


Effect of Suppressing Thoughts of Desire to Smoke on Ratings of Desire to Smoke and Tobacco Withdrawal Symptoms

SAGE Open
January-March 2015: 1–8
© The Author(s) 2015
DOI: 10.1177/2158244015572488
sgo.sagepub.com


James A. K. Erskine¹, David Rawaf¹, Sophie Grice¹,
and Michael Ussher¹

Abstract

Studies indicate that while suppressing smoking thoughts increases subsequent smoking, it may have no impact on desire to smoke. However, previous research has examined suppression of general smoking thoughts rather than thoughts specifically related to desire to smoke. The present study investigated whether suppression of thoughts of desire to smoke results in subsequently elevated ratings of desire to smoke. An experimental study examined the effects of suppressing thoughts of desire to smoke, versus expressing thoughts of desire to smoke, versus a control group thinking about anything, on ratings of desire to smoke and tobacco withdrawal symptoms at four time points (before manipulations, just after manipulations, 5 min after, 10 min after). In addition, effects of suppressing thoughts of desire to smoke on subsequent reports of thoughts of desire to smoke were examined. Suppressing the thoughts of desire to smoke caused thought rebound (i.e., greater subsequent reports of thoughts of desire to smoke). However, compared with control groups, this suppression did not elevate subsequent ratings of desire to smoke. Suppressing the thoughts of desire to smoke does not elevate subsequent ratings of this desire. Increased cigarette consumption following suppression of smoking thoughts may be mediated by mechanisms other than increased desire to smoke.

Keywords

smoking, tobacco, cravings, withdrawal, thought suppression

Introduction

Thought suppression (i.e., trying not to think about something) may cause a post-suppression rebound effect, whereby the individual comes to think about the to-be-avoided thought more often rather than less often (Clark, Ball, & Pape, 1991; Wegner, Schneider, Carter, & White, 1987). Furthermore, thought suppression may increase behavior associated with the suppressed thought (Erskine & Georgiou, 2011). For example, suppressing thoughts of food may increase subsequent food consumption (Erskine, 2008; Erskine & Georgiou, 2010).

Similarly, suppression of smoking thoughts can increase thinking about smoking (Salkovskis & Reynolds, 1994) and cigarette consumption (Erskine, Georgiou, & Kvavilashvili, 2010), and can make quitting more difficult (Toll, Sobell, Wagner, & Sobell, 2001). Erskine et al. (2010) postulated that suppression may exacerbate cigarette cravings, increasing desire to smoke and smoking behavior. Some studies have not found an association between thought suppression and increased smoking (Haaga & Allison, 1994; Nosen & Woody, 2009; Rogojanski, Vettese, & Antony, 2011a, 2011b).

However, these studies are limited in that they did not differentiate between suppressing thoughts of smoking specifically or other thoughts (Haaga & Allison, 1994; Nosen & Woody, 2009; Rogojanski et al., 2011a, 2011b). In addition, Litven, Kovacs, Hayes, and Brandon (2012) observed that both suppression and acceptance strategies were associated with less craving and affect compared with the controls. However, this study was limited as all experimental manipulations occurred in the presence of the to-be-avoided or accepted stimulus.

In a study examining the effects of frequency of suppressing smoking thoughts, Nosen and Woody (2013) revised the White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994), measuring everyday use of thought

¹St George's, University of London, UK

Corresponding Author:

James A. K. Erskine, Institute of Medical and Biomedical Education, St George's, University of London, 6th Floor, Hunter Wing, Cranmer Terrace, London, SW17 0RE, UK.
Email: JErskine@sgul.ac.uk



suppression to make a specific smoking measure (termed the *WBIS smoking version*, with two subscales—thought intrusion and suppression). The intrusion subscale and the overall scale were related to increased craving, smoking urges, and negative affect. The suppression subscale was related to greater use of distraction, reappraisal, punishment, and worry, but was not related to the urge to smoke or negative affect. Higher scores on the measure were found in quitting smokers relative to continuing smokers.

As the desire to smoke is a good predictor of smoking relapse (Allen, Bade, Hatsukami, & Center, 2008; Hughes, 2006; Killen & Fortmann, 1997; West & Grunberg, 1991; West, Hajek, & Belcher, 1989) and thought suppression is a common smoking cessation strategy (Nosen & Woody, 2013; Salkovskis & Reynolds, 1994; Toll et al., 2001), it is important to investigate whether suppression of smoking thoughts can lead to stronger subsequent desire to smoke, as theoretically this could increase relapse.

