

The Suppression of Exciting Thoughts

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We examined how the suppression of an exciting thought influences sympathetic arousal as indexed by skin conductance level (SCL). Subjects were asked to think aloud as they followed instructions to think about or not to think about various topics. Experiment 1 showed that trying not to think about sex, like thinking about sex, elevates SCL in comparison to thinking about or not thinking about less exciting topics (e.g., dancing). Experiment 2 revealed that the suppression of the thought of sex yielded SCL elevation whether or not subjects believed their think-aloud reports would be private or public, and it also revealed that the effect dissipated over the course of a few minutes. Experiment 3 found such dissipation again but showed that subsequent intrusions of the suppressed exciting thought are associated with further elevations in SCL over 30 min. Because such an association was not found when subjects were trying to think about the exciting thought, it was suggested that the suppression of exciting thoughts might be involved in the production of chronic emotional responses such as phobias and obsessive preoccupations.

Certain thoughts quickly excite our bodies. They produce sympathetic arousal of the autonomic nervous system and therefore can yield symptoms of emotion—from sweating and quivering to difficulty in breathing, muscle tension, sinking feelings in the stomach, and weakness in the limbs. It is natural that when we become excited in this way, we may try to avoid the emotion and its symptoms by suppressing the thought. After all, suppressing exciting thoughts seems to be a good strategy to subdue negative emotions, such as anger, fear, or sorrow, or to avoid positive emotions when these are out of place.

This natural impulse to suppress exciting thoughts, however, may not serve us well. From the outset, thought suppression may be difficult because the thought may remain consciously accessible even as we try to suppress it, and we therefore become excited in the very act of suppression. But even if the thought is removed from our conscious attention, we may thus put ourselves in a position to be disturbed by the thought's recurrence. An exciting thought seems more stimulating after suppression (when we are idly thinking of other things and it suddenly intrudes on our minds) than when we are purposefully dwelling on it and know it is coming. There is thus the ironic prospect that the suppression of exciting thoughts can intensify the very excitement that we hope to avoid through suppression. This re-

search examined whether the suppression of an exciting thought can itself cause excitation.

Dismantling Emotion

The idea that bodily arousal often begins with an exciting thought was expressed by William James. He noted that “bodily changes follow directly on the perception of the exciting fact” (James, 1890, p. 449), and his observation has been echoed in a variety of ways in emotion theories since (e.g., Schachter & Singer, 1962). Most people seem to appreciate this connection between thought and emotion, implicitly at least, and realize that the absence of the exciting thoughts that trigger emotion can provide a respite from unwanted emotional upheaval and symptoms. A natural strategy for dismantling an emotion, then, is the suppression of the exciting thought. This was a point often mentioned by Freud as part of his theory of anxiety (e.g., Freud, 1923/1936).

People do report a desire to suppress unwanted exciting thoughts. Thoughts of the loss of a loved one, of a humiliating failure at work, of an inappropriate sexual impulse, of food during a diet, of a secret one must not divulge, of a traumatic experience, of a physical symptom that could portend grave illness are typical candidates for suppression (Wegner, 1988, 1989; Wegner & Schneider, 1989). People often report that they work to keep such thoughts out of their minds (Pennebaker, 1988; Rachman & de Silva, 1978; Silver, Boon, & Stones, 1983) and that they use thought suppression as a mental control strategy to influence their moods as well (Clark & Isen, 1982; Klinger, 1982; Mayer & Gaschke, 1988). And certainly there are many occasions in social interaction when one may desire to suppress thoughts as an aid to deception (Ekman, 1985), self-presentation (Hochschild, 1983), or the self-control of prejudicial thinking (Fiske, 1989; Gilbert, 1989).

