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I Suppress, Therefore I Smoke: Effects of Thought Suppression on Smoking Behavior

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Abstract

Thought suppression is a method frequently employed by individuals who are trying to control their thoughts and behaviors. Although this strategy is known to actually increase unwanted thoughts, it is unclear whether thought suppression also results in behavioral rebound. The study presented in this article investigated the effects of suppressing thoughts of smoking in everyday life on the number of cigarettes subsequently smoked. Study participants recorded their daily cigarette intake and stress levels over a 3-week period. In Week 1 and Week 3, participants monitored intake and stress. During Week 2, in addition to monitoring intake and stress, participants in the experimental groups either suppressed or expressed smoking thoughts, whereas the control group continued monitoring. Our results showed a clear behavioral rebound: The suppression group smoked significantly more in Week 3 than the expression or control group did. Moreover, the tendency to suppress thoughts (measured by the White Bear Suppression Inventory) was positively related to the number of attempts to quit smoking. The implications of our findings for smoking cessation are discussed.

Keywords

thought suppression, behavioral rebound, self-regulation, smoking

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Numerous studies demonstrate that suppressing negative or even neutral thoughts can have a rebound effect. Therefore, a person who suppresses a thought may end up thinking about the suppressed thought more frequently than if he or she had not attempted suppression (Wegner, Schneider, Carter, & White, 1987). Despite considerable evidence pointing to the ineffectiveness of thought suppression in achieving mental control, and the almost ubiquitous negative effects associated with the technique, thought suppression remains a widely used self-control strategy (Wenzlaff & Wegner, 2000).

Furthermore, people often use thought suppression in an attempt to control their behavior (Baumeister, Heatherton, & Tice, 1994). For example, people attempting to stop smoking are likely to avoid thinking about smoking. However, this strategy actually increases thoughts of smoking, making the process of quitting more difficult. Salkovskis and Reynolds (1994) conducted a study in which participants attempting to reduce or give up smoking suppressed or monitored their thoughts of smoking. The study found that suppression (of smoking thoughts) increased thoughts about smoking relative to monitoring (of smoking thoughts). A study by Toll, Sobell, Wagner, and Sobell (2001) found that the self-reported tendency to suppress thoughts in everyday life, as measured by the White Bear Suppression Inventory (WBSI; Wegner &

Zanakis, 1994), was more prevalent in smokers than in ex-smokers. However, although these findings suggest that thought suppression makes quitting smoking more difficult, they do not suggest that thought suppression causes increased smoking. In the study presented in this article, we aimed to determine whether suppressing thoughts of smoking can subsequently cause increased smoking.

In addition to studies showing the rebound effect on thought following thought suppression, several studies have demonstrated that avoiding thoughts about a specific behavior can cause an increase in that behavior during active suppression, particularly while under a mental or physical load (Wegner, Ansfield, & Pilloff, 1998; Wegner, Broome, & Blumberg, 1997). For example, participants who suppressed thoughts of overputting a golf ball were found to be more likely to overput if under a simultaneous load (Wegner et al., 1998). However, all instances of overputting the golf ball occurred during thought suppression, rather than after thought suppression, and involved concurrent loads.

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Wegner (1994) proposed a mechanism of thought and behavioral rebound, the *ironic process theory*, that may account for the rebound effect observed during thought suppression while under a mental load. Wegner suggested that thought suppression involves two distinct processes: (a) an intentional operating process seeking distractor thoughts during suppression and (b) an automatic monitoring process searching for the presence of the to-be-avoided thought. The second process leads to rebound effects because it increases the accessibility of suppressed concepts (Wegner & Erber, 1992). Thus, when suppressing thoughts with mental capacity to spare, one is often successful for a time. However, mental load compromises the intentional operating process, but leaves the automatic monitor untouched as it is insensitive to capacity limitations, resulting in the immediate rebound effect (Wenzlaff & Wegner, 2000). It is important to note that highly accessible constructs are likely to spontaneously come to mind (Bargh, 1997) and be subsequently enacted (Bargh, Chen, & Burrows, 1996). Therefore, the greater accessibility resulting from thought suppression should increase the occurrence of previously suppressed behaviors (Wegner, 2009).