Despite the finding that suppressing smoking thoughts resulted in greater subsequent smoking (Erskine et al., 2010), a follow-up study demonstrated that suppressing smoking thoughts did not lead to increased desire to smoke, although participants did report greater hunger (Erskine et al., 2012). However, participants in the suppression condition were asked to suppress “their thoughts about smoking” rather than thoughts about their desire to smoke. Erskine and colleagues concluded that either thought suppression results in increased cigarette consumption without elevated desire to smoke or the specific content that is suppressed is critical to the elevation of this desire. The concept of desire to smoke is likely to be broader than mere thoughts about smoking. Therefore, to equate the desire for something with thought about it may miss important components of desire, such as more physiological signals and emotions (Kavanagh, Andrade, & May, 2005).

In view of these differences, it is significant that the previous study of Erskine et al. (2012) had participants suppress smoking thoughts and examine the effect on desire to smoke. It is possible that suppressing smoking thoughts elevates subsequent smoking thoughts but does not necessarily activate the emotional aspects of desire to smoke. Therefore, the present study was designed to extend Erskine et al.’s (2012) study by investigating whether suppression of “thoughts of the desire to smoke” leads to subsequently elevated desire to smoke or tobacco withdrawal symptoms, relative to groups either expressing the desire to smoke or thinking anything they wished. Furthermore, the present study aimed to investigate desire to smoke over several time points.

In addition, the study investigated several questionnaire measures thought to be associated with suppression of smoking thoughts and cravings. These were as follows: a general measure of the frequency of use of thought suppression, a measure of mindfulness, and a measure of how many participants attempt to restrain their smoking behavior.

It was predicted that suppression of thoughts of the desire to smoke would subsequently result in elevated ratings of desire to smoke and also a thought rebound, whereby participants would subsequently think of their desire to smoke more following suppression compared with the other conditions. These effects were hypothesized to occur at all later measurement points. Finally, it was predicted that general use of thought suppression would be related negatively to mindfulness (see Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) and positively to attempts to control smoking via a variety of means as measured by the Smoking Restraint Questionnaire (SRQ; Erskine et al., 2012), and that mindfulness would be negatively related to attempts to control smoking (SRQ).

Method

Participants

Participants were recruited via adverts in a large London teaching hospital medical school. Participants were aged 18 to 65 years, reported smoking ≥ 10 cigarettes per day for >1 year, had no intention to quit smoking in the immediate future, were not in psychiatric treatment, not pregnant, reported fluent English, and demonstrated an expired carbon monoxide (CO) reading of >8 parts per million (ppm). Participants received £10.

Measures

At baseline, participants provided demographic information and smoking history, including the Fagerström Test for Cigarette Dependence (FTCD, Fagerström, 2012; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The Mood and Physical Symptoms Scale (West & Hajek, 2004; West & Russell, 1985) was used to determine the dependent variables of desire to smoke and tobacco withdrawal symptoms. Desire to smoke was assessed by asking, “How strong is your desire to smoke right now?” The withdrawal symptoms assessed were irritability (i.e., How irritable do you feel right now?), depression, anxiousness, restlessness, difficulty concentrating, and hunger (in all cases, 1 = *not at all*, 4 = *somewhat*, to 7 = *extremely*). Several measures that have previously been related to thought suppression were included: The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) assessed awareness of the present moment (15 items, scale in each case: 1 = *almost never*, 6 = *almost always*). This scale has previously shown excellent reliability (Cronbach’s alphas of .86 and .87 in two separate samples) and shown very good convergent and divergent validity (Brown & Ryan, 2003). The WBSI (Wegner & Zanakos, 1994) assessed frequency of thought suppression in everyday life (15 items, 1 = *strongly agree*, 5 = *strongly disagree*). This scale has demonstrated excellent reliability (Cronbach’s alpha of between .87 and .89 across multiple samples) and

shown good convergent and divergent validity (Wegner & Zanakos, 1994). The SRQ (Erskine et al., 2012; reported Cronbach's $\alpha = .70$) assessed attempts to alter/reduce one's smoking behavior (seven items, Scale: 1 = *not at all/no attempts* to 5 = *very much so/on most days/more than 6 attempts*).