However, the conscious desire to suppress an unwanted thought, even an unexciting one, can be difficult to execute. In

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studies by Wegner, Schneider, Carter, and White (1987), for instance, subjects were asked to think aloud as they suppressed the thought of a white bear and to ring a bell each time the thought came to mind. By their frequent bell rings and mentions of the thought during the 5-min session, subjects indicated remarkable difficulty in ridding their minds of this thought. Comparably high levels of thought recurrence have been found when subjects are asked to write down everything that comes to mind after they have been instructed to suppress the thought of a positive or negative hypothetical incident (Wenzlaff, Wegner, & Roper, 1988).

These laboratory observations of people engaged in suppression indicate a common course of thought recurrence. Initially, the person has great difficulty suppressing an unwanted thought and finds it returning to mind almost constantly. Over the course of several minutes, however, as more effective distracters are found, the thought recurs less frequently, and eventually reports of its occurrence become relatively rare. Some individuals stop reporting the thought entirely in 10 min. Outside the laboratory setting, where the person can encounter many new distracters and tasks, it makes sense that the rate of recurrence might drop yet further and that suppression might be considered successful. Still, returns of the thought at much later points are not uncommon. The evidence from studies of thought suppression, then, suggests that the natural impulse to dismantle an emotion by suppressing the emotion-producing thought may commonly make such thoughts return and thus reinstate the very emotion one wishes to avoid.

Initial Suppression

When an individual begins to suppress an exciting thought, he or she can certainly be expected to experience arousal from the start. At this time, excitation can occur because the person must be conscious of the thought in order to suppress it. Because suppression is not likely to be perfect at first, the thought will probably stay in mind long enough to promote some continued excitement. Although this possibility has not been assessed in an unambiguous way through research, there is evidence indicating some forms of arousal are initially elevated under conditions that may promote the suppression of exciting thoughts. A study by Cohen, Silverman, and Burch (1956), for instance, found that electrodermal responses observed when subjects were asked to discuss a list of emotion-provoking words were stronger when the discussion was abruptly cut off by the experimenter. This was not the case when the discussion of unemotional words was so terminated.

Other investigations reveal a similar pattern. In a study by Martin (1964), for instance, college men looked at pictures of nude women under inhibitory conditions: They had been asked beforehand to think of "memories that come to mind that involve your mother or your father" (p. 308). These men exhibited a higher skin conductance level (SCL) during the session than did men who were not reminded of their parents. A related study by Koriat, Melkman, Averill, and Lazarus (1972) exposed subjects to an arousing film of (faked) sawmill accidents. Some subjects were asked to remain detached during the film, and they indeed reported less emotional arousal. At the same time,

these individuals showed increased SCL during the film in comparison with subjects that were given no special instructions.

Past studies thus provide some evidence suggestive of the exciting properties of the initial suppression of exciting thoughts. However, the operations that introduced suppression in these experiments—the termination of discussion, reminders of parents, instructions to be detached—are not unambiguous suppression manipulations, nor was their influence on ongoing thought examined in any study. Moreover, the research was focused on the influence of suppression while subjects were in the presence of an exciting stimulus (e.g., words, film, pictures). Thus the past studies do not directly address the question of whether the suppression of an exciting thought per se can promote excitement.

One other line of evidence suggests that the initial suppression of exciting thoughts can be exciting even in the absence of the exciting stimulus. Pennebaker and Chew (1985) proposed that suppression itself is arousing, although they did not differentiate between the exciting or unexciting character of the thoughts that are suppressed. Their study revealed increased SCL among subjects who were led not to reveal "guilty knowledge" (a secret) to an experimenter. Under these conditions, the thought may be made exciting by the very fact of its concealment, and the observed electrodermal changes therefore may be an instance of SCL heightened by the suppression of exciting thoughts. There is some support in past research, then, that initial attempts at the suppression of exciting thoughts can yield bodily excitation in the form of increased SCL.

