Journal of Applied Social Psychology

Journal of Applied Social Psychology 2013, 43, pp. 2158–2162

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

Brian D. Earp[1], Brendan Dill[2], Jennifer L. Harris[3], Joshua M. Ackerman[2], John A. Bargh[3]

[1]University of Oxford
[2]Massachusetts Institute of Technology
[3]Yale University

Correspondence concerning this article should be addressed to Brian D. Earp, Uehiro Centre for Practical Ethics, University of Oxford, Suite 8, Littlegate House, St. Ebbes Street, Oxford OX1 1PT, UK.
Email: brian.earp@gmail.com

doi: 10.1111/jasp.12202

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 condition) or edited out (control condition). Primed smokers showed amplified automatic approach tendencies toward smoking-related stimuli, but not toward smoking-unrelated stimuli: an ironic motivational response to exposure to the signs. Since passive priming effects generally serve to facilitate forms of action, not inhibit them, antismoking and other public health campaigns may ironically increase the very behaviors they seek to reduce.

"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 the 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, & Burnstein, 2004) suggest 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 et al., 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 et al. (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 et al. (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 harmful stereotype ironically facilitates stereotype-*consistent* judgments (Gawronski, Deutsch, Mbirkou, 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 as well—not only on target judgments and stereotyping (as has been demonstrated by prior research) but also on motivational states and actual behavior.

Public health implications

This proposed ironic negation-priming effect is especially relevant in the public health domain. Our model suggests that public health campaigns that 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* (e.g., Deutsch et al., 2006) and *stereotyping* (e.g., Gawronski et al., 2008), we propose that incidental exposure to negated messages will also prime ironic *motivations* and overt *behavioral tendencies* as well. 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 toward 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 Houwer, and De Raedt (2010), who showed that stimulus response on this task is driven specifically by motivational orientations toward 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, retraining 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 toward 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 orientations 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 A). 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 four 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 2–7 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 analysis of variance 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 7 (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 motivations to approach smoking-related stimuli. This motivation is evidenced by increased reflexive stimulus-approach movements after exposure to the primes, an automatic bias that 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 nonsmoker 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 states (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 images with a "no smoking" sign (in the prime condition) and those same images with only the *negation* removed (in the control condition)—holding everything else constant. This contrast would help to narrow in on the specific contribution of the negation itself to the ironic motivational effect. Again, further research is needed to refine our theory, as well as the possible mechanisms undergirding this effect. We present these original findings as a first step, and look forward to more work in this area.

Acknowledgment

This research was funded by Grant RO1-MH60767 from the National Institute of Mental Health to JAB.

References

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 253–285). New York: Cambridge University Press.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype priming on action. *Journal of Personality and Social Psychology*, *71*, 230–244.

Bargh, J. A., & Ferguson, M. J. (2000). Beyond behaviorism: The automaticity of higher mental processes. *Psychological Bulletin*, *126*, 925–945.

Chen, M., & Bargh, J. A. (1999). Consequences of automatic evaluation: Immediate behavior predispositions to approach or avoid the stimulus. *Personality and Social Psychology Bulletin*, *25*, 215–224.

Deutsch, R., Gawronski, B., & Strack, F. (2006). At the boundaries of automaticity: Negation as reflective operation. *Journal of Personality and Social Psychology*, *91*, 385–405.

Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. In M. Zanna (Ed.), *Advances in Experimental Social Psychology*, *33*, 1–40.

Dijksterhuis, A., Bargh, J. A., & Miedema, J. (2000). Of men and mackerels: Attention and automatic behavior. In H. Bless & J. Forgas (Eds.), *Subjective experience in social cognition and behavior* (pp. 36–51). Philadelphia, PA: Psychology Press.

Dijksterhuis, A., Chartrand, T. L., & Aarts, H. (2007). Automatic behavior. In J. A. Bargh (Ed.), *Social psychology and the unconscious: The automaticity of higher mental processes* (pp. 51–131). Philadelphia, PA: Psychology Press.

Gawronski, B., Deutsch, R., Mbirkou, S., Seibt, B., & Strack, F. (2008). When "just say no" is not enough: Affirmation versus negation training and the reduction of automatic stereotype activation. *Journal of Experimental Social Psychology*, *44*, 370–377.

Gilbert, D. T. (1991). How mental systems believe. *American Psychologist*, *46*, 107–119.

Grandpre, J., Alvaro, E. M., Burgoon, M., Miller, C. H., & Hall, J. R. (2003). Adolescent reactance and anti-smoking campaigns: A theoretical approach. *Health Communication*, *15*, 349–366.