Procedure

Participants were tested individually and asked to smoke an hour before taking part. On arrival, they reported the time of their last cigarette. Anyone smoking within the past 30 min or more than 90 min ago was asked to return at another time to take part. Participants provided an expired CO reading using a Bedfont Smokerlyzer.

Participants were informed that they would be required to verbalize all of their thoughts out loud on several occasions and that they may be asked to actively think or not think of particular concepts. Participants were not informed that the aim of the study was to examine the effects of thought suppression on cravings. Participants provided written informed consent, and the study was approved by a local ethics committee.

After providing baseline data for demographic and smoking history, participants began the first thought verbalization task. The first period was a practice session where individuals were asked to verbalize all of their thoughts, on any topic, out loud for 3 min, while alone in the room. Next, participants reported their baseline ratings for desire to smoke and tobacco withdrawal symptoms.

They were then randomly allocated into one of three experimental conditions (suppression, expression, and control). Instructions were as follows:

Suppression group:

I would like you to continue speaking aloud your thoughts for a further five minutes, but this time please try to avoid thinking about your desire to smoke. Each time you think about your desire to smoke, please press the buzzer.

Expression group:

I would like you to continue speaking aloud your thoughts for a further five minutes, but this time please try to think about your desire to smoke. Each time you think about your desire to smoke, please press the buzzer.

Control group:

I would like you to continue speaking aloud your thoughts for a further five minutes. Once again there are no restrictions on what you might think about, but each time you think about your desire to smoke, please press the buzzer.

It is common in thought suppression studies to have participants press a buzzer every time they think of the concept

under study in all conditions, including the control group. This is to overcome issues involved in mentioning a concept (i.e., priming the concept) in some conditions and not others (see Erskine & Georgiou, 2010; Wegner et al., 1987).

Following the 5 min of thought verbalization, participants again provided ratings of their desire to smoke and withdrawal symptoms. To investigate the desire to smoke over time, there were two further periods of thought verbalization for 5 min each, when all participants followed the control instructions. Once again, after each verbalization period, participants completed measures of their desire to smoke and withdrawal symptoms.

Common to research on thought suppression buzzes and mentions of smoking desire that were not buzzed were totaled (by listening to the voice recordings of the verbalizations) in each 5-min period to calculate the total number of smoking desire thoughts (Wegner et al., 1987). In all experimental conditions, desire to smoke and withdrawal symptoms were rated at four times: immediately after the practice verbalization (baseline) and immediately after each of the three experimental verbalization periods. The session ended with participants completing the MAAS, WBSI, and SRQ.

Statistical Analysis

Statistical analyses used SPSS version 19 with mixed-model ANOVA techniques. In each analysis, the independent variable was the participant group (suppression vs. expression vs. control). If there were time-based measures (e.g., desire to smoke and withdrawal symptoms), repeated measures was used. Sex was included as a between-subjects variable in all analyses but as it demonstrated no main or interactional effects, it was omitted.

The present study also investigated the correlations between scores on the WBSI, SRQ, FTCD, MAAS, and the baseline measures of desire (see Table 1). In view of findings reporting that the WBSI may contain two subscales (Höping & de Jong-Meyer, 2003), we also investigated the pure thought suppression subscale reported by Höping and de Jong-Meyer (2003) and correlated it with other measures.

Results

Fifty-one smokers participated. Two participants were removed for failing to follow the experimental instructions by not suppressing in the suppression condition or expressing in the expression condition. Table 2 indicates that the groups were similar at baseline, except for irritability. Due to outliers, mean scores on buzzes were square root transformed; however, for ease of interpretation, raw mean scores are reported.

The first analysis examined whether participants had followed the instructions by calculating the frequency of thoughts of the desire to smoke during active suppression, expression, or monitoring. An ANOVA, using all

Table 1. Correlations Between Baseline Measures.

	Baseline D	C pday	FTCD	MAAS	SRQ	WBSI	WBSI TS
Baseline D	1						
C pday	-.15	1					
FTCD	.24	.36**	1				
MAAS	-.12	.07	.01	1			
SRQ	-.10	.07	.09	-.29*	1		
WBSI	.02	.03	-.15	-.60***	.45***	1	
WBSI TS	-.03	.01	-.13	-.49***	.32*	.81***	1

Note. Baseline D = baseline desire to smoke; C pday = average cigarettes per day; FTCD = Fagerström Test for Cigarette Dependence; MAAS = Mindful Attention Awareness Scale; SRQ = Smoking Restraint Questionnaire; WBSI = White Bear Suppression Inventory; WBSI TS = White Bear Suppression Inventory pure thought suppression (see Höping & de Jong-Meyer, 2003).

