Rebound Effects of Thought Suppression: Instruction-Dependent?

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Previous studies have shown that when normal subjects are instructed to think of a white bear ("forced" expression instructions), they do so more frequently when they have previously suppressed the thought of a white bear than when they have not suppressed this thought. It has been proposed that this rebound effect of thought suppression provides a laboratory model for the development of real-life obsessions. The present studies were undertaken in order to explore further the tenability of this model. Rebound effects were evaluated when more "liberal" expression instructions ("you might think of a white bear, but you don't have to") were used. In Experiment 1, no evidence was obtained to suggest that suppression results in a heightened frequency and/or accelerated rate of white bear thoughts during a subsequent expression period (with "liberal" instructions). Interestingly, initial suppression lead to an immediate and stable increase of thought related electrodermal fluctuations. In Experiment 2, it was found that successful suppressors (few target thoughts during suppression) report fewer white bear thoughts during expression (with "liberal" instructions) than unsuccessful suppressors (many target thoughts during suppression). Assuming that the ecological validity of "liberal" expression instructions is greater than that of "forced" instructions, the present findings cast doubt on the claim that the rebound effect mimics the etiology of obsessions. The findings also suggest that it may be the immediate counter-productive effects of suppression that are relevant to theories concerned with obsessions.

Introduction

Although recent years have seen advances in the treatment of obsessive cognitions (e.g., Salkovskis and Westbrook, 1989), the etiology of obsessions remains uncertain. The notion that obsessions are covert conditioned stimuli that have acquired negative valence through prior association with aversive events appears to be untenable because obsessions can
arise in the absence of a conditioning history (i.e., without exposure to a traumatic event; Emmelkamp, 1982; Rachman and Hodgson, 1980). It is of interest to note that several investigators have observed that clinical obsessions do not differ in content from negative intrusive thoughts that are reported by a vast majority of the normal population (Rachman and de Silva, 1978; Salkovskis and Harrison, 1984). Characteristics that do differentiate abnormal from normal obsessions are “resistance” and frequency: obsessional patients report a strong resistance to and a high frequency of intrusive thoughts, whereas normals do not (e.g., Salkovskis and Harrison, 1984). This finding may be relevant for understanding the origins of clinical obsessions: a possibility is that resistance to intrusions may itself result in a high frequency of intrusions. Referring to a phenomenon termed “rebound effect of thought suppression”, Wegner (1988, 1989; Wegner, Schneider, Carter and White, 1987) argued that suppression (i.e., resistance) does indeed result in obsession. The experimental paradigm employed by Wegner and colleagues consists of a “suppression” and an “expression” condition. In the former, normal subjects have to suppress the thought of a white bear during a five minute period. In the latter, subjects are asked “to try to think of a white bear” during a five-minute period. Subjects are instructed to ring a bell whenever the thought of a white bear comes to mind. Half of the subjects first receive suppression and then expression instructions (initial suppression group). For the other half, instructions are given in the reverse order (initial expression group).

With this paradigm, Wegner and associates repeatedly documented that during expression, the initial suppression group thinks more often about a white bear (as indexed by the number of bell rings) than does the initial expression group. Wegner et al. (1987; Experiment 1, Experiment 2) also found that the frequency of white bear thoughts of the initial suppression group increases during the expression period, i.e., follows an accelerative course, whereas that of the initial expression group decreases during expression. Evidence further suggests that these rebounds of suppression are especially strong in those subjects who are the better suppressors (during initial suppression). As for the theoretical interpretation of the rebound Wegner (1988) argues that in the process of suppression, environmental distracters as well as irrelevant thoughts are associatively linked to the thought of a white bear. During subsequent expression, these distracters now become “new reminders of white bear” (p. 693) and, consequently, raise the frequency of white bear thoughts. Wegner and colleagues (1987) claim that experimentally induced rebound effects of suppression form a laboratory analogue to real-life obsessions (see also Wegner, 1989).
Experiment 1

