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A Naturalistic Study of the Impact Of Message Framing on Highway Speeding

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Authors' note. This paper is based on a part of Floriane Bossart Master's thesis (Paris 2 University) under the supervision of Patricia Delhomme. Nadine Chaurand is a researcher at Ifsttar, Floriane Bossard is a police forces member, and Patricia Delhomme is a senior researcher at Ifsttar.

Abstract

Speeding is the most common road violation, and is one of the main causes of crashes. To protect road users, authorities use sanctions and preventive measures to prompt drivers to observe speed limits. However, the efficacy of prevention messages varies according to a number of factors, among which risk framing is important. We ran a study to test whether gain is more effective than loss (framing effect). Four anti-speeding messages were presented on variable-message signs, along one side of a busy 8-lane highway in France (speed limit: 130 km/h – 80 mph), during 6 weekends. Within a between subject design, the messages differed in orientation (gain vs. loss vs. no message) and theme (crash vs. fuel consumption). The drivers' speed was recorded on the highway 2 km (1.25 miles) after the sign (6486 recordings of speed). The results showed that speed was lower when a message was displayed than in the control condition, and when the message was gain-framed rather than loss-framed. These effects were stronger on the left lanes (overtaking lanes). Hence, gain framed messages are recommended for prevention campaigns at least when no risk factor is salient.

Keywords

Speeding, message framing, gain, loss, highway, variable-message sign (VMS)

Highlights

- Messages to drivers about speed are rarely evaluated in real-world driving contexts
- Framing of a prevention message as gain or loss can influence its effectiveness
- We compare the impact of differently framed messages on drivers' speeds on highways
- Speed was significantly lower after a gain- rather than a loss- or no message

INTRODUCTION

a. Speeding Rates and Role of Speeding in Crashes

Speeding is among the most commonly observed road violation in many countries. Estimations are that at any given time, about 40% to 50% of car drivers exceed the speed limits while on the road, and that about 10% to 20% exceed the limit by more than 10 km (6.25 miles) (OECD, 2006). Speeding behavior occurs mainly in overtaking lanes (the leftmost lanes in France).

Speeding has been identified as an important factor in crashes (particularly serious ones). Numerous studies have illustrated the link between speed and the occurrence of crashes, reporting that an increase in speed of 1 km (0.62 miles) per hour leads to an average increase of 3% in crashes (Aarts and van Schagen, 2006; Elvik, Christensen and Amundsen, 2004; Finch et al., 1994; Nilsson, 2004; OECD, 2006; Taylor, Lynam, and Baruya, 2000). Because this relationship cannot be considered totally linear, researchers have developed formulae based on the principles of kinetic energy to model the role of speed in crash occurrence, which have then been validated on crash data from different countries (Elvik, Christensen and Amundsen, 2004; Nilsson, 2004). They have found that when speed is multiplied by 2, the rate of injury crashes is multiplied by 4, the rate of severe injury crashes is multiplied by 8, and the rate of fatal crashes is multiplied by 16.

b. Speeding Prevention

In order to avoid crashes caused by speeding, speed enforcement in most countries is done by the police force (often through the use of automatic radar devices). Sanctions are applied to drivers who exceed the speed limit, be it monetary fines, administrative sanctions (demerit point systems, driving license suspension), or legal action. Moreover, governments can set up prevention campaigns with messages that are broadcast on TV or radio, or through promptings displayed to drivers along the road, on variable-message signs (VMS). In order to increase road safety, any information provided via VMS would have to be quickly read and understood. Thus, a lot of work has been carried out on drivers' reading and comprehension of messages provided via VMS (Dutta et al., 2005). It appears that motorists require about one second per word displayed on VMS or "4-units information (1-unit

information = one word)" to accurately process and understand the information while paying attention to the driving activity (Dudek and Huchingson, 1986; Ullman et al., 2005). The messages can be aimed at to the whole population or be targeted to specific groups. In the case of incentives displayed along the road, messages can be targeted to speeders by appearing only when speeding is detected. Two possible issues with prevention campaigns are that they may not be evaluated and may not be based on theoretical knowledge about behavior modification. In answer to these issues, a growing number of research in various fields has focused on speeding prevention campaigns, in order to design campaigns derived from behavior modification theories, and test the efficiency of these campaigns (for example, see Algie & Rossiter, 2010; Delhomme et al., 2010; Delhomme et al., 2008; Falk and Montgomery, 2007; Hoekstra and Wegman, 2011; Poulter & McKenna, 2010; Rossiter & Thornton, 2004; Schulze and Kossmann, 2010; Stead, Tagg, MacKintosh, & Eadie, 2005; Tay, 2005a, 2005b, 2011; Tay & Ozanne, 2002; Tay & Watson, 2002; or Walton & McKeown, 2001). In particular, several studies have focused on messages broadcast on VMS, illustrating that such messages can help reduce drivers' speed (Schramm et al., 2012; Tay & de Barros, 2008, 2010).

