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I suppress therefore I smoke:

Effects of thought suppression on smoking behavior.

James A. K. Erskine [1], George J. Georgiou [2], Lia Kvavilashvili [2]

[1] *Division of Mental Health, St George's, University of London*

[2] *School of Psychology, University of Hertfordshire, U.K.*

Correspondence to: Dr James Erskine

Division of Mental Health

St George's, University of London

6th Floor, Hunter Wing

Cranmer Terrace

London

SW17 ORE

UK

Email: JErskine@sgul.ac.uk

Phone: +44 [0] 208 725 2707

Fax: +44 [0] 208 725 3538

Abstract

Thought suppression is frequently reported by individuals trying to control their thoughts and behaviors. Although this strategy is known to increase unwanted thoughts, it is unclear whether it can also result in behavioral rebound. The present study investigated the effects of suppressing smoking thoughts in everyday life on the number of cigarettes subsequently smoked. Participants recorded daily cigarette intake and stress levels over 3-weeks. In Weeks 1 and 3, participants simply monitored intake and stress. In Week 2, in addition to monitoring, experimental groups either suppressed or expressed smoking thoughts and the control group continued monitoring. Results showed a clear behavioral rebound; the suppression group smoked significantly more in Week 3 than the expression or control groups. Moreover, the tendency to suppress thoughts measured by White Bear Suppression Inventory (Wegner & Zanakos, 1994) was positively related to the number of attempts to quit smoking. Implications for smoking cessation are discussed.

Keywords: Thought suppression, behavioral rebound, self-regulation, smoking

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Numerous studies have demonstrated that suppressing negative or even neutral thoughts can result in a subsequent rebound effect, whereby one ends up thinking about the suppressed thought more frequently than if s/he had not previously attempted suppression (Wegner, Schneider, Carter, & White, 1987). Despite considerable evidence of the ineffectiveness of thought suppression and its almost ubiquitously negative effects, it remains a widely used strategy (Wenzlaff & Wegner, 2000). Furthermore, people often use thought suppression in their attempts to control behavior (Baumeister, Heatherton, & Tice, 1994). For example, people attempting to stop smoking, are likely to avoid thinking about smoking. However, this strategy should increase smoking thoughts, making efforts to quit more difficult.

Indeed, Salkovskis and Reynolds (1994) had participants, attempting to reduce or give up smoking, suppress or monitor smoking thoughts. Suppression increased thoughts about smoking compared to monitoring. Similarly, 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 & Zanakos, 1994), was reliably higher in smokers than ex-smokers. However, these results do not suggest that thought suppression causes increased smoking, merely that it makes quitting harder. Therefore, the aim of the present study was to address the question of whether suppressing smoking thoughts can subsequently cause increased smoking.

Several studies have demonstrated that avoiding thoughts about a behavior can cause an increase in that behavior during active suppression (Wegner, Ansfield, & Pilloff, 1998; Wegner, Broome, & Blumberg, 1997). For example, participants suppressing thoughts of over-putting a golf-ball were more likely to over-putt if under simultaneous

load (Wegner et al., 1998). However, all instances of the behavior occurred during suppression rather than subsequently and involved concurrent loads.

Rebound during suppression under mental load links strongly with the proposed explanatory mechanism (Wegner's 1994 ironic process theory) that can account for thought and behavioral rebound. Wegner (1994) suggests that thought suppression involves two distinct processes: (i) an intentional operating process seeking distracter thoughts during suppression, and (ii) 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 spare mental capacity, one is often successful for a time. However, load compromises the intentional operating process, leaving the automatic monitor untouched as it is insensitive to capacity limitations, hence, the immediate rebound effect (Wenzlaff & Wegner, 2000). Critically, 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 Erskine (2008) has investigated the effects of suppression of thoughts about a behavior on the post-suppression performance of that same behavior. Erskine (2008) had non-dieting participants think aloud for five-minutes under three conditions (suppression or expression of chocolate thoughts, or monitoring only). Next, in an ostensibly unrelated task, participants tried two brands of chocolate and answered questions about them. Unbeknownst to participants, the variable of interest was the amount of chocolate consumed. Results indicated that males and females in the suppression group consumed significantly more chocolate than the control condition and, in the case of women, significantly more than the expression group. One possible reason for the stronger behavioral rebound in females is that women may be under greater societal/personal

pressure with regard to eating. Although Erskine (2008) excluded dieting participants, women may have been more likely to have dieted in the past than men, and their previous dieting history could have affected the outcome.

