% of estimated French GhGs was due to motorized road transportation (individual cars excluded) and 14% were due to individual car emissions (Dussus et al., 2014)). This was achieved by enhancing the structural characteristics of cars and putting effort into making cars more energy-efficient via integrated driver-assistance systems (e.g., stop/start system, gearshift counselor, etc.). However, the age of currently registered vehicles is increasing (in 2014, French cars were 8.7 years old on average, 0.2 years more than in 2013; Comité des constructeurs français d'automobile, 2015) and not all cars are equipped with the newest driver-assistance systems. While awaiting fully automated cars with potential environmental benefits, drivers especially car-dependent ones (Stradling, 2007) should be urged to start eco-driving or to improve their eco-driving practices. These two actions alone could enhance every driver's carbon footprint. However, numerous drivers commit road violations or express angry driving behaviors, both of which are in opposition to eco-driving rules, added to the fact that few people eco-drive and many new adopters have trouble maintaining this driving style. Previous studies have focused on eco-driving and its advantages, but, to our knowledge no studies have looked drivers' eco-driving self-perceptions.

This paper is divided into four main sections. The first presents eco-driving, followed the theoretical framework and aims of the present study. The second section focuses on the method of our empirical research, and the third provides the results. The fourth section discusses the findings, their implications, the new research questions raise, and the limitations of the study.

1.1. Eco-driving rules and practices

In this paper, we focused on driving activity, while considering that eco-driving rules can be applied by drivers who abide by traffic laws and who want to follow some or all of the following five rules. The first rule in eco-driving is to exercise sustained awareness during driving, pay particular attention to other users, and upcoming situations, and be in position to smoothly adapt one's behavior to them. The second rule is to try to maintain a steady speed, with a low number of revolutions per minute (rpm) by avoiding fast acceleration and heavy braking. The third rule, only for cars with a manual shift, which make up the major part of the cars now on the roads in France (80% of new cars sold in 2015, Comité des constructeurs français d'automobile, 2016), requires up-shifting early (at a low rpm) during acceleration and using the engine brake during deceleration. The last two eco-driving rules, which are independent of the driving activity itself, urge drivers to improve car maintenance (e.g., by checking tire pressure regularly) and to avoid overconsumption of fuel (e.g. heavy loads in or on top of the car).

This way of driving has been widely studied (see literature review by Barkenbus, 2010), using pre- and post-training comparisons (Jeffreys et al., 2016) or by exploring the impact of driving-assistance systems (Andrieu and Saint Pierre, 2012), and various effects have been found. Several studies on how drivers maintain eco-driving (af Wåhlberg, 2007; Beusen et al., 2009; Zarkadoula et al., 2007), have noted that the practice decreases with the time, even if feedback is used (Tulusan et al., 2011).

1.2. Eco-driving gains

Eco-driving can have important benefits for drivers, especially if they are car-dependent (Stradling, 2007), whether by choice or by necessity (e.g., no close public transit).

The gains can be environmental due to a decrease in GhGs emission caused by less fuel consumption (for combustion engines), with an average reduction of 10% (range: 5–25%; Barkenbus, 2010; LeBlanc et al., 2010; Mensing et al., 2013; Onoda, 2009). Environmental gains can also result from a reduction car emissions other than exhaust, such as particulate matter (PM_x) emitted by break-pad and tire-road contact (tire and road-surface wear), particularly during high-speed driving and heavy braking (Kumar et al., 2013), found in emissions and in re-suspensions (Beltran et al., 2012).

These environmental gains go hand in hand with money saving because they reduce fuel purchases (Barkenbus, 2010; calculated gains from \$214 to \$428 per year) and lead to an overall drop in the cost of car use (e.g., because smoother driving causes less wear and tear on vehicles).

Gains in driving comfort can also be obtained due to reduced noise levels during travel (Lauper et al., 2015): *the noise of the engine of one car running at 4000 rpm is equal to the engine noise of 32 cars running at 2000 rpm* (Barić et al., 2013, p. 266), which not only affects drivers but also people nearby (e.g., in residential areas).

Moreover, these benefits can be obtained without increasing one's theoretical travel time (Mensing et al., 2013), thereby maintaining a certain standard of living (Barkenbus, 2010) and could be sustained both by the emergence of a new environmental social norm, mostly for women because they are more environmentally conscious than men (Becker and Félonneau, 2011), and by the relationship between environmental attitude and knowledge of eco-driving (McIlroy and Stanton, 2016).

Despite these gains, only a few drivers eco-drive, and the ones who do, have difficulty maintaining it. Moreover, some eco-trained drivers tend to “forget” or abandon eco-driving (Beusen et al., 2009), using it less and less in everyday life (af Wåhlberg, 2007; Zarkadoula et al., 2007). In addition, it has been shown that drivers have scripts and schemas, called mental models (Schank and Abelson, 1977), that to guide them during eco-driving (Pampel et al., 2015), although Pampel et al. concluded (p. 679) that such mental models are generally not used when drivers are “instructed to drive normally”. However, an important dimension involved in eco-driving seems to be lacking in the literature: the self-perceptions that people have about their driving, e.g., “do they feel that they are eco-drivers?”.

In this paper we do not focus on real eco-driving. Rather, we look at eco-driving self-perceptions linked with knowledge of eco-

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