Given the potential relevance of the rebound effect for theories concerned with the etiology and treatment of obsessions (e.g., "thought stopping techniques" vs "taped habituation"; Salkovskis and Westbrook, 1989; Salkovskis, 1989), the first study sought to replicate and extend the findings of Wegner and associates. More specifically, the following issues were examined. Firstly, do rebound phenomena occur when more "liberal" expression instructions are used? In the expression condition of Wegner et al., subjects were explicitly requested "to try to think of a white bear". Yet, in real life, obsessive individuals are not requested to try and produce obsessions. Consequently, the conditions under which rebound effects have been observed are rather artificial. Therefore, one aim of the present study was to see whether rebound phenomena (i.e., increased total number of white bears and/or accelerative rate of white bear thought frequency following suppression) would emerge under clinically more relevant conditions, i.e. with "liberal" expression instructions ("in the next five minutes, think about anything you want; you might think of the white bear, but you don't have to").

Secondly, does suppression result in intrusion-linked phasic autonomic activity (measured in terms of skin conductance)? Previous studies have shown that one important characteristic of obsessions is their discomfort-eliciting nature which is reflected in all sorts of psychophysiological measures (e.g., Rachman and Hodgson, 1980). Recently, Wegner, Shortt, Blake and Page (1990, Experiment 1) found that in normal subjects, suppression of exciting ("sex") but not of neutral ("dancing") topics led to an increase in tonic electrodermal activity (skin conductance level; SCL). From this the authors concluded that suppression per se does not produce heightened autonomic activity. It may well be, however, that physiological indices of suppression are primarily reflected in short-term phasic responses (e.g., "spontaneous" or "non-specific" electrodermal responses).

Method

Subjects

The subjects were 34 healthy undergraduate volunteers (18 women, 16 men). Their mean age was 23.7 years (range 18–38 years). They participated in the experiment in return for a small financial reward. Subjects were told that the experiment was concerned with sweat gland activity during rest.
Non-specific skin conductance responses were measured with two Beckman Ag-AgCl electrodes (diameter 8 mm) placed on the medial phalanges of the subject's second and third finger (non-dominant hand) by means of adhesive collars. The electrodes were filled with isotonic paste and connected to a Beckman Skin Conductance Coupler (type 9844). Although somewhat misleading, the term "non-specific (spontaneous) skin conductance response" (NSCR) is widely used to refer to electrodermal deflections occurring in the absence of external stimulation (Stern, Ray and Davis, 1980). There are reasons to assume that NSCRs originate from internal stimulation, i.e., from salient, emotion-laden cognitions (Hassett, 1978; Nikula, 1988).

Respiration was measured with a respiration belt fastened around the subject's chest. The respiration belt was connected to a Beckman Voltage/Pulse/Pressure Coupler. Respiration was used to help to identify electrodermal deflections due to respiratory artifacts.

NSCRs and respiration were continuously recorded on paper (5 mm/sec) by a Beckman Polygraph (type R711). Subjects held a Beckman event marker (diameter approximately 3 cm; Length approximately 5 cm) in their dominant hand. They were instructed to push the button of the event marker whenever they thought of a white bear. The event marker was connected to the polygraph.

The experiment was conducted according to a 2 (group) × 2 (condition) factorial design. The first factor was a between-subjects factor. Half of the subjects were first given suppression and then expression instructions (initial suppression group). For the other half, the order of the instructions was reversed (initial expression group). The condition factor was a within-subjects factor: all subjects received both types of instructions. As the primary aim of the present study was a replication of the Wegner et al. (1987) findings, the design stayed as close as possible to the one used by Wegner and associates. It should be noted, however, that this design is far from ideal (Lavy and van den Hout, 1990). For example, with this design, order-effects are hard to control for (see below).

Upon arrival in the laboratory, subjects were asked to sit down in a comfortable chair which was placed in a soundproof and dimly lit chamber. The recording apparatus was placed in an adjacent room. After the electrodermal recording sites had been cleaned with distilled water, electrodes and respir-
ation belt were attached. The subject was then asked to hold the event marker in his/her dominant hand and to relax for the next five minutes. The experimenter left the room and calibrated the recording apparatus. After five minutes, the experimenter re-entered the room and instructed the subject. Half of the subjects were given suppression instructions (initial suppression group): “In the next five minutes, please think about anything that comes to mind. There is one exception; please, try not to think of a white bear. Every time the white bear nevertheless comes to mind, please press the button of the event marker”. The other half of the subjects received expression instructions as follows: “In the next five minutes, think about anything you want; you might think of a white bear, but you don’t have to. If you happen to think about a white bear, please press the button of the event marker”. After this five-minute period, the instructions were reversed. Thus, the initial suppression group now received expression instructions, whereas the initial expression group received suppression instructions. Finally, subjects were debriefed and paid.