To our knowledge, only one study (Erskine, 2008) has investigated the effects of suppression of thoughts about a behavior on the postsuppression performance of that behavior. In that study, nondieting participants thought aloud for 5 min under three conditions: suppression of thoughts of eating chocolate, expression of thoughts of eating chocolate, or no instructions (other than to verbalize). Next, in an ostensibly unrelated task, participants tried two brands of chocolate and answered questions about which brand they preferred. Unbeknownst to participants, the variable of interest was the amount of chocolate consumed, rather than their brand preference. Results indicated that both males and females in the suppression group consumed significantly more chocolate than participants in the control condition. Women, in particular, consumed significantly more chocolate in the suppression group than in the expression group. One possible reason for the stronger behavioral rebound in females than in males is that women may be under greater societal and personal pressure than men with respect to eating. Although this study excluded dieting participants, women are more likely to have dieted in the past than men, and female participants' dieting history may have affected the outcome of the study.

Despite demonstrating behavioral rebound, our study (Erskine, 2008) left several questions unanswered. For example, it is unclear whether behavioral rebound effects extend to other important health-related behaviors (e.g., smoking) and whether they occur in everyday life over longer periods of time (e.g., days rather than minutes). In addition, the study did not examine the role of stress in behavioral rebound. Research links thought suppression to increased discomfort and stress, and it is possible that rebound effects are at least partly mediated by enhanced stress. Therefore, in the current study, we aimed to examine the effects of thought suppression on cigarette consumption in everyday life. We also studied the effects of

thought suppression on self-reported levels of stress and examined the effect of gender on behavioral rebound.

To address these questions, we asked study participants (all regular smokers) to monitor their smoking behavior and levels of stress over 3 weeks. In Week 1 and Week 3, all participants monitored their cigarette intake and stress levels. In Week 2, in addition to monitoring intake and stress, experimental groups either suppressed or expressed thoughts of smoking, and the control group carried out monitoring alone. Participants also completed the WBSI (Wegner & Zanakos, 1994) before the study, which allowed us to measure their preexisting tendency for chronic thought suppression and to determine whether this tendency was related to the number of cigarettes smoked during the study or the number of previous attempts to quit smoking (e.g., Toll et al., 2001).

If thought suppression causes behavioral rebound, in Week 3, we would expect participants in the suppression group to smoke significantly more than those in the expression group and control group. Furthermore, if suppression is related to increased discomfort (Trinder & Salkovskis, 1994), then the suppression group's stress levels would be expected to rise in Week 2 and then fall in Week 3, but no changes in stress levels would be expected among participants in the expression group and control group. Also, if increased stress in Week 2 in the suppression condition is crucial for behavioral rebound, we would expect this to be confirmed by mediational analysis. Finally, given that gender effects are less obvious in smoking than in dieting behaviors, we anticipated finding a behavioral rebound in both males and females.

Method

Materials and procedure

One day before the start of the experiment, participants were contacted by telephone and e-mail and were told that they would be recording the number of cigarettes they smoked and their stress levels each day, but that they should not alter their smoking behavior in any way. Prior to the beginning of the study, participants were issued diaries and instructed to record every evening their cigarette intake (number of cigarettes smoked) and level of stress (on a scale from 0, *not at all stressed*, to 100, *highly stressed*) for that day. Participants were then asked their gender and age, the average number of cigarettes they smoked per day, whether they liked smoking (on a scale from 1, *not at all*, to 9, *very much*), whether cigarettes had positive effects (on a scale from 1, *not at all*, to 9, *many positive effects*) or negative effects (on a scale from 1, *not at all*, to 9, *many negative effects*), and the number of attempts they had made to quit smoking. Participants also completed the WBSI (Wegner & Zanakos, 1994), a series of questions scored on a 5-point scale, with higher scores indicating greater use of thought suppression (total score range: 15–75).

All participants started recording their daily cigarette intake and stress levels at the beginning of Week 1. On Day 1 of

Week 2, all participants were instructed to continue to smoke as they would under normal circumstances and to record their cigarette use and stress levels. Participants in the suppression group were additionally asked to “try not to think about smoking. If you do happen to have thoughts about smoking this week, please, try to suppress them.” In contrast, participants in the expression group were asked to try to think about smoking as frequently as they could during the week. Finally, on Day 1 of Week 3, all participants were instructed to monitor daily cigarette intake and stress levels.

Participants

Ninety undergraduates, postgraduates, and their acquaintances took part in the study. All participants indicated that they had smoked at least 10 cigarettes per day for more than 12 months and had no current intention to quit smoking. The final sample comprised 85 participants (42 males, 43 females; mean age = 31.36 years, $SD = 11.46$), as 4 participants left the study and 1 demonstrated insight into the hypotheses. There were 30 participants in the suppression condition, 29 in the expression condition, and 26 in the control condition. Participants were randomly allocated to groups.