In the field of social psychology, research on effective ways to get drivers to comply with speed limits has focused on different domains, including commitment (Delhomme et al., 2008), persuasion (Goldenbeld et al., 2008), and fear arousal (Castillo-Manzano et al., 2012). Following persuasion models (Petty & Cacioppo, 1986), it is also necessary that the population targeted by the campaign feel involved. Indeed, people who do not feel involved in the issue, the situation or the specific topic addressed in the campaign message are likely to discard it as irrelevant, and are therefore not likely to change their behavior. As a result, the target population has to be clearly defined and the features of the campaign (in terms of its theme, consequences displayed, media used, etc.) must be tailored to that target (Cauberghe et al., 2009; Goldenbeld et al., 2008; Kaye, White & Lewis, 2014; Lewis et al., 2007; Lewis et al., 2008; Lewis et al., 2013). In particular, anti-speeding messages are more effective when displayed on the road than when displayed out of context, as drivers feel more involved in

speed- and crash-related questions when they are actually driving than when they are not (Phillips, Ulleberg & Vaa, 2011).

Furthermore, the choice of the campaign theme itself is also a factor of effectiveness. For example, a large number of campaigns stress that speed increases crash risks, so we may assume that people had already knowledge of risks associated to speed. It is thus possible that habituation occurs: people expect to see crash-related messages and pay less attention to them. By contrast, uncommon anti-speeding messages, such as ones about fuel consumption or environmental pollution (Delhomme et al., 2010), are less expected, so they capture attention, are considered more informative, and thus have more probability to change people's behavior. In line with this research, the question of message content, and more particularly message framing has gained considerable importance.

c. Framing Theory

Message framing can concern different dimensions of the message (Lindenberg and Steg, 2007; Steg et al., 2014), one of which is goal framing. Indeed, a number of studies (Levin et al., 1998; Meyers-Levy and Maheswaran, 2004; Rothman et al., 1999; Rothman and Salovey, 1997) showed that the framing of the message in terms of gains that adopting the promoted behavior will trigger, or in terms of losses that avoiding the promoted behavior will trigger, has an impact on the efficiency of the message and on the adoption rate of the behavior. Meta-analyses show that on average, gain framed messages have a larger effect than loss framed messages on modifying people's behavior (O'Keefe and Jensen, 2007), in domains such as health (Banks et al., 1995; Meyerowitz and Chaiken, 1987), consumer behaviors (Meyers-Levy and Maheswaran, 2004), pro-environmental behaviors (Stillwater and Kurani, 2012), or safety (D'Onghia et al., 2007; D'Onghia et al., 2008; Delhomme et al., 2010; Haddad and Delhomme, 2006; Meyer and Delhomme, 2000; Millar and Millar, 2006). This framing effect is sometimes reversed though for some behaviors. Indeed, the framing effect is moderated by the risk (or uncertainty) associated with the advocated behavior, as proposed by the Prospect Theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981). More precisely, when proposed a gain, people will choose non risky options (100% chances of saving 200 persons); when proposed a

