

BRIEF REPORT

No sign of quitting: Incidental exposure to no-smoking signs ironically boosts cigarette-approach tendencies in smokers

Brian D. Earp¹, Brendan Dill², Jennifer L. Harris³, Joshua M. Ackerman², John A. Bargh³

¹University of Oxford

²Massachusetts Institute of Technology

³Yale University

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Abstract

The unconscious mind tends to disregard negations in its processing of semantic meaning. Therefore, messages containing negated concepts can ironically prime mental representations and evaluations that are opposite to those intended. We hypothesized that the subtle presentation of a negated concept (e.g., “no smoking”) would activate ironic *motivational orientations* as well. We tested this hypothesis in a public health context. Smokers viewed photographs in which no-smoking signs were either inconspicuously embedded (prime) or edited out (control). Primed smokers showed amplified automatic approach tendencies toward smoking-related stimuli, but not toward smoking-unrelated stimuli. Since passive priming effects generally serve to facilitate forms of action, not inhibit them, anti-smoking and other public health campaigns may ironically increase the very behaviors they seek to reduce.

Key words: unconscious, priming, negation, no, smoking, ironic, public health

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“No smoking.” “Just say ‘no’ to drugs.” “Don’t drink and drive.” Public health messages often remind us of the importance of abstaining from harmful behaviors. However, their ubiquitous presence may relegate them to background noise in the environment, only passively attended to, at least much of the time. In fact, studies on semantic priming of goals and behaviors (e.g., Dijksterhuis & Bargh, 2001; Dijksterhuis, Chartrand, & Aarts, 2007) in combination with research on automatic (or unconscious) processing of negated information (e.g., Deutsch, Gawronski, & Strack, 2006; Greenwald & Liu, 1985; Mayo, Schul & Bernstein, 2004) suggests that these public health messages might be more than just ignored; they may well serve to trigger the very behaviors they are meant to discourage.

Priming research has established the existence of a direct perception-behavior link through which subtle action cues in the environment automatically increase the perceiver’s likelihood of behaving in line with those cues—possibly due to overlapping mental representations for perception and action in the brain (Bargh & Ferguson, 2000; Dijksterhuis & Bargh, 2001; Dijksterhuis, Chartrand & Aarts, 2007). For example, administering a modified Stroop task with words related to drunkenness causes undergraduates to quaff more beer in a subsequent taste-test (Roehrich & Goldman, 1995). Televised food advertisements increase eating behavior both during, and immediately after, exposure to the ads (Harris, Bargh, & Brownell, 2009). And unobtrusively exposing college-aged participants to words that are stereotypic of the elderly causes them to walk more slowly (Bargh, Chen, & Burrows, 1996) and perform less well on incidental memory tasks (Dijksterhuis, Bargh, & Miedema, 2000), both in line with the content of the primed stereotype. Indeed, the power of cues and primes in the

environment to trigger automatic cue-consistent behavioral responses is now well established (see Dijksterhuis et al., 2007 for a review).

But what if those cues are preceded by a negation or other modifier? Modern social-cognitive theory suggests that the unconscious mind may disregard negations in its automatic processing of semantic meanings. Factoring in negations, as in “don’t drink and drive,” involves integrating the negation with the content of the rest of the message. However, automatic or unconscious processing has difficulty performing this operation (Morewedge & Kahneman, 2010; Sloman, 1996). Greenwald and Liu (1985) demonstrated that for evaluative priming, phrases with double negatives such as “enemy fails” did not function as positive primes, as they should if the meanings of the individual words were integrated into a single concept. Instead, they functioned as negative primes, just as they would if the words were presented in isolation. Similarly, Mayo, Schul and Bernstein (2004) showed that negated descriptions of a person (e.g., “Tom is not tidy”) facilitated incongruent judgments (e.g., “Tom folds his clothes neatly”), as though the negation had not been present in the first place. Finally, Deutsch, Gawronski and Strack (2006) demonstrated that priming of negated words can have the same effect on target judgments as priming the words alone, without the negation. They extended these findings to show that training individuals to negate a negative stereotype ironically facilitates stereotype-*consistent* judgments (Gawronski, Deutsch, Mbirikou, Seibt & Strack, 2008).

For unconscious or automatic processing, then, “*not good*” is often taken as “good,” and “*not bad*” as “bad.” Negation of concepts does not occur automatically but requires cognitive effort. For example, Deutsch et al. (2006) conclude that effortful cognitive control is required to counteract an automatic evaluative association, including one resulting from a negated prime. In such cases, the perceiver must consciously attend to the stimulus and generate a rule-based

controlled response. Similarly, Gilbert (1991) proposed that the mind automatically accepts any new information as true, whereas the negation of that information requires conscious attention and effort.