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2. Baseline Measures by Experimental Condition.

	Suppression (n = 18)	Expression (n = 16)	Control (n = 15)	Total (n = 49)
	F = 13, M = 5	F = 9, M = 7	F = 2, M = 13	F = 24, M = 25
Age	25.11 (10.43)	28.81 (15.32)	21.13 (3.04)	25.10 (11.14)
Cigarettes per day	11.56 (2.75)	13.12 (4.88)	11.20 (3.08)	11.96 (3.69)
Years of education	14.61 (2.40)	15.38 (2.36)	15.73 (2.02)	15.20 (2.28)
Minutes since last cigarette	33.89 (18.72)	32.13 (18.69)	27.33 (13.35)	31.31 (17.13)
CO (ppm)	13.28 (4.75)	12.25 (4.04)	10.33 (2.94)	12.04 (4.14)
FTCD	2.61 (1.14)	2.94 (1.00)	3.33 (1.88)	2.94 (1.38)
MAAS	46.11 (10.57)	55.44 (12.54)	46.93 (13.87)	49.50 (12.88)
SRQ	16.94 (3.49)	17.31 (3.81)	19.53 (7.27)	17.86 (5.05)
WBSI	53.33 (10.36)	48.81 (8.66)	50.67 (12.78)	51.04 (10.61)
Desire to smoke	2.83 (1.51)	2.31 (1.14)	2.47 (1.19)	2.55 (1.29)
Irritability	2.33 (1.33)	1.69 (0.87)	3.00 (1.77)	2.33 (1.44)
Depression	1.44 (0.71)	1.81 (1.05)	1.93 (1.22)	1.71 (1.00)
Anxiousness	1.89 (1.02)	1.88 (1.26)	1.80 (0.94)	1.86 (1.06)
Restlessness	2.50 (1.34)	2.19 (1.42)	2.87 (1.55)	2.51 (1.43)
Poor concentration	2.89 (1.53)	2.00 (0.73)	2.80 (1.70)	2.57 (1.41)
Hunger	2.22 (1.56)	2.37 (1.20)	3.13 (1.85)	2.55 (1.57)

Note. CO = carbon monoxide; FTCD = Fagerström Test for Cigarette Dependence; MAAS = Mindful Attention Awareness Scale; SRQ = Smoking Restraint Questionnaire; WBSI = White Bear Suppression Inventory.

three conditions, demonstrated a significant difference in the frequency of thoughts of the desire to smoke, $F(2, 46) = 6.29$, $p = .004$, $\eta^2 = .22$. The mean (SD) number of smoking desire thoughts by group were as follows: suppression = 4.94 (4.26), expression = 10.81 (7.42), think anything control = 6.27 (3.83). Planned comparisons demonstrated that the expression group had a greater frequency of smoking desire thoughts than the suppression ($p = .001$) and the “think anything” ($p = .03$) groups, but the suppression and “think anything” groups were not significantly different ($p = .26$). These findings show that participants followed the instruction. It is common in thought suppression studies for the suppression and control condition to have an equivalent frequency of thought, albeit significantly lower than the expression group (see Erskine & Georgiou, 2010).

The next analysis investigated scores on desire to smoke and withdrawal symptoms at the four times (see Table 3 for means). Mixed-model ANOVAs were conducted with the time of desire/withdrawal measurement as the within-subject factor and experimental group as the between-subjects factor. Desire to smoke demonstrated a main effect of time, $F(1.93, 88.78) = 29.23$, $p = .001$, $\eta^2 = .39$. Follow-up tests indicated that desire to smoke rose over time on average. Thus, desire at Time 1 was significantly lower than the desire at Times 2, 3, and 4 ($p < .001$ in all cases), but Times 2, 3, and 4 were not different. There was no time by group interaction ($F < 1$). Furthermore, there was no between-subjects effect of group ($F < 1$).¹

Results for the withdrawal symptoms using similar mixed-model ANOVAs were as follows. For irritability and

Table 3. Desire to Smoke and Intrusive Smoking Thoughts Over Time.