Table 1 shows each group's mean scores for five variables (attempts to quit smoking, positive effects of smoking, negative effects of smoking, liking for smoking, and WBSI scores) collected before the study, as well as the mean number of cigarettes smoked and stress levels in Week 1. One-way analyses of variance (ANOVAs) indicated that participants did not differ significantly in attempts to quit smoking or in ratings of positive and negative effects of smoking. However, participants in the expression group reported liking smoking more than those in the suppression group ($p = .02$) or the control group ($p = .001$); the latter two groups did not differ ($p = .09$).

Participants also differed in their WBSI scores: Although the expression and suppression groups were equivalent ($p = .68$), both had higher WBSI scores than the control group ($ps = .008$ and $.02$ for the expression and suppression groups, respectively). Despite these differences, liking for smoking and WBSI scores did not correlate with the number of cigarettes consumed or with stress levels (all $ps > .05$ in all groups, in all 3 weeks), so it was unnecessary to use these factors as covariates in the analyses reported in the Results section. Finally, there was a small but significant correlation between the number of times participants reported having attempted quitting and WBSI score, $r(85) = .22$, $p = .05$.

Results

Participants recorded the number of cigarettes they smoked and their levels of stress for each day of the 3-week period.¹ To examine any preexisting group differences in Week 1, we entered the number of cigarettes smoked in Week 1 into a 3 (group: suppression vs. expression vs. control) \times 2 (gender: males vs. females) between-subjects ANOVA. There was a main effect of gender, $F(1, 79) = 8.89$, $p = .004$, $\eta_p^2 = .10$, with males smoking significantly more ($M = 125.13$, $SE = 2.56$) than females ($M = 114.40$, $SE = 2.53$). However, there was no main effect of group ($F < 1$), and no group-by-gender interaction, $F(2, 79) = 2.64$, $p = .08$, $\eta_p^2 = .06$.

Despite the absence of preexisting group differences, the number of cigarettes smoked in Week 1 was significantly and positively correlated with the number of cigarettes smoked in Week 2 and Week 3 in all groups (all $rs > .93$). Therefore, baseline cigarette consumption (Week 1) was entered as a covariate into a 3 (group: expression vs. suppression vs. control) \times 2 (week: Week 2 vs. Week 3) mixed ANOVA, with the number of cigarettes smoked in Week 2 and Week 3 as the

Table 1. Baseline and Week 1 Measures for the Three Groups and the Results of One-Way Analyses of Variance

Measure	Experimental group			Analysis of variance	
	Suppression ($n = 30$)	Expression ($n = 29$)	Control ($n = 26$)	$F(2, 82)$	η_p^2
Baseline					
Number of attempts to quit smoking	1.50 (0.22)	1.07 (0.22)	1.46 (0.24)	1.1	.03
Positive effects of smoking	2.00 (0.24)	2.24 (0.25)	2.54 (0.26)	1.2	.03
Negative effects of smoking	5.77 (0.35)	5.48 (0.36)	5.77 (0.38)	0.30	.01
Liking for smoking	1.97 (0.28)	2.93 (0.28)	1.27 (0.30)	9.20**	.18
White Bear Suppression Inventory score	44.73 (2.24)	46.07 (2.28)	37.07 (2.41)	4.23*	.09
Week 1					
Stress level	32.29 (2.70)	32.94 (2.75)	31.57 (2.89)	0.059	.001
Number of cigarettes smoked	121.90 (3.27)	119.34 (3.28)	117.65 (3.47)	0.41	.01

Note: Standard errors are given in parentheses. The measures of the effects of smoking refer to participants' ratings of whether cigarettes have positive effects (1 = not at all, 9 = many positive effects) or negative effects (1 = not at all, 9 = many negative effects). Participants rated their liking for smoking on a 9-point scale (1 = not at all, 9 = very much), and stress level refers to participants' self-rated stress level (0 = not at all stressed, 100 = highly stressed). The White Bear Suppression Inventory (Vegner & Zanakos, 1994) measures tendency to suppress thoughts.

* $p < .05$. ** $p < .01$.

dependent variable.² Week 1 scores showed no significant interaction with group ($F < 1$), which indicated that the assumption of homogeneity of slopes was tenable and that the mixed analysis of covariance was valid.