If action cues in the environment can trigger automatic cue-consistent motivations and even outright behavior, and if negations are ignored in unconscious semantic processing, then it follows that *negated cues* might have ironic consequences not only on target judgments and stereotyping (as has been demonstrated by prior research) but on motivational states and behavioral tendencies as well.

Public health implications

This proposed ironic negation-priming effect is especially relevant in the public health domain. Our model suggests that public health campaigns which explicitly *discourage* the consumption of unhealthy substances could in fact trigger that very consumption. Indeed, research has shown a “boomerang” effect in response to public health interventions across a variety of contexts (e.g., Ringold, 2002); however, the mechanism invoked in such findings is usually conscious reactance on the part of the consumer (e.g., Grandpre, Alvaro, Burgoon, Miller, & Hall, 2003). Ironic effects associated with impaired unconscious processing of negation have not generally been explored in prior research.

In summary, to extend what has been shown regarding the ironic effects of negation priming on *evaluations* (Greenwald et al., 1989; Deutsch, et al. 2006) and *stereotyping* (Gawronski et al., 2008), we propose that incidental exposure to negated messages will also prime *motivations* and overt *behavioral tendencies* opposite to those encoded in the messages’ literal meaning. To test this hypothesis, we conducted an experiment that measured the reflexive behavioral responses of smokers to an existing public health message: a simple no-smoking sign.

In the present study, we surreptitiously exposed smokers to no-smoking signs and assessed their subsequent motivational orientation toward cigarettes, as measured by the relative strengths of their automatic approach tendencies towards smoking-related and neutral stimuli. Reflexive motivations to approach or avoid a given stimulus can be assessed using a “joystick task” in which participants push and pull a lever in response to the presentation of various stimuli (Chen & Bargh, 1999). This measure has been recently validated by Krieglmeyer, Deutsch, De Hower, and De Raedt (2010), who showed that stimulus-response on this task is driven specifically by motivational orientations towards the stimuli and not by stimulus valence alone. Furthermore, Wiers, Eberl, Rinck, Becker, and Lindenmeyer (2011) showed that alcoholic patients exhibited a stronger approach-bias on this measure for images of alcohol compared to control images, again regardless of the valence of the control images. In their study, re-training this response bias (by practicing avoidance movements with the joystick) predicted greater positive outcomes in an alcohol treatment program, indicating a further link between this motivational orientation and actual behavior regarding addictive substances.

In light of these findings, we hypothesized that exposure to no-smoking signs would automatically facilitate approach tendencies in response to smoking stimuli but would have no effect on approach or avoidance tendencies towards neutral, smoking-unrelated stimuli.

Method

We employed a mixed model design, with smokers assigned randomly to either the prime or control condition. We utilized the “joystick” paradigm from Chen and Bargh (1999) to assess participants’ motivational orientation toward smoking-related and neutral stimuli. In this paradigm, participants reflexively push the joystick *away* from themselves more quickly in response to stimuli they are motivated to avoid, and pull the joystick *toward* themselves more

quickly in response to stimuli they are motivated to approach.

Participants and procedure

Participants were 32 students and community members (12 women) at a private Northeastern university, between the ages of 18 and 49 years ($M = 26.0$), who received \$15 as compensation. To minimize awareness of the purpose of the study, potential participants were screened for smoking behavior using an online “health behaviors” questionnaire that also included questions about diet, exercise, and alcohol consumption. All participants reported having smoked at least one cigarette in the previous 48 hours. Upon arrival at the experiment, participants were informed that they would be participating in a study of “health attitudes.” They then performed a priming task, by random assignment, that involved a sequence of photographs showing everyday scenes. In a subset of the images, no-smoking signs were either inconspicuously embedded (priming condition) or edited out (control condition). All participants then completed the joystick approach-avoidance task in response to smoking-related and neutral stimuli. Next, participants completed the Fagerstrom Test for Nicotine Dependence (FTND) to assess level of nicotine addiction (Heatherton, Kozlowski, Frecker & Fagerstrom, 1991). Finally, the experimenter administered a funneled interview to test for awareness of the purpose of the experiment (Bargh & Chartrand, 2000).

Priming manipulation. Images of 23 everyday scenes were selected from a Google image search, including 13 images with a no-smoking sign located discretely somewhere in the pictured environment. For the control condition, the same images were used with the no-smoking signs digitally edited out (see Appendix). Participants were seated in a small room by themselves in front of a computer monitor and asked (as part of a cover story) to determine whether the images had been taken by a professional or amateur photographer. Each image was presented for 1.5

seconds; then a prompt appeared asking participants to press “p” if they thought it had been taken by a professional photographer and “a” if it had been taken by an amateur. Participants were explicitly told that speed of response was not important. Images were presented in the same random order for each participant.