	Suppression (<i>n</i> = 18) F = 13, M = 5	Expression (<i>n</i> = 16) F = 9, M = 7	Control (<i>n</i> = 15) F = 2, M = 13
Desire to smoke			
Time 1 (baseline)	2.83 (1.51)	2.31 (1.14)	2.47 (1.19)
Time 2 (immediately after)	3.33 (1.61)	3.25 (1.13)	2.80 (1.08)
Time 3 (5 min after)	3.50 (1.51)	3.38 (1.26)	3.47 (1.46)
Time 4 (10 min after)	4.06 (1.59)	3.75 (1.44)	4.00 (1.51)
Intrusive smoking thoughts			
Time 1 intrusions (under manipulation)	4.94 (4.26)	10.81 (7.42)	6.27 (3.83)
Time 2 intrusions (think anything)	5.44 (3.37)	7.75 (7.04)	6.40 (3.91)
Time 3 intrusions (think anything)	9.61 (6.26)	5.56 (4.43)	6.47 (4.61)

depression, there was no main effect of time and no interaction of time and group. For anxiety, there was a main effect of time, $F(2.26, 103.78) = 3.76, p = .02, \eta^2 = .08$, but no time by group interaction. Follow-up tests indicated that anxiety rose over time with Time 1 being lower than Time 3 and Time 4 but not Time 2 ($p < .01$). For restlessness, there was a main effect of time, $F(2.26, 103.87) = 5.55, p = .004, \eta^2 = .11$, but no time by group interaction. Follow-up tests indicated that restlessness rose over time with Time 1 being lower than Time 3 and Time 4 but not Time 2 ($p < .05$). For poor concentration, there was a main effect of time, $F(2.6, 119.70) = 5.00, p = .004, \eta^2 = .10$. In addition, there was also an interaction between time and group, $F(5.21, 119.70) = 2.56, p = .03, \eta^2 = .10$. Follow-up tests indicated that the suppression and expression groups remained stable over time on poor concentration, but that the control group rose over time, with Time 4 being significantly above Times 1, 2, and 3 only in the control group ($p < .001$). For hunger, there was a main effect of time, $F(1.99, 91.57) = 10.91, p = .0001, \eta^2 = .19$, but no interaction of time and group. Follow-up tests indicated that Time 1 was below Time 3 and Time 4 ($p < .001$) but not different from Time 2.

Further analysis examined the number of desire to smoke thoughts reported during each 5-min verbalization period (see Table 3 for means). This was examined to assess whether thought rebound occurred. An ANOVA conducted on thought intrusions during the second verbalization period (when all participants were thinking anything they wished) indicated no main effect of group (previous suppression, expression, or control, $F < 1$). Another ANOVA conducted on intrusions during the third verbalization period (when all participants were again thinking anything they wished) indicated a main effect of group, $F(2, 46) = 2.91, p = .03, \eta^2 = .11$. The mean number of intrusions by group demonstrated that this was a thought rebound, thus prior suppression participants had a mean of 9.61 intrusions ($SD = 6.26$), expression participants had 5.56 ($SD = 4.43$), and the think anything group had 6.47 ($SD = 4.61$). Planned comparisons confirmed that the suppression group reported more smoking desire thoughts than the expression group ($p = .01$) or the think anything group ($p = .04$).

Correlations

There was no relationship between the use of thought suppression in everyday life (WBSI scores) and the desire to smoke at baseline ($r = .02$). The pure thought suppression subscale correlated with other measures similarly to the overall WBSI.

A significant negative relationship was found between the use of thought suppression (WBSI) and mindful awareness (MAAS scores, $r = -.60, p = .001$), whereas a significant positive relationship was found between the use of thought suppression (WBSI) and attempts to alter or reduce smoking (SRQ scores, $r = .45, p = .001$). Cronbach's alpha for the SRQ was .81.

In addition, we found significant low-to-moderate correlations between the number of desire thoughts reported by participants during the first verbalization period (when they were suppressing, expressing, or monitoring) and ratings of desire to smoke at baseline ($r = .32, p = .03$), immediately after ($r = .41, p = .004$), 5 min after ($r = .41, p = .004$), and 10 min after ($r = .33, p = .02$). Furthermore, smoking desire thoughts during the second and third 5-min verbalization periods (when all participants were monitoring their thoughts) were also significantly positively correlated with the desire to smoke ratings at all time points.