Despite demonstrating behavioral rebound, Erskine's (2008) study left several questions unanswered. Thus, 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 (days rather than minutes). In addition, Erskine did not examine the role of stress in behavioral rebound. Previous research has linked thought suppression to increased discomfort/stress and it is possible that rebound effects are at least partly mediated by enhanced stress. Therefore, the aim of the current study was to examine the effects of thought suppression on cigarette consumption in everyday life. We also studied the effects of thought suppression on self-reported stress and examined the effects of gender on behavioral rebound.

To address these questions, participants (all regular smokers) monitored their smoking behavior and stress levels over 3-weeks. In Weeks 1 and 3, all participants monitored intake and stress. However, in Week 2, in addition to monitoring, experimental groups either suppressed or expressed smoking thoughts and the control group simply continued monitoring. Participants also completed the WBSI (Wegner & Zanakos, 1994) before the study, allowing us to measure participants' pre-existing tendency for chronic thought suppression and whether it was related to the number of cigarettes smoked during the study or the number of previous attempts to quit smoking (e.g. see Toll et al. 2001).

If thought suppression causes behavioral rebound, the suppression group should smoke significantly more than the expression and control groups in Week 3. Furthermore, if suppression is related to increased discomfort (Trinder & Salkovskis, 1994), then Week 2 stress should rise, followed by a decrease in Week 3 for the suppression group, with no changes occurring in the expression and control groups. Also, if increased stress in the

Week 2 suppression condition is crucial for behavioral rebound, this should be confirmed by mediational analysis. Finally, given that gender effects are less obvious in smoking than dieting, we anticipated behavioral rebound in both males and females.

Method

Materials and Procedure

Participants were issued diaries to record daily cigarette intake and stress (0=not at all stressed, 100=highly stressed). At this stage, participants provided their gender, age, average number of cigarettes smoked per day, whether they liked smoking (1=not at all, 9=very much), whether cigarettes had positive effects (1=not at all, 9=many positive effects) or negative effects (1=not at all, 9=many negative effects) and the number of previous attempts to quit. Participants also completed the WBSI (Wegner & Zanakos, 1994) with higher scores indicating greater use of thought suppression (range 15-75).

All participants started recording on the same day. The day before, participants were contacted by telephone and email and instructed to record the number of cigarettes smoked and stress each day (last thing at night), but not to alter their smoking behavior in any way. On day one of Week 2, all participants were instructed to continue to smoke as they would normally, and record their cigarette use and stress. 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, the expression group were asked to try to think about smoking as frequently as they could during the week. Finally, on day one of Week 3, all participants were instructed to return to monitoring.

Participants

Ninety undergraduates, postgraduates and their acquaintances took part. All smoked at least 10 cigarettes per day for more than 12 months and had no current intention to quit. The final sample comprised 85 participants (42 males, 43 females, mean age 31.36; *SD*=11.46) as four left the study and one demonstrated insight into the hypotheses. There

were 30, 29 and 26 participants in the suppression, expression and control conditions, respectively. Participants were randomly allocated to groups.

Table 1 shows participants' mean scores on the variables collected before the study, as well as the mean number of cigarettes smoked and stress levels in Week 1, by group. One-way ANOVAs indicated that participants were not different on most variables. However, the expression group reported liking smoking more than suppression (p=.02) or control groups (p=.001), which did not differ (p=.09). Participants also differed on WBSI scores: although the expression and suppression groups were equivalent (p=.68), both had higher WBSI scores than the control group (p=.008 and p=.02, respectively). Despite these differences, liking for smoking and WBSI scores did not correlate with the number of cigarettes consumed or stress levels (all p's>.05 in all groups, in all three weeks), making it unnecessary to have them as co-variates in the analysis of variance 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 scores $r(85)$=.22, p=.05.

Results

Participants recorded the number of cigarettes smoked and stress each day of the 3-week period.[1] To examine any pre-existing group differences in Week 1, the number of cigarettes smoked in Week 1 was entered into a 3 group (suppression vs. expression vs. control) x 2 gender (males vs. females) between subjects ANOVA. There was a main effect of gender $F(1,79)$=8.89, p=.004, η^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, η^2=.06.