Response definition and analysis

The number of white bear thoughts was measured by counting event marks on the polygraph chart. For each period (suppression and expression), white bear thoughts were summed. The differences between the two groups were evaluated with a 2 (groups) × 2 (condition) analysis of variance (ANOVA). In order to examine whether the initial suppression group was characterized by an accelerative pattern of white bear thoughts during expression, data were subjected to a 2 (groups) × 5 (minutes) ANOVA, with the last factor having repeated measures.

Electrodermal data were measured in micromho and scored by hand. An electrodermal deflection was regarded as a NSCR when it exceeded the value of 0.05 micromho within 2 seconds and when it was not due to respiratory irregularities (Stern et al., 1980). A NSCR was said to be related to a white bear thought when it occurred 5 seconds prior to an event mark. NSCRs that occurred up to 5 seconds after a white bear mark were disregarded because they might be attributed to motor activity (i.e., pressing the event mark). NSCR data were analysed in two steps. First, it was examined whether there were pre-experimental differences in SCL or differences in the frequency of non-white bear related NSCRs between the initial suppression and the initial expression group. Second, percentages of white bear thoughts preceded by a NSCR were computed and evaluated by a 2 (group) × 2 (condition) ANOVA.
Results

White bear thoughts

Due to apparatus failure, the record of one subject had to be excluded from data analyses, leaving 17 subjects in the initial suppression and 16 subjects in the initial expression group. Table 1 shows the mean number of white bear thoughts of both groups during suppression and expression. A 2 (group) × 2 (condition) ANOVA yielded no significant main effects of group \[F (1,31) = 2.10, p = 0.15\] or period \[F (1,31) <1\]. Most importantly, the interaction of group with condition failed to reach significance \[F (1,31) <1.0\]. Furthermore, a t-test indicated that during expression, the initial suppression group did not report significantly more white bear thoughts than the initial expression group \[t (31) = 1.3, p = 0.10,\ one-tailed\].

<table>
<thead>
<tr>
<th></th>
<th>Suppression</th>
<th>Expression</th>
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<tbody>
<tr>
<td>Initial suppression</td>
<td>9.9 (6.0)</td>
<td>10.1 (6.0)</td>
</tr>
<tr>
<td>Initial expression</td>
<td>6.7 (7.1)</td>
<td>7.4 (5.8)</td>
</tr>
</tbody>
</table>

Figure 1 shows the mean number of white bear thoughts during expression. As can be seen, there was no accelerative course of white bear thoughts over minutes in the initial suppression group. A 2 (group) × 5 (minutes) ANOVA revealed neither a significant main effect of group \[F (1,31) = 1.70, p = 0.20\], nor a significant interaction of group with minutes \[F (4,124) <1.0\]. The only effect reaching significance was a main effect of minutes \[F (4,124) = 6.4, p <0.05\], which was caused by an overall decline in white bear thoughts over time. Negative results (i.e., a non-significant effect of group or non-significant interaction effect of group × minutes) were obtained when: 1. the mean number of white bear thoughts during suppression was entered as a covariate in a 2 (group) × 5 (minutes) ANOVA; 2. the number of white bear thoughts during expression was square-root transformed (Wegner et al., 1987) and then subjected to a 2 (group) × 5 (minutes) ANOVA; 3. a trend-analysis was performed, i.e., group × minutes interactions were broken down in orthogonal trends (linear, quadratic etc).
Electrodermal data

Due to apparatus failure, the records of 5 subjects had to be excluded from the data analysis. The two groups did not differ with regard to pre-experimental electrodermal levels (SCLs). That is, the initial suppression \((n = 15)\) and initial expression \((n = 14)\) groups had comparable SCLs at the start of the experiment, the means being \(3.6 (SD = 2.0)\) and \(3.5 (SD = 2.3)\) micromho, respectively \([t (27) < 1]\). Furthermore, the two groups did not differ significantly with respect to the frequency of NSCRs that were unrelated to the target thought. For example, during the expression period, the initial suppression group had a mean of \(10.3 (SD = 7.1)\) unrelated NSCRs and the initial expression group had a mean of \(6.7 (SD = 7.0)\) unrelated NSCRs \([t (27) = 1.3, p = 0.11, \text{two-tailed}]\). Thus, it seems fair to conclude that there were no \textit{a priori} differences between the groups in phasic or tonic electrodermal activity.