Discussion

The findings of the present study indicate that suppressing thoughts of desire to smoke leads to a thought rebound as indicated by elevated thinking about desire to smoke in the second verbalization period after the manipulation. The results also show that the group that suppressed thoughts of their desire to smoke did not subsequently report significantly greater ratings of desire to smoke, relative to the other groups. The latter findings are consistent with Erskine et al. (2012), which reported that suppressing the smoking thoughts in general did not result in elevated ratings of desire to smoke. Thus, it may be that suppression of either smoking thoughts in general or of thoughts of the desire to

smoke does not lead to increased desire. These findings suggest that the phenomenon whereby suppressing smoking thoughts leads to increased smoking (Erskine et al., 2010) cannot be explained due to an effect of thought suppression on the desire to smoke. These findings suggest that desire is not the same as simple thoughts of desire, as a thought rebound was in evidence in the suppression condition but this did not translate into ratings of greater desire to smoke in this group.

The observed lack of an effect on ratings of desire to smoke, while showing a rebound effect for thoughts of desire to smoke, may be because the rebound effect is specific; thus, when thoughts are suppressed, thoughts are subsequently increased. However, desire to smoke includes more than thoughts about desire to smoke (e.g., it may include non-cognitive elements such as physiological cravings or affective components; Kavanagh et al., 2005; Kuhl, 1987; Shiffman, West, & Gilbert, 2004). Therefore, the specifically cognitive task of suppressing thoughts of desire to smoke may be insufficient to result in a rebound effect for ratings of desire. There were significant low-to-moderate positive correlations between thoughts of desire to smoke and ratings of the desire to smoke at all time points, ranging from $r = .27$ to $r = .42$. This supports thinking of desire as a component of ratings of actual desire, however ratings of desire may assess elements beyond the cognitive.

The findings confirm reports (Baer et al., 2006; Erskine et al., 2012) of the strong negative relationship between WBSI and MAAS scores ($r = -.60$, $p < .001$). In view of the observation that mindful interventions are effective for reducing cigarette cravings (Bowen & Marlatt, 2009; Cropley, Ussher, & Charitou, 2007; Ussher, Cropley, Playle, Mohidin, & West, 2009), the negative relationship between mindfulness and thought suppression suggests that suppression could potentially be detrimental to smoking cessation. Furthermore, a direct comparison of thought suppression and mindfulness intervention in smokers demonstrated that while both strategies resulted in a significant reduction in smoking, only the mindfulness condition reduced negative affect, depressive symptoms, and nicotine dependence scores (Rogojanski et al., 2011a). These findings mirror the results of Erskine et al. (2010) who also demonstrated a significant reduction in smoking behavior during active suppression of smoking thoughts.

In line with studies suggesting that the WBSI measures both a tendency to suppress thoughts and thought intrusions (Höping & de Jong-Meyer, 2003; Nosen & Woody, 2009), the present study also used the previous subscale of Höping and de Jong-Meyer (2003) purporting to measure pure thought suppression. However, this measure did not correlate any differently with the other measures than found for the overall WBSI. Furthermore, the correlation between the subscale for intrusion and the subscale for thought suppression was above .60, suggesting that they may be similar concepts.

There were several limitations of this study. First, the sample comprised mostly young smokers limiting generalizability, and participants were only abstinent for 1 hr prior to taking part. It is possible that longer abstinence prior to taking part may have led to significant effects of suppressing the desire to smoke on subsequent desire, as with a longer period of abstinence, one might anticipate more intrusive thoughts regarding the desire to smoke. At baseline, the mean (*SD*) desire to smoke in the present study was 2.55 (1.29) on the 0- to 7-point scale. Previous research using the same rating scale following 15 hr of abstinence reported mean (*SD*) baseline desire to smoke of 5.6 (1.3) (Taylor, Katomeri, & Ussher, 2005). Thus, the absence of the predicted effect on ratings of desire to smoke may be partly due to the short period of abstinence; in light of this limitation the findings must be treated with caution.

In summary, this study did not demonstrate significant elevations in ratings of desire to smoke as a result of suppressing thoughts of desire to smoke. However, it did demonstrate a thought rebound, whereby suppressing thoughts of the desire to smoke resulted in greater subsequent thoughts of desire. Furthermore, once again mindfulness and thought suppression were strongly negatively related. The findings suggest that while suppressing desire can lead to greater subsequent thoughts of desire, it may not necessarily translate to greater subsequent ratings of desire to smoke. However, in light of previous evidence showing that suppressing smoking thoughts increases subsequent smoking (Erskine et al., 2010), thought suppression remains a potentially detrimental strategy for smoking cessation.