Despite no pre-existing group differences, the number of cigarettes smoked in Week 1 was significantly and positively correlated with cigarettes smoked in Weeks 2 and 3 in all groups (all r's>.93). Therefore, baseline cigarette consumption (Week 1) was entered as a

co-variate into a 3 group (expression, suppression, control) x 2 week (2 vs. 3) mixed ANOVA with the number of cigarettes smoked in Weeks 2 and 3 as the dependent variable.[2] Week 1 scores showed no significant interaction with group ($F<1$) indicating that the assumption of homogeneity of slopes was tenable and that the mixed ANCOVA was valid.

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

Next, we investigated whether participants' stress ratings were affected by their mental control strategies across the weeks. A mixed model ANOVA was conducted with week as a within subjects factor (1 vs. 2 vs. 3) and group as a between subjects factor on 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 $F(4,164)=2.85$, $p=.03$, $\eta^2=.07$ (Figure 2). Tests of simple main effects indicated a significant rise in stress from Week 1 to Week 2 in the suppression condition ($p=.03$), followed by a decrease from Week 2 to Week 3 ($p=.001$). In contrast, the expression and control groups stress did not change across weeks ($p>.10$ all cases).

One important question concerns whether increased Week 3 smoking in the suppression group was mediated by increased Week 2 stress. To assess the feasibility of

mediational analysis, we subtracted the number of cigarettes smoked in Week 2 from that of Week 3 and correlated this difference score with self-reported Week 2 stress, separately for each condition (suppression vs. expression vs. control). Correlations were all non-significant. This lack of association precludes mediational analysis as stress cannot be a mediator if it is not associated with the dependent variable.

Discussion

The present study demonstrated that participants suppressing thoughts about smoking subsequently smoked more cigarettes the following week, relative to groups that had been monitoring or expressing, and that this behavioral rebound was present in males and females. These findings strongly support work reporting post-suppression 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 and control groups even though all participants were asked not to alter their behavior. This suggests that in the short-term suppression may "work", leading to behavioral reductions. This highlights a troublesome aspect of thought suppression, that individuals perceive the strategy as beneficial. Thus, smokers attempting abstinence using thought suppression should first experience the intended reduction in smoking (as Week 2 suppression participants did), however, they would also unwittingly invite the Week 3 increase in smoking. In addition, they are unlikely to infer the causal status of thought suppression due to the interval between thought suppression and its subsequent effects (Wegner, 2004).

Furthermore, in the suppression group, self-rated stress rose from Week 1 to Week 2 (active suppression) and then returned to baseline when suppression stopped in Week 3, indicating that suppression increases stress. This supports Trinder and Salkovskis (1994), who found that participants suppressing negative thoughts over 4-days demonstrated

significantly more discomfort than groups either focusing on the thoughts or monitoring thought occurrence. Importantly, further analysis of the present results demonstrated that the rise in stress scores in the Week 2 suppression condition was not responsible for the increased Week 3 smoking. Finally, in line with Toll et al. (2001), results showed a significant positive correlation between the number of times participants tried to quit smoking and their WBSI scores. This 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, Corbett, Bramley, Riddell, Wills, Lin & Jones, 2005). Instead, our results suggest that these programs need to investigate the impact of thought suppression on outcomes, and encourage alternative strategies.

The significance of our findings is emphasised 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 at least once. The rationale was 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 (*cf*. Wegner et al., 1987). Furthermore, had we used a sample attempting to quit, participants would be using thought suppression irrespective of experimental group (as found by Salkovskis & Reynolds, 1994) as well as other methods (nicotine-replacement, pharmacotherapy and psychotherapy) further complicating the analysis. However, investigating behavioral rebound in smokers who actively try to quit and those who have never attempted quitting is an interesting avenue for research.

In summary, if thoughts related to behaviors are suppressed several consequences arise. First, one may think about the behavior more rather than less (Wegner et al., 1987). Second, one may engage in the behavior more rather than less (Erskine, 2008), and third, one may feel as though the action was not intentionally completed (Wegner & Erskine,

2003). The present results, coupled with converging related evidence, suggest that thought suppression may be more harmful than previously believed. It is especially relevant to populations seeking to control behaviors on an ongoing basis (addicts), but has relevance to anyone who has attempted to control their desires, thoughts and behaviors.

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Author note

James A. K. Erskine, St George's, University of London; George Georgiou, University of Hertfordshire; Lia Kvavilashvili, University of Hertfordshire.