Table 2 shows the percentage of white bear thoughts that were preceded by a NSCR: A \(2 (\text{group}) \times 2 (\text{condition})\) ANOVA revealed a main effect
of group \[ F(1, 27) = 6.95, \ p < 0.05 \]: white bear thoughts in the initial suppression group were more often preceded by a NSCR than those in the initial expression group. No further effects reached significance.

**TABLE 2.** Percentage of pertinent thoughts that were preceded by a non-specific spontaneous fluctuation in the initial suppression \((n = 15)\) and the initial expression \((n = 14)\) group

<table>
<thead>
<tr>
<th></th>
<th>Suppression</th>
<th>Expression</th>
</tr>
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<tbody>
<tr>
<td>Initial suppression</td>
<td>56</td>
<td>40</td>
</tr>
<tr>
<td>(45)</td>
<td>(29)</td>
<td></td>
</tr>
<tr>
<td>Initial expression</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>(27)</td>
<td>(27)</td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

To summarize the data presented above, for the number of white bear thoughts the critical group \( \times \) period interaction did not reach significance. In addition, no evidence was obtained to suggest that during the expression period, the frequency of white bear thoughts of the suppression group followed an accelerative course. Thus, it appears that with "liberal" expression instructions ("think of anything you want; you might think of a white bear, but you don’t have to"), thought suppression does not result in a rebound effect during subsequent expression.

Although white bear-related NSCRs did not show a rebound effect in the sense of Wegner *et al.* (1987), the two groups did differ with respect to this index of phasic reactivity. Throughout both conditions, the initial suppression group had more electrodermal fluctuations that preceded the target than the initial expression group. Admittedly, because of the asymmetrical change-over procedure used in this experiment, the difference in phasic reactivity preceding the target thought is difficult to interpret. One could argue, for example, that this result is caused by a difference in general reactivity between the two groups. Yet, the fact that the two groups did not differ in SCLs at the start of the experiment or in unrelated NSCRs throughout the experiment makes this view less plausible. An alternative view is that suppression makes the target thought salient which is reflected in a permanently heightened frequency of related NSCRs. On the other hand, initial expression might lead to semantic satiation (Smith, 1984) which, in its turn, reduces the impact of consequent suppression.

**Experiment 2**

Because of the small sample sizes, the precise relationship between the amount of thought suppression and the frequency of pertinent thoughts during expression could not be examined in Experiment 1. Wegner (1988)
claimed to have shown that "those subjects who were the better suppressors at first were found to be more expressive later on" (p. 692). What this suggests is that successful suppression results in a heightened frequency of intrusions. However, Wenzlaff, Wegner and Roper (1988) demonstrated that depressed students experience more difficulty in suppressing negative thoughts than do non-depressed students. Acknowledging the facts that obsessional thoughts often pertain to negatively evaluated themes (e.g., aggressive or sexual themes; Rachman & Hodgson, 1980) and that obsessions are frequently accompanied by a depressive mood (Rachman and Hodgson, 1980), this finding seems to imply that obsessional patients are unsuccessful thought-suppressors.

The second experiment examined whether successful suppression is associated with a high frequency of pertinent thoughts during expression. Normal subjects were given suppression and then ("liberal") expression instructions. Subjects were post hoc assigned to a successful or an unsuccessful "suppressor" group. It was examined whether these two groups differed with respect to frequency of pertinent thoughts during expression and a number of self-report measures (e.g., "How well did you succeed in suppressing the thought" etc).