loss, they will choose more risky options (1/3 chances of letting 600 persons die) (Tversky and Kahneman, 1981). This means that when the outcomes of the advocated behavior are certain and not risky, in other words when the behavior is meant for prevention, gain framed messages have more impact than loss framed ones; but when the outcomes of the promoted behavior are uncertain and undertaking it presents a risk, in other words when the behavior is meant for detection, loss framed messages have more impact than gain framed ones (O'Keefe and Jensen, 2007; Rothman et al., 1999). In the domain of road safety, slowing one's driving speed is a prevention behavior, as it reduces one's risk to be involved in a crash, and thus should be better prevented by positive-framed messages. Several studies tested this hypothesis, mostly by presenting people various framed messages and measuring afterwards speeding intentions (D'Onghia et al., 2007; D'Onghia et al., 2008). However, conclusions are inconsistent, showing either a stronger effect for gain-framed messages (D'Onghia et al., 2007; D'Onghia et al., 2008; Millar and Millar, 2006), or loss-framed messages or even no framing effect (Delhomme et al., 2010). Indeed, although participants from Delhomme et al.'s (2010) reported higher intentions to decrease speeding after seeing a message than in the control condition, there was no difference between those seeing the loss framed message and those seeing the gain framed one. This inconsistency may be in part due to the fact that the dependent variable is most often a behavioral intention and not an actual behavior on the road. Participants may thus be wrong when predicting their speeding behavior in driving context. Moreover, most often when the behavioral intention is measured, participants are not driving. Thus, it is likely that participants sitting on a chair during a study, feel less involved by the messages, and have more difficulties relating to the danger speeding represents, because they are not in context. Thus, it would be interesting to study whether the framing effect does appear with speeding prevention messages, by measuring actual speed in a road context.

d. Our study

We investigated the impact of anti-speeding framed messages, displayed on a variable-message sign on a highway. Participants' actual speeding behavior was measured. More precisely, we compared the impact of messages that were positively framed or negatively framed. As loss-framed messages are

globally more frequent in health and speed risk communication, we chose a commonly used theme -crash rate-, and a less commonly used theme -fuel consumption-.

II. METHOD

a. Participants

The speeds of 6486 vehicles were measured. In order to have a homogeneous sample, and to avoid participants with a poor knowledge of French language or road legislation, only cars, with a French license plate, were considered. Drivers were not aware that an experiment was conducted.

b. Messages

The prevention messages were the same as the ones used by Meyer and Delhomme (2000). They presented the gains associated with non speeding or losses associated with speeding, in regard to 2 themes, crashes and fuel consumption. The length of the messages displayed on a variable-message sign is limited to 60 characters, so that drivers can read the message quickly without allotting too much attention to it. As such, the messages we used had to be short and “slogan like”.

The 4 messages were “respected speed limit = less crashes” (crash gain), “exceeded speed limit = more crashes” (crash loss), “speed limit respected = less fuel consumption” (fuel gain), and “speed limit exceeded = more fuel consumption” (fuel loss). In the control condition, the variable-message sign displayed the time.

c. Location

The study took place on a highway section close to a tollbooth about 55 km south west of Paris. The highway comprises 4 lanes in each direction. Following legal rules, speed is limited at 130 km per hour (about 80 mph). Traffic comprises vehicles of all sorts and sizes allowed in highways.

The study was run on about 20 weekend days between September and November 2010. Only days where weather was nice (no rain, wind or fog) and that did not correspond to holiday rushes were considered, leaving 12 weekend days (6 Saturdays and 6 Sundays). There was one measurement timeslot per day. Measurement timeslots were from 9:30 to 11:05 am on Saturdays, and from 3:00 to

4:35 pm on Sundays. These timeslots were chosen based on official statistics (COFIROUTE), as traffic was fluid (about 800 vehicles per hour) and the tollbooth was not clogged up at these times, in order to be able to measure free-flow speed.

Authorizations to display the messages on highway variable-message signs and to record speeds were obtained from public road safety authorities, police forces, as well as the highway operator.

d. Procedure

We used a quasi-experimental design. On six of the study days (3 Saturdays and the 3 following Sundays), only fuel related messages were displayed; on the other six (again 3 Saturdays and the 3 following Sundays), only crashes related messages were displayed.

To avoid biases caused by road conditions, environment, or weather, each timeslot contained the 3 different message conditions (positive, negative and no message), with the "no message" condition serving as a baseline. Each timeslot was divided in three 25 minutes sections. On Saturdays, the 25-minutes sections times were 9:30-9:55, 10:05-10:30, and 10:40-11:05; on Sundays, they were 3:00-3:25, 3:35-4:00, and 4:10-4:35. In a given timeslot, each of the three messages was allocated a section, and thus broadcast for 25 minutes. The order of the messages during the timeslots was counterbalanced. There were 6 possible orders; each order was attributed to one of the 6 days with fuel related messages and to one of the 6 days with crashes related messages.