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Correspondence should be addressed to James Erskine, St. George's, University of London, Cranmer Terrace, London, SW17 0RE, UK. Email: jerskine@sgul.ac.uk

Footnotes

[1] As the number of cigarettes consumed were non-normally distributed, they 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] Since gender did not result in significant main or interaction effects it was omitted from analyses.

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

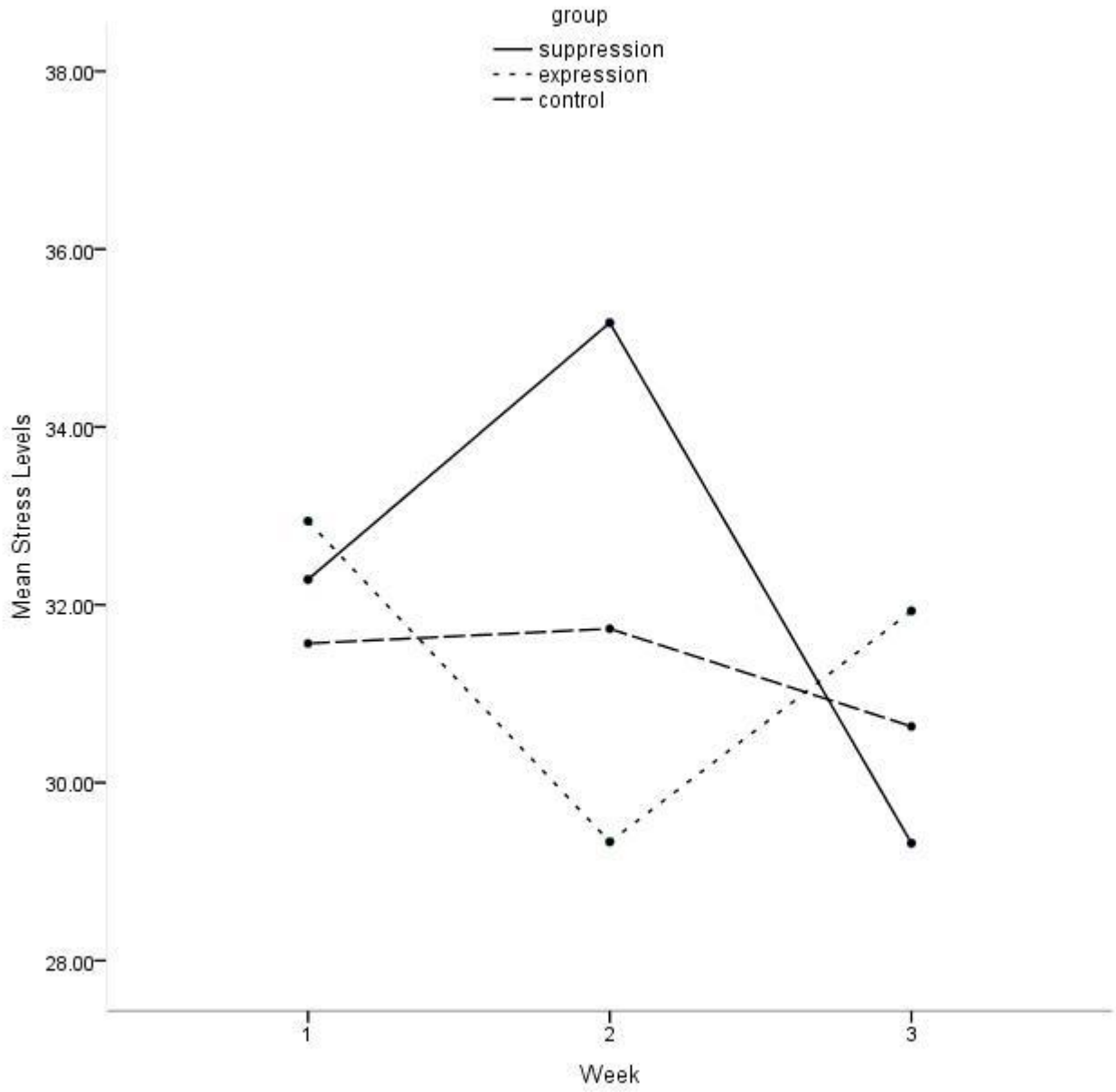

Figure 2 - Mean stress level as a function of week, for each experimental group (suppression, expression, and control).