**Method**

**Subjects**

The subjects were 35 undergraduate students (19 women, 16 men), all of whom received a small financial reward for their participation in the experiment. Their mean age was 22.7 years (range 19–37 years).

**Procedure**

The apparatus and procedure employed in Experiment 2 were identical to those in Experiment 1, with the exception that no NSCRs were examined and all subjects first received suppression and then expression instructions. After the suppression period (5 minutes), subjects answered the following questions, using 100 mm visual analog scales (VASs): "How difficult did you find the suppression task?" (0 = "not at all difficult", 10 = "extremely difficult"); "How well did you succeed in suppressing the white bear thought?" (0 = "very well", 10 = "did not succeed at all"); "To what extent did you use distraction strategies (e.g., counting, silently rehearsing the alphabet, etc) to avoid the white bear thought?" (0 = "not at all"; 10 = "very much"). After the expression period (5 minutes), subjects were asked to indicate on a 100 mm VAS to what extent they had continued suppressing the white bear thought (0 = "not at all"; 10 = "very much").
Design and data reduction

The number of white bear thoughts during suppression and expression was obtained by counting event marks on the polygraph chart. A “successful suppressor” (relatively few white bear thoughts during suppression) and an “unsuccessful suppressor” (many white bear thoughts during suppression) group was formed by subjecting the summed white bear thoughts during suppression to a median split. A 2 (group) × 5 (minutes) ANOVA was performed on the expression data. In addition, group differences with respect to VAS scores were evaluated with t-tests. For these t-tests a Bonferroni correction was used, i.e., \( \alpha \) was set at \( 0.05/4 = 0.0125 \), two-tailed.

Results

The median number of white bear thoughts during suppression was 8.3 (range 0–40). Subjects in the upper part of the distribution (>8.3) were assigned to the “unsuccessful suppressor” group, whereas subjects in the lower part of the distribution (<8.3) were assigned to the “successful suppressor” group. The mean numbers of target thoughts during suppression of the unsuccessful and the successful groups were 19.6 (SD = 8.6) and 5.0 (SD = 2.3), respectively \( [t(33) = 6.9, p <0.01, \text{ one-tailed}] \).

Figure 2 shows the mean number of white bear thoughts per minute during expression. A 2 (group) × 5 (minutes) ANOVA, with the last factor having repeated measures, revealed a main effect of group \( [F(1,33) = 44.7, p <0.01] \). Unsuccessful suppressors reported more white bears during expression than successful suppressors. Furthermore, a main effect of minutes was found \( [F(4,132) = 6.2, p <0.01] \), which was caused by a general decline of pertinent thoughts over time. The interaction effect of group and minutes did not reach significance \( [F(4,132) = 2.1, p = 0.15] \).

The Pearson product-moment correlation (based on the whole sample) between the total number of white bears during suppression and expression was positive and significant: \( r(35) = 0.59, p < 0.001 \) (two-tailed).

Table 3 shows the mean VAS scores. Successful suppressors found it somewhat less difficult to inhibit the white bear thought during suppression \( [\text{VAS1: } t(33) = 2.6, p = 0.013, \text{ two-tailed}] \) than unsuccessful suppressors. Furthermore, successful suppressors were significantly more optimistic about their success in inhibiting the pertinent thought than were unsuccessful suppressors \( [\text{VAS2: } t(33) = 3.4, p <0.01, \text{ two-tailed}] \). As to the use of distraction strategies, there were no differences between the two groups \( [\text{VAS3: } t(33)<1] \). Successful suppressors did not report more often that they continued to inhibit the pertinent thought during expression than did unsuccessful suppressors \( [\text{VAS4: } t(33)<1.0] \).
Rebound effects of thought suppression

FIGURE 2. Mean number of pertinent thoughts per minute during expression for successful and unsuccessful suppressors

TABLE 3. Mean scores of successful (n = 18) and unsuccessful (n = 17) suppressors on VASs

<table>
<thead>
<tr>
<th></th>
<th>Difficult</th>
<th>Success</th>
<th>Distraction</th>
<th>Continued supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful Suppressors</td>
<td>6.4*</td>
<td>5.1**</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>(1.8)</td>
<td>(1.6)</td>
<td>(3.2)</td>
<td>(2.3)</td>
</tr>
<tr>
<td>Unsuccessful Suppressors</td>
<td>7.9</td>
<td>3.3</td>
<td>4.9</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>(1.6)</td>
<td>(1.5)</td>
<td>(3.2)</td>
<td>(2.4)</td>
</tr>
</tbody>
</table>

* p < 0.03, two-tailed.
** p < 0.01, two-tailed.