Greenwald, A. G., & Liu, T. J. (1985). Limited unconscious process of meaning. *Bulletin of the Psychonomic Society*, *23*, 292–313.

Harris, J. L., Bargh, J. A., & Brownell, K. D. (2009). Priming effects of television food advertising on eating behavior. *Health Psychology*, *28*, 404–413.

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. (1991). The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction*, *86*, 1119–1127.

Krieglmeyer, R., Deutsch, R., De Houwer, J., & De Raedt, R. (2010). Being moved: Valence activates approach-avoidance behavior independently of evaluation and approach-avoidance intentions. *Psychological Science*, *21*, 607–613.

Mayo, R., Schul, Y., & Burnstein, E. (2004). "I am not guilty" vs "I am innocent": Successful negation may depend on the schema used for its encoding. *Journal of Experimental Social Psychology*, *40*, 433–449.

Morewedge, C. K., & Kahneman, D. (2010). Associative processes in intuitive judgment. *Trends in Cognitive Science*, *14*, 435–440.

Ringold, D. J. (2002). Boomerang effects in response to public health interventions: Some unintended consequences in the alcoholic beverage market. *Journal of Consumer Policy*, *25*, 27–63.

Roehrich, L., & Goldman, M. S. (1995). Implicit priming of alcohol expectancy memory processes and subsequent drinking behavior. *Experimental and Clinical Psychopharmacology*, *3*, 402–410.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, *119*, 3–22.

Wiers, R., Eberl, C., Rinck, M., Becker, E., & Lindenmeyer, J. (2011). Retraining automatic action tendencies changes alcoholic patients' approach bias for alcohol and improves treatment outcome. *Psychological Science*, *22*, 490–497.

Appendix A

Example image with a "no smoking" sign included versus edited out

Appendix B

Standardized instructions

Intro: Hi, my name is _____. The first thing I will have you do is look over this consent form. [Give the participant the form and a few minutes to look over it.]

Let me tell you a little bit about the study you'll be doing today. This is a study about health attitudes—what we're doing is recruiting participants from a range of demographic backgrounds, so: students and community members, people with different dietary and health and exercise habits, and so on, to see how they respond to various health cues. During this study, you will be asked to perform a number of computer tasks. Altogether, these tasks should take you about 20 minutes. As you read on the consent form, you are of course free to decline to complete a task at any time, although we obviously prefer if you complete the whole study! Do you have any questions? Ok, wait here for a moment while I set up the task, and then I'll ask you into the study room and we'll begin. [Go into the room and set up the task; then invite the participant in.]

IV Task: OK, now it's time to do the first computer task. This is just a starter task that will help you get used to responding to visual stimuli on a computer screen, to get everyone on the same page. The task is really simple—there will be some pictures presented to you one at a time, and what we want you to do is just look at the picture until it goes away, and then decide whether you think it was taken by a professional photographer or an amateur photographer. A question will pop up asking you for your decision. When you see this question, press "p" if you think the photographer was a professional, or press "a" if you think it was an amateur. It's really important for you to remember that this is not a speed task, and it's OK if you don't guess correctly. There's no rush—in fact, it's important that you wait until the prompt comes up before pressing any keys, so feel free to take your time. Do you have any questions? OK, we'll do a couple of practice trials so you can get used to the task, and then you'll start the real task.

DV Task Part I: Ok, now that you've had a chance to practice responding to visual stimuli on the computer, we're going to start the main task of the study. This task is different from the one you just did in a couple of ways. First of all, speed is really important—this is a reaction speed test, and your one goal is to react as quickly as you can. Various images will pop onto the screen, and your job is, as soon as you see any image at all, whatever it is, to "knock it off the screen" using this joystick, like this. [If they're in the "pull" condition first, demonstrate pulling the joystick toward them as how to do it; or pushing for the push condition.] Let's do a couple of practice trials to see how it works. Now, you don't actually have to jam it ["forward" or "backward"] really hard, a nice even stroke will do. Also, one thing about the buttons on the joystick—they don't do anything. You might be tempted to pull the trigger to respond to the stimuli, but all this will do is make your reaction time slower because it won't work. So I'll stick around and help you through the practice trials to make sure that you really see it's JUST moving the lever that counts for this task, not any of the buttons. Do you have any questions?

DV Task Part II: OK, now you're going to do exactly the same thing, with just one change. Instead of moving the joystick in this direction [show] to knock the objects off the screen, you're going to move it this way [show]. It's exactly the same task, so we're going to do fewer practice trials this time, but remember that you're going to move the joystick in this new direction. Once again, I'll stick with you through the practice rounds just so we can make sure you're used to the new direction. Ok, are you ready? Let's begin.