The prevention messages were displayed 2 kilometers after the tollbooth on a variable-message sign above the 4 lanes. Speed was assessed 2 kilometers after the variable-message sign (which corresponds to around 1 minute at 130 km/h – 80 mph), using a laser speed gun. The laser speed gun belonged to the set of devices the police forces used for assessing speed and thus fining speeders. It emits electro-magnetic waves and uses the Doppler effect to determine the speed of a car. By law, the margin of error of such speed guns cannot exceed 5%, and the devices are regularly checked to control their reliability. This specific laser speed gun did not take pictures of the cars, and as such, did not emit flashes. Each measure took 0.36 seconds, and the minimum interval between 2 measures was 3

seconds. Using a laser speed gun operated by an experimenter on the side of the highway had to be preferred to more automatic solutions (such as using traffic sensors and recorders) due to financial and time constraints. The experimenter was stationed in a place hidden from drivers' view.

As the first lane is largely used by slow vehicles (such as trucks), this lane was not used in the measures. Moreover, preliminary observations revealed that the 4th lane was relatively rarely used. As such, speeds measured in this lane were combined with speeds measured in the 3rd lane. Then, speed was measured for cars in the 2nd and in the 3rd and 4th lanes.

There was only one experimenter for the entire experiment. She was blind to the experimental conditions and did not know which message, at a particular time in a particular timeslot, was broadcast. She stood down the side of the road, such that highway users on both sides could not see her. During each timeslot section, she would randomly select a car on the second lane, measure its speed, and report the speed and the lane number on the data sheet (identified with the timeslot section and the date). She would then without delay randomly select a car on the third or fourth lane, measure and report its speed, and switch back to the second lane for the next measure. Time between 2 measures was kept as short as possible.

These speed measures only served research aims, and were not used to fine or sanction drivers.

III. DATA ANALYSIS

a. Data description

Among the 6486 speeds recorded, 3442 were measured after crashes messages (gain: 1195; loss: 1088; control: 1159) and 3044 after fuel messages (gain: 981; loss: 1023; control: 1040). Moreover, 2435 were measured on a Saturday and 4031 on a Sunday. Finally, 2756 were measured in the 2nd lane and 3733 in the 3rd and 4th lanes.

Total average speed was 128.40 km/h (79.78 mph) (SD = 9.634). Speeds exceeding the limitation (130 km/h – 80 mph) represented 36.8% of the sample (2384 observations). Among these, "moderate speeding" (speeds between 130 and 150 km/h – 80 and 93 mph, usually sanctioned by 68€ fines)

represented 34.7% of the sample (2249 observations). Extreme speeding (speeds higher than 150 km/h – 93 mph, usually sanctioned by 135€ fines) represented 2.1% of the sample (135 observations).

b. Distribution

We examined our data following recommendation by Judd, McClelland & Ryan (2009).

Normality and heteroscedasticity tests applied on raw data showed problems with outliers.

We identified 2 main outliers, with speeds respectively of 211 and 207 km/h, both measured on a Sunday, during the crash theme, no message condition, on lanes 3 and 4. Suppressing these 2 outliers led to acceptable normality values of raw data in each of the 6 messages by lane conditions, as indicated by raw skewness and kurtosis scores (given the size of our sample, we rely on raw values for these indicators, as suggested by West et al., 1996). More specifically, it led to acceptable normality values (again indicated by raw skewness and kurtosis scores), as well as acceptable homoscedasticity (as indicated by homogeneity of residuals among predicted values) for residuals in the ANOVA. Thus, we discarded the 2 outliers and ran ANOVAs.

Among the 6484 speeds left, total average speed was 128.38 km/h (79.77 mph) (SD = 9,53; Min: 92; Max: 183). Speeds exceeding the limitation (130 km/h – 80 mph) represented 36.7% of the sample (2382 observations). Among these, "moderate speeding" represented 34.6% of the sample (2249 observations). Extreme speeding represented 2.1% of the sample (133 observations).

IV. RESULTS

We ran analyses using speed (continuous variable) and exceeding speed limit (yes/no, dichotomous) as DVs. We first ran a 2*2*3 between-subjects ANOVA to study the effect on speed on theme (crashes vs. fuel), lane (2 vs. 3/4), framing (goal vs. loss vs. control) and their interactions. This ANOVA revealed no effect of theme: speed in the crashes theme

($m=128.28$) was the same as in the fuel theme ($m=128.48$, $F(1,6472)<1$, $p>.54$). As could be expected, speed was significantly higher on lanes 3 and 4 ($m=132.45$) than on lane 2 ($m=122.85$, $F(1,6472)=2197.749$, $p<.001$, partial $\eta^2=.253$).