Motivational orientation measure. After the priming manipulation, the experimenter returned to connect the joystick to the computer for the motivational task. This measure used two different sets of 25 images of everyday objects. Each set included 21 images of familiar objects unrelated to smoking (e.g., soccer ball, can opener, pencil) and 4 different images of cigarettes. Participants were informed that they would see various images and that they should move the joystick as quickly as possible to “knock the images off the screen.” This task was divided into two blocks. In the avoidance trials, participants were instructed to move the joystick quickly *forward* (“pushing away” motion). In the approach trials, they were told to move the joystick *backward* (“pulling toward” motion). The stimuli appeared after 2 to 7 seconds and disappeared instantaneously in response to the appropriate joystick movements. Each participant completed both blocks, counterbalanced for order. The computer recorded participants’ response times to each image.

Results and discussion

Data from two participants were excluded from the final analysis: one for failing to follow task instructions, the other due to a computer malfunction. Scores on the FTND ranged from 0 to 5 ($M = 1.00$, $SD = 1.39$) out of a possible 8 points, indicating generally low levels of nicotine addiction in this group. Participants in the control and prime conditions did not differ in level of nicotine addiction ($p = .81$). For each participant, we subtracted the mean response time of approach trials from the mean response time of avoid trials for both smoking-related and

neutral images. Because participants would be *faster* to make an approach motion and *slower* to make an avoid motion in response to a stimulus they are motivated to approach, a higher score indicates a behavioral tendency to approach the stimulus. Conversely, a lower or negative score indicates a less-pronounced approach tendency or a behavioral tendency to avoid the stimulus. We conducted a mixed model ANOVA with a between-subjects comparison of participants in the prime versus control conditions and a within-subjects comparison of approach scores for smoking versus neutral stimuli.

Overall, participants displayed a modest tendency to approach smoking-related stimuli ($M = 8.6$ ms, $SE = 18.4$) versus neutral stimuli ($M = -14.0$ ms, $SE = 13.5$), $F(1,28) = 2.93$, $p = .10$. Participants who were exposed to no-smoking signs showed greater approach tendencies toward smoking-related stimuli ($M = 40.7$ ms, $SE = 25.9$) relative to neutral stimuli ($M = -8.5$ ms, $SE = 19.1$), $F(1, 28) = 4.02$, $p = .055$, $\eta^2 = .13$. However, participants in the control condition responded similarly to smoking ($M = -23.4$, $SE = 25.9$) and neutral ($M = -19.5$, $SE = 19.1$) stimuli. These findings support our hypothesis that incidental exposure to no-smoking signs increases automatic approach tendencies of smokers toward smoking-related stimuli.

The funneled debriefing identified seven (of 14) participants in the experimental condition who consciously noticed the no-smoking signs in the photographs during the priming manipulation, but did not guess the experimental hypothesis. However, there was no difference in approach scores for smoking stimuli between participants who did and did not notice the signs, $t(12) = .21$, $p = .84$. This finding indicates that the ironic effect of incidental exposure to no-smoking signs can occur regardless of whether the smoker consciously notices the signs, and that conscious awareness may not be sufficient to override the automatic motivation to attain the negated item.

General Discussion

To summarize our findings: incidental exposure to no-smoking signs boosts smokers' implicit motivation to approach smoking-related stimuli. This motivation is evidenced by increased reflexive stimulus-approach movements after exposure to the primes, an automatic bias which seems to occur regardless of the level of conscious processing of the no-smoking signs. Building upon previous research in the social-cognitive domain, we believe this constitutes the first controlled, though preliminary, evidence for an ironic negation-priming effect on motivations and actual behavioral tendencies.

Our study does have several limitations. First, we cannot conclude, on the basis of these results, whether the reflexive-approach behavior we have captured on our joystick task would translate to actual smoking behavior in a real-life environment. Further studies are needed to determine the strength of our effect in settings outside the laboratory, and should employ heavier smokers as well as a non-smoker control group. There are theoretical limitations as well. While we were able to demonstrate that images with no-smoking signs could exert an ironic effect on smokers' motivational state (compared against the same images with the no-smoking signs digitally removed), the strongest test of our hypothesis would include a more specific comparison between no-smoking sign images (in the prime condition) and those same images with only the *negation* removed (in the control condition)—holding everything else constant. Again, further research is needed to further refine our theory, as well as the possible mechanisms undergirding this effect. We present these initial findings as a first step, and look forward to more work in this area.

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Appendix. Example image with a no smoking sign included vs. edited out