Discussion
The data presented above clearly show that the frequency of target thoughts during suppression is positively related to this frequency during expression. In contrast to Wegner’s suggestion cited earlier, it was found that subjects
who were successful at inhibiting the white bear thought during suppression reported only a few pertinent thoughts during the subsequent expression period. Although the self-report data must be interpreted with caution, there was no indication that successful subjects relied more on distraction strategies during suppression than unsuccessful suppressors, nor was there any evidence to suggest that successful subjects suppressed the white bear thought during expression to a larger extent than unsuccessful suppressors. Successful suppressors reported more success in inhibiting the pertinent thought during suppression than unsuccessful suppressors, a finding that validates the distinction between the two subgroups.

**General discussion**

According to Wegner (1988, 1989), experimentally induced suppression results in a rebound effect that mimics clinical obsessions. Wegner and colleagues (1987, Experiment 1, Experiment 2; Wegner, 1988) described this rebound effect in three different, though related, ways. First, in the Wegner et al. (1987) studies it was found that the overall frequency of pertinent thoughts during an expression period is raised when suppression precedes expression. Second, the Wegner et al. (1987) studies reported that the frequency of pertinent thoughts during suppression follows an accelerative course when expression is preceded by suppression. Third, Wegner (1988, 1989) suggested that strong (i.e., “successful”) suppression results in heightened expression later on. Yet, as noted earlier, the Wegner et al. studies all made use of “forced” expression (“try to think of a white bear”; Wegner et al., 1987, p. 7).

The results of Experiment 1 show that with “liberal” expression instructions, suppression neither results in a generally raised frequency of pertinent thoughts during expression, nor in an accelerated rate of these thoughts during expression. The findings of Experiment 2 clearly indicate that with “liberal” expression instructions, successful suppression (i.e., few pertinent thoughts during suppression) is associated with a lowered rather than a heightened incidence of pertinent thoughts during expression. Taken together, the results of Experiments 1 and 2 imply that with “liberal” expression instructions, suppression is unlikely to result in a rebound effect. It is plausible to assume that daily life conditions are imitated better by “liberal” than by “forced” expression instructions. Consequently, the present findings cast doubt on Wegner’s (1988, 1989) claim that the rebound effect of thought suppression models the etiology of obsessional thought. In fact, they suggest that the rebound effect is a product of a highly artificial condition (i.e., “forced” expression). It may well be that in the Wegner et al. studies
initial suppression leads to a priming of memory structures which, during consequent forced expression, makes it easier for the subject to concentrate on the target thought.

The findings presented above validate one important aspect of the Wegner et al. (1987, 1990) studies, namely the fact that subjects are unable to completely suppress a target thought. Even the successful suppressors in Experiment 2 reported on the average one target per minute during suppression. Furthermore, the electrodermal data of Experiment 1 demonstrate that initial suppression produces a heightened frequency of target related NSCRs that is already present during suppression. At the same time, it appears that initial expression immunizes against such effects of consequent suppression. Thus, in contrast to the conclusion reached by Wegner and associates (1990), these findings strongly suggest that suppression per se has immediate as well as long term (phasic) autonomic effects, provided it is not preceded by expression. This suggestion is, at least, in line with the notion that it is the immediate counter-productiveness of thought suppression rather than a rebound later on that is relevant to understanding obsessional thought (e.g., Lavy and van den Hout, 1990). Note that this makes perfect sense clinically. It appears that obsessional patients are always trying to suppress obsessional thoughts and there is no indication that they periodically engage in deliberate expression. Thus, the paradigm introduced by Wegner appears to be relevant to the study of obsessions, if not for the reasons presented by Wegner. Further studies on the immediate counter-productiveness of thought suppression and its autonomic indices may shed light on the dynamics of unwanted thinking that culminates in clinical problems.

References


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