Moreover, speed was significantly higher in the control condition ($m=129.32$) than in the loss framing condition ($m=128.27$), which was itself significantly higher than in the goal framing condition ($m=127.53$, $F(1,6472)=36,801$, $p<.001$, partial $\eta^2=.006$). This framing effect was moderated by lane ($F(1,6472)=29.823$, $p<.001$, partial $\eta^2=.005$), and was stronger on lanes 3 and 4 than on lane 2. More precisely, simple effect analyses reveal that the framing effect is indeed statistically significant for lanes 3 and 4 ($F(1,6472)=77.707$, $p<.001$, partial $\eta^2=.010$), but not for lane 2 ($F(1,6472)<1$, $p>.68$). These results are represented in Figure 1. No other interaction reached significance.

Speed was then recoded, with speeds higher than 130 km/h – 80 mph – coded as exceeding speed limit, and speeds 130 km/h – 80 mph – or lower coded as non exceeding speed limit. We ran logistic regression analyses, where we regressed topic, lane and message type on this dichotomous variable, The Wald χ^2 values associated with each variable are reported. Results replicated the ones from the previous analyses. Indeed, speeding was no more likely when the message was crashes related (36.9%) than fuel related (36.6%; $\chi^2= .501$, $p>.48$). There was a significant effect of lane, the odds of speeding compared to non speeding was 8.069 times higher on lanes 3 and 4 (where speeding represents 54.1% of cases) than on lane 2 (13.2% of cases; $\chi^2= 999.126$, $p<.001$). There was a significant effect of the message ($\chi^2= 14.997$, $p<.001$). The odds of speeding compared to non speeding for drivers in the control condition (41.1% of cases) was 1.246 times higher than for drivers in the loss framing condition (36.0% of cases; $\chi^2= 7.426$, $p<.001$), and 1.343 times higher than for drivers in the

goal framing condition (33.0%, $\chi^2= 13.923$, $p<.001$). However, the odds of speeding compared to non speeding for drivers in the loss condition did not differ from the odds for drivers in the goal framing condition ($\chi^2= 0.873$, $p>.350$). Again, this message effect was moderated by lane ($\chi^2= 10.558$, $p<.001$, and was significant for lanes 3 and 4 ($\chi^2=47.087$, $p<.001$), but not for lane 2 ($\chi^2=.385$, $p>.825$). Speeding rates are indicated in Table 1.

Table 1. Speeding and extreme speeding rates by message and lane

Message	Speeding			Extreme speeding		
	Lane 2	Lanes 3/4	Total	Lane 2	Lanes 3/4	Total
Control	13,68%	61,52%	41,16%	0,00%	5,38%	3,09%
Loss	12,73%	52,72%	36,05%	0,00%	3,01%	1,75%
Gain	13,23%	47,94%	33,00%	0,00%	2,42%	1,38%
Total	13,22%	54,11%	36,76%	0,00%	3,62%	2,08%

Finally, we studied the impact of message on extreme speeding by coding speeds higher than 150 km/h – 93 mph – as extreme speeding and speeds 150 km/h – 93 mph – or lower as not extreme speeding. As there were no extreme speeding cases on lane 2, we only analyzed lanes 3 and 4. Again, analyses replicated the results. Extreme speeding was no more likely when the message was crashes related (1.9%) than fuel related (2.2 %; $\chi^2= .310$, $p>.58$).

There was a significant effect of the message ($\chi^2= 15.419$, $p<.001$). The odds of speeding compared to non speeding for drivers in the control condition (5.4% of cases) was 1.781 times higher than for drivers in the loss framing condition (3.0% of cases; $\chi^2= 7.595$, $p<.006$), and 2.224 times higher than for drivers in the goal framing condition (2.4%, $\chi^2= 12.736$, $p<.001$). However, the odds of speeding compared to non speeding for drivers in the loss condition did not differ from the odds for drivers in the goal framing condition ($\chi^2= 0.794$, $p>.373$).

Extreme speeding rates are indicated in Table 1.