Note

1. As scores on irritability had differed significantly between the groups at baseline and Mindful Attention Awareness Scale (MAAS), scores narrowly missed differing significantly at baseline, these were entered as covariates and the ANOVA reported above was re-run. Adding these covariates resulted in no changes to the overall results, and therefore, the original ANOVA without covariates was accepted.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research and/or authorship of this article: This work was supported by St. George's, University of London internal funding.

References

- Allen, S. S., Bade, T., Hatsukami, D., & Center, B. (2008). Craving, withdrawal, and smoking urges on days immediately prior to smoking relapse. *Nicotine & Tobacco Research*, 10, 35-45. doi:10.1080/14622200701705076

- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13, 27-45. doi:10.1177/1073191105283504
- Bowen, S., & Marlatt, G. A. (2009). Surfing the urge: Brief mindfulness-based intervention for college student smokers. *Psychology of Addictive Behaviours*, 23, 666-671. doi:10.1037/a0017127
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84, 822-848. doi:10.1037/0022-3514.84.4.822
- Clark, D. M., Ball, S., & Pape, D. (1991). An experimental investigation of thought suppression. *Behaviour Research and Therapy*, 29, 253-257.
- Cropley, M., Ussher, M., & Charitou, E. (2007). Acute effects of a guided relaxation routine (body scan) on tobacco withdrawal symptoms and cravings in abstinent smokers. *Addiction*, 102, 989-993. doi:10.1111/j.1360-0443.2007.01832.x
- Erskine, J. A. K. (2008). Resistance can be futile: Investigating behavioural rebound. *Appetite*, 50, 415-421. doi:10.1016/j.appet.2007.09.006
- Erskine, J. A. K., & Georgiou, G. (2010). Effects of thought suppression on eating behaviour in restrained and non-restrained eaters. *Appetite*, 54, 499-503. doi:10.1016/j.appet.2010.02.001
- Erskine, J. A. K., & Georgiou, G. (2011). Thoughts on suppression: How trying not to think of an action might lead you down that very path. *The Psychologist*, 24, 824-827. Retrieved from http://www.thepsychologist.org.uk/archive/archive_home.cfm?volumeID=24&editionID=207&ArticleID=1945
- Erskine, J. A. K., Georgiou, G., & Kvavilashvili, L. (2010). I suppress therefore I smoke: The effects of thought suppression on smoking behaviour. *Psychological Science*, 21, 1225-1230. doi:10.1177/0956797610378687
- Erskine, J. A. K., Ussher, M., Cropley, M., Elgindi, A., Zaman, M., & Corlett, B. (2012). Effect of thought suppression on desire to smoke and tobacco withdrawal symptoms. *Psychopharmacology*, 219, 205-211. doi:10.1007/s00213-011-2391-4
- Fagerström, K. (2012). Determinants of tobacco use and renaming the FTND to the Fagerstrom Test for Cigarette Dependence. *Nicotine & Tobacco Research*, 14, 75-78. doi:10.1093/ntr/ntr1371
- Haaga, D. A., & Allison, M. L. (1994). Thought suppression and smoking relapse: A secondary analysis of Haaga (1989). *British Journal of Clinical Psychology*, 33, 327-331. doi:10.1111/j.2044-8260.1994.tb01128.x
- Heatherston, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K. O. (1991). The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction*, 86, 1119-1127. doi:10.1111/j.1360-0443.1991.tb01879.x
- Höping, W., & de Jong-Meyer, R. (2003). Differentiating unwanted intrusive thoughts from thought suppression: What does the White Bear Suppression Inventory measure? *Personality and Individual Differences*, 34, 1049-1055. doi:10.1016/S0191-8869(02)00089-2
- Hughes, J. R. (2006). Clinical significance of tobacco withdrawal. *Nicotine & Tobacco Research*, 8, 153-156. doi:10.1080/146222005004948856
- Kavanagh, D. J., Andrade, J., & May, J. (2005). Imaginary relish and exquisite torture: The elaborated intrusion theory of desire. *Psychological Review*, 112, 446-467. doi:10.1037/0033-295X.112.2.446
- Killen, J. D., & Fortmann, S. P. (1997). Craving is associated with smoking relapse: Findings from three prospective studies. *Experimental and Clinical Psychopharmacology*, 5, 137-142. doi:10.1037/1064-1297.5.2.137
- Kuhl, J. (1987). Action control: The maintenance of motivational states. In F. Halisch & J. Kuhl (Eds.), *Motivation, intention and volition* (pp. 279-291). New York, NY: Springer-Verlag.
- Litven, E. B., Kovacs, M. A., Hayes, P. L., & Brandon, T. H. (2012). Responding to tobacco craving: Experimental test of acceptance versus suppression. *Psychology of Addictive Behaviours*, 26, 830-837. doi:10.1037/a0030351
- Nosen, E., & Woody, S. R. (2009). Applying lessons learned from obsessions: Metacognitive processes in smoking cessation. *Cognitive Therapy and Research*, 33, 241-254. doi:10.1007/s10608-007-9180-8
- Nosen, E., & Woody, S. R. (2013). Development and initial validation of the White Bear Suppression Inventory (Smoking Version). *Nicotine & Tobacco Research*, 15, 1155-1160. doi:10.1093/ntr/nts251
- Rogojanski, J., Vettese, L. C., & Antony, M. M. (2011a). Coping with cigarette cravings: Comparison of suppression versus mindfulness-based strategies. *Mindfulness*, 2, 14-26. doi:10.1007/s12671-010-0038-x
- Rogojanski, J., Vettese, L. C., & Antony, M. M. (2011b). The role of sensitivity to anxiety symptoms in responsiveness to mindfulness versus suppression strategies for coping with smoking cravings. *Journal of Clinical Psychology*, 67, 439-445. doi:10.1002/jclp.20774
- Salkovskis, P. M., & Reynolds, M. (1994). Thought suppression and smoking cessation. *Behavior Research and Therapy*, 32, 193-201. doi:10.1016/0005-7967(94)90112-0
- Shiffman, S., West, R. J., & Gilbert, D. G. (2004). Recommendation for the assessment of tobacco craving and withdrawal in smoking cessation trials. *Nicotine & Tobacco Research*, 6, 599-614. doi:10.1080/14622200410001734067
- Taylor, A. H., Katomeri, M., & Ussher, M. (2005). Acute effects of self-paced walking on urges to smoke. *Psychopharmacology*, 181, 1-7. doi:10.1007/s00213-005-2216-4
- Toll, B. A., Sobell, M. B., Wagner, E. F., & Sobell, L. C. (2001). The relationship between thought suppression and smoking cessation. *Addictive Behaviour*, 26, 509-515. doi:10.1016/S0306-4603(00)00140-4
- Ussher, M., Cropley, M., Playle, S. L., Mohidin, R., & West, R. (2009). Effects of isometric exercise and body scanning on cigarette cravings and withdrawal symptoms. *Addiction*, 104, 1251-1257. doi:10.1111/j.1360-0443.2009.02605.x
- Wegner, D. M., Schneider, D. J., Carter, S., & White, T. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, 53, 5-13. doi:10.1037/0022-3514.53.1.5
- Wegner, D. M., & Zanakos, S. (1994). Chronic thought suppression. *Journal of Personality*, 62, 615-640. doi:10.1111/j.1467-6494.1994.tb00311.x