There was no main effect of week or group ($F < 1$), but there was a significant week-by-group interaction, $F(2, 81) = 36.70, p = .0001, \eta_p^2 = .48$ (Fig. 1). Tests of simple main effects showed that in Week 2, the suppression group smoked significantly less than both the expression group ($p = .001$) and the control group ($p = .009$). The expression and control groups did not differ significantly ($p = .40$). In Week 3, the expression and control groups smoked an equivalent amount ($p = .77$), but the suppression group smoked significantly more than both the expression group ($p = .03$) and the control group ($p = .01$). There was a significant increase in smoking in the suppression group from Week 2 to Week 3 ($p = .0001$) that did not occur in the expression group ($p = .13$) or the control group ($p = .53$).

Next, we investigated whether participants' stress ratings were affected by their mental control strategies across the 3 weeks. We conducted a mixed-model ANOVA with week as a within-subjects factor (Week 1 vs. Week 2 vs. Week 3), group as a between-subjects factor, and stress ratings as the dependent variable. Results indicated no main effect of week or group, $F < 1$, but there was a significant week-by-group interaction, $F(4, 164) = 2.85, p = .03, \eta_p^2 = .07$ (Fig. 2). Tests of simple main effects in the suppression condition indicated a significant rise in stress from Week 1 to Week 2 ($p = .03$), followed by a decrease in stress from Week 2 to Week 3 ($p = .001$). In contrast, stress levels of the expression and control groups did not change significantly across the weeks ($p > .10$ all cases).

One important question is whether the increased smoking in Week 3 reported by participants in the suppression group was mediated by increased stress in Week 2. To assess the feasibility of mediational analysis, we subtracted the number of

cigarettes smoked in Week 2 from the number smoked in Week 3 and correlated this difference score with self-reported Week 2 stress levels, separately for each condition (suppression vs. expression vs. control). All correlations were nonsignificant. This lack of association precluded mediational analysis, as stress cannot be a mediator if it is not associated with the dependent variable.

Discussion

Our results demonstrate that participants in the group that suppressed thoughts about smoking smoked more cigarettes the following week than participants in either the control group or the group that expressed thoughts about smoking. This behavioral rebound was observed for both male and female participants. Our findings strongly support our earlier work reporting postsuppression increases in eating behavior (Erskine, 2008) and extend the literature on thought suppression by demonstrating that suppressed thoughts can rebound behaviorally, in naturalistic contexts.

Another important finding was that during Week 2, the suppression group smoked less than the expression group and the control group, even though all participants were asked not to alter their behavior. This suggests that in the short term, suppression may be effective in reducing unwanted behavior. This may explain a troublesome aspect of thought suppression—that individuals perceive the strategy as beneficial. Thus, smokers attempting abstinence using thought suppression will probably first experience the intended reduction in smoking behavior (as suppression participants did in Week 2), but will also unwittingly trigger a subsequent increase in smoking. In addition, they are unlikely to infer the causal status of thought suppression because of the interval between thought suppression and its subsequent effects (Wegner, 2004).

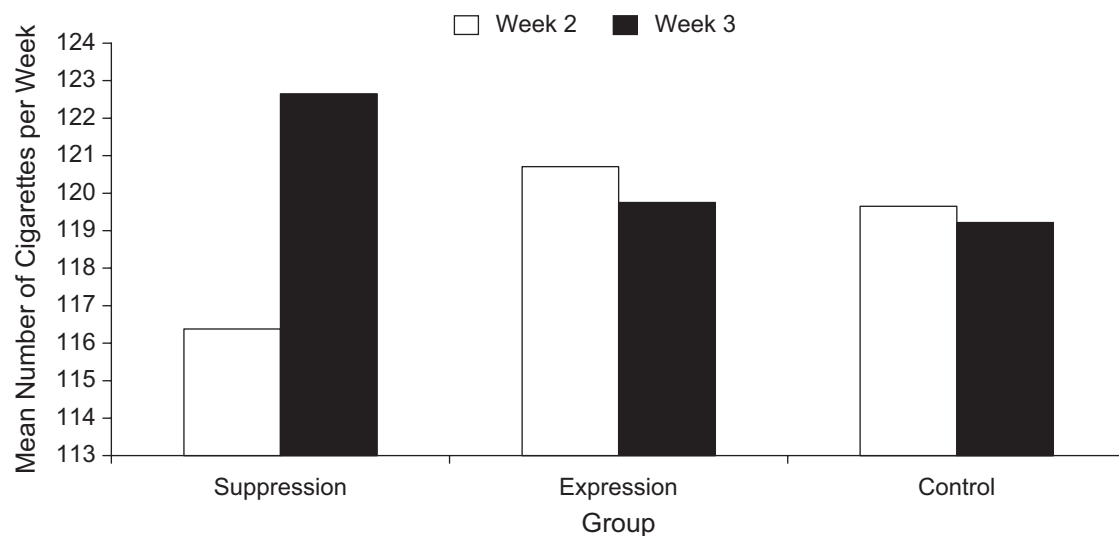


Fig. 1. Adjusted mean number of cigarettes smoked in Weeks 2 and 3 as a function of experimental group (suppression, expression, and control).