V. DISCUSSION

Speeding, among the most common causes of road crashes, particularly on highways, has been for years one of the main target of prevention campaigns. The literature in social and cognitive psychology has demonstrated that the framing of the messages used to promote safe behaviors, such as reducing one's speed, influences the efficiency of the message. Gain framed messages should be more efficient in promoting this behavior than loss framed ones. However, this framing hypothesis had rarely been tested in context, while people are driving. We ran a study by measuring the speed people drove on a highway, after seeing speeding-prevention messages that were either gain-, loss-, or control-framed. Results confirm our framing hypothesis: speed is lower in the gain-framed condition, followed by the loss-framed condition, and finally by the control condition. This result is consistent with literature about the framing effect and the documented stronger impact of gain-framed messages. It is even more interesting in that it was obtained by measuring actual behaviors in a naturalistic driving environment, and as such presents more validity than previous studies on speeding intentions (D'Onghia et al., 2007; D'Onghia et al., 2008; Delhomme et al., 2010). However, although speeding rates (exceeding the speed limit) are greater in the control condition than in the messages conditions, we cannot conclude that these speeding rates differ between gain- and loss-framed conditions.

As could be expected, the framing effect is stronger on the overtaking lanes. Indeed, speeding is more common on left-side lanes (the overtaking lanes in France) than on the right-side lane (the regular driving lane in France). Right-side lanes are used by vehicles with a large range of speeds, high and low, while left-side lanes are only used by vehicles that are overtaking slower vehicles, and that have as such a higher average speed than on the right-side lane. As such, vehicles on the right-side lane may not feel as involved in anti-speeding messages as vehicles on the left-side lanes, which could lead to a floor effect.

Interestingly, the theme of the message (crashes or fuel consumption) had no effect, which may imply that the framing effect we observe is not influenced by people's familiarity with the theme, or that participants considered both themes to be equally familiar and relevant to their speeding behavior. In an applied perspective, this means that given both themes have the same efficacy, they could be used simultaneously in an anti-speeding campaign, which would allow to avoid habituation and reactance.

The framing effect that appears in our study implies that actions at low cost can help decrease speeding rates, which is likely in turn to decrease crash rates. One may object that the effect size for this relationship is quite small, at $\eta^2=.010$ for the left-side lanes (used for overtaking), but even though small, any significant effect size can be interesting in driving behavior.

Indeed, according to previous research (Elvik et al., 2004; Nilsson, 2004), such a decrease in speed of 3 km/h – 1.875 mph – could lead to a decrease of up to 8.5% of crash rate. A cost-benefit analysis of such an action would thus put in perspective the low implementation costs (the messages are short, easily displayed to large numbers of drivers, and do not imply identification and targeting of specific categories of drivers), and the small but significant expected benefits. A possible drawback should however be taken into account, in that there may be potential negative side effects of using VMS for anti-speeding campaigns (Tay & De Barros, 2008). Nonetheless, given the low implementation costs, the results of this study could be of interest for stakeholders.

Our study suffers from some limitations. Indeed, drivers were exposed to the messages only once, and it is likely that seeing these messages multiple times may lead to different results. Moreover, we measured speed 2 km – 1.25 mile – after the variable-message sign. As such we cannot tell whether framing has a long-term impact or only a short-term one. Moreover, although the experimenter stood on the side of the road so as not to be seen by automobilists on the highway, it is possible that some automobilists spotted her and, not knowing the speed

measure would not be used for fining purposes, reduced their speed to avoid a fine. Thus, the following automobilists, cued by the previous driver slowing down, may have reduced their own speed accordingly. The proportion of cyclists who spotted the experimenter should be low, and should not differ across the experimental conditions. However, the slowing down behavior should be more likely from automobilists who were speeding beforehand, which could cause a small bias in our results. Future research could thus benefit from developing more discrete ways to measure speed.

Finally, the setting of the study prevented us from measuring a number of complementary variables, such as message perception and processing, baseline speed, individual and personality characteristics such as goal orientation, etc. In the same vein, variability of driving conditions (fog, raining, previous crashes, presence of police, fuel price, etc.) may add a lot of additive and no additive effects. Being able to take into account these variables in future studies will be necessary to identify the conditions in which the framing effect is the most efficient, as well as the population most receptive to this effect.

VI. CONCLUSION

The impact of message framing on speeding had never been studied by measuring speeding behavior in an actual driving context. Our research filled this gap and revealed that driving speed decreased after seeing a gain-framed message than a loss-framed message, or than a control message. Such a result could be used by authorities to set up non costly efficient anti-speeding interventions.

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FIGURE CAPTIONS

Figure 1. Actual mean speed by lane and framing condition.