- West, R., & Grunberg, N. E. (1991). Implications of tobacco use as an addiction. *British Journal of Addiction*, 86, 485-488. doi:10.1111/j.1360-0443.1991.tb01794.x
- West, R., & Hajek, P. (2004). Evaluation of the mood and physical symptoms scale (MPSS) to Assess cigarette withdrawal. *Psychopharmacology*, 177, 195-199. doi:10.1007/s00213-004-1923-6
- West, R., Hajek, P., & Belcher, M. (1989). Severity of withdrawal symptoms as a predictor of outcome of an attempt to quit smoking. *Psychological Medicine*, 19, 981-985. doi:10.1017/S0033291700005705
- West, R., & Russell, M. A. (1985). Pre-abstinence smoke intake and smoking motivation as predictors of severity of cigarette withdrawal symptoms. *Psychopharmacology*, 87, 334-336. doi:10.1007/BF00432717

Author Biographies

Dr James Erskine is senior lecturer in Psychology and Behavioural Medicine at St George's Medical School London.

Mr David Rawad is a graduate from St George's with a BSc (Hons) in Biomedical Sciences and is currently there studying final year medicine.

Ms Sophie Grice is a former BSc (Hons) Biomedical Sciences student at St George's, University of London.

Prof. Michael Ussher, Professor of Behavioural Medicine, conducts randomised controlled trials, surveys and experimental studies relating to smoking cessation, physical activity promotion and mindfulness-based interventions.