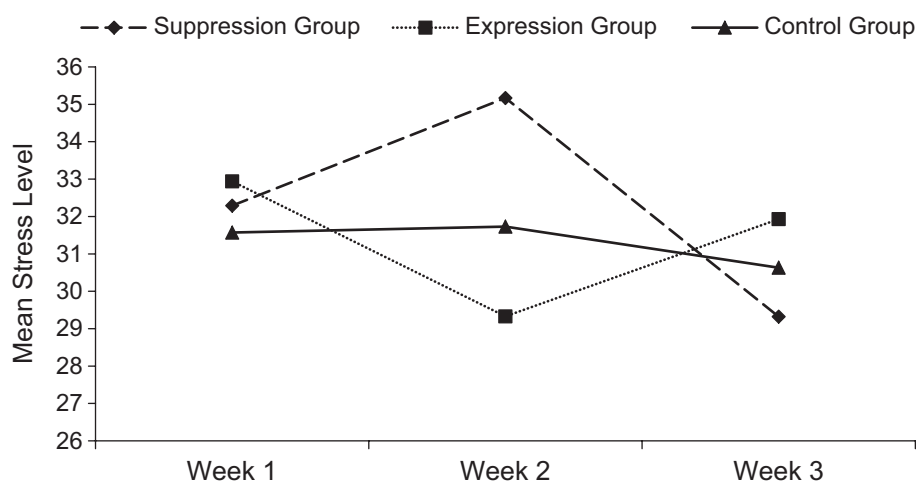


Fig. 2. Mean stress level as a function of week, for each experimental group (suppression, expression, and control).

Furthermore, in the suppression group, self-rated stress levels increased from Week 1 to Week 2 (active suppression) and then returned to baseline when suppression stopped in Week 3, a pattern indicating that suppression increases stress. This supports Trinder and Salkovskis's (1994) finding that participants who suppressed negative thoughts over 4 days demonstrated significantly more discomfort than groups that either focused on the thoughts or monitored thought occurrence. It is important to note that further analysis of the results we obtained demonstrated that the rise in stress scores in the suppression condition during Week 2 was not responsible for the increase in Week 3 smoking. Finally, our results showed a significant positive correlation between the number of times participants had tried to quit smoking and their WBSI scores, in agreement with the findings of Toll et al. (2001). This result links thought suppression with failure to quit smoking and has implications for smoking-cessation programs that recommend distraction and suppression (Myers, MacPherson, Jones, & Aarons, 2007; Rodgers et al., 2005). Instead, our results suggest that these programs should investigate the impact of thought suppression on outcomes and encourage alternative strategies.

The significance of our findings is emphasized by the fact that none of our participants was attempting to quit smoking during the study, even though the majority (70%) had previously tried to quit smoking at least once. We reasoned that if a behavioral rebound can be demonstrated in smokers who are not actively trying to quit, the effect should be stronger in those who are attempting to quit (Wegner et al., 1987). Furthermore, had we used a sample of participants in the process of attempting to quit smoking, these participants would have been using thought suppression, irrespective of experimental group (as found by Salkovskis & Reynolds, 1994), as well as other methods to quit smoking (nicotine-replacement therapy, pharmacotherapy, and psychotherapy), which would have further complicated the analysis. However, investigating behavioral rebound in smokers actively trying to quit smoking and

smokers who have never tried to quit would be an interesting avenue for research.

In summary, the suppression of thoughts related to unwanted behavior may have several consequences: One may think about the behavior more rather than less (Wegner et al., 1987), engage in the behavior more rather than less (Erskine, 2008), and feel as though the action was not intentionally completed (Wegner & Erskine, 2003). The results presented in this article, coupled with evidence from other research on this topic, suggest that thought suppression may be more harmful than previously believed. Our findings are especially relevant to populations that seek to control behaviors on an ongoing basis (e.g., addicts), but are also relevant to any individuals attempting to control their desires, thoughts, and behaviors.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Notes

1. As the number of cigarettes consumed was not normally distributed, these values were square-root-transformed before analyses. For clarity, untransformed means are reported. After transformation, three marginal outliers that did not change the results with removal were retained.
2. Because gender did not result in significant main or interaction effects, this factor was omitted from analyses.

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