Intrusion Reaction

Once an individual has successfully suppressed an exciting thought, a second source of suppression-induced excitement can be expected: There can be bodily reactions to any intrusive return of the suppressed thought. When suppression has been successful for a time and something else is now occupying conscious attention, the person becomes inattentive to the exciting thought and probably is somewhat more relaxed. In this distracted state of mind, the individual can be surprised and alarmed by an intrusion of the exciting thought and so be aroused once again. Horowitz (1975) showed that people experience intrusions of stressful thoughts following a stressful experience and that these intrusions are themselves experienced as unpleasant. The occasional returns of a suppressed exciting thought can follow this pattern and can introduce a series of intrusion reactions that each yield a surge of arousal.

An intrusion reaction should not ensue during intentional thought about an exciting topic. When a person is consciously intending to think about something, even when that thought is exciting, he or she knows when the thought is coming and is somewhat prepared for its occurrence. Even in turning the thought over and over, one does not seem to be excited anew each time, as long as one is doing this on purpose. The initial excitement at the thought may be strong, but the continued conscious accessibility of the thought seems to promote habituation that relaxes the excitement. When the thought has been suppressed, in contrast, one is momentarily ignorant of the thought and its exciting quality and may thus be especially startled by its return. With suppression, we seem to create a state

of conscious oblivion in which we remain sensitive to any reminder of the exciting thought.

The self-startling that is experienced in this instance resembles what happens when an individual unexpectedly retrieves a memory. In a "tip of the tongue" experience, for example, a person might fail to retrieve an item for a time and consciously abandon the search—only to have the item later "pop up" in consciousness. The surprise that is felt when this happens has been described as resulting from a special sensitivity to the retrieval of the item that arises because of the unfulfilled plan to retrieve (Reason & Lucas, 1984). The plan to suppress may similarly initiate sensitivity to a suppressed item so that the return of the thought may yield a sudden realization that a special item has come to mind. Such a process could serve to enhance the individual's cognitive and physiological reactivity to the intrusive return of the thought.

This reasoning about intrusion reactions implies an interactive effect of thought suppression and the thought's exciting quality. Excitement could arise specifically on the return of an exciting thought that has been suppressed, but not on the return of an unexciting thought that was suppressed or on the occurrence of an exciting thought that is purposefully considered. The excitement introduced by the intrusion reaction would be uniquely traceable, then, to the surprising return of a suppressed exciting thought, not to the effort involved in suppression or to the exciting quality of the thought *per se*.

Although to date there is no conclusive evidence available for any special physiological responsiveness to the intrusion of exciting thoughts during suppression, case research by Dittes (1957) is suggestive. This investigation followed a patient's electrodermal responses to "embarrassing sex statements" during sessions of psychotherapy. Such responses were higher in sessions in which the therapist was rated as unpermissive and critical than in other sessions. Presumably, an overall tone of suppression could make the breakthrough of exciting thoughts more exciting and so fuel repeated intrusion reactions.

In summary, there are two probable patterns of arousal that should follow an attempt to suppress an exciting thought. First, the suppression should be difficult at the outset and require some frequent instances of conscious contact with the exciting thought. This should yield an increase in arousal in the early stages of suppression. Second, once suppression is successfully under way, returns of the suppressed exciting thought should be associated with intrusion reactions—surges in arousal—more than are new occurrences of the thought when it is being entertained intentionally. In Experiments 1 and 2, we examined the influence of initial suppression, and in Experiment 3, we focused on the intrusion reaction.

Following the precedent of earlier studies that examined the psychophysiology of thought suppression, the present research focused on SCL as an indicator of sympathetic arousal. This measure has been identified as a concomitant of inhibition (Fowles, 1980) and has been described as more sensitive to cognitive operations than are other measures such as heart rate or blood pressure (see, e.g., Edelberg, 1972; Waid, 1984). Most important, in preliminary research comparing SCL, heart rate, blood pressure, blood volume pulse, and skin temperature, we observed that SCL was the only measure that showed reliable elevation when subjects were instructed to think about exciting

topics such as sex. Thus, it was the measure of choice for examining the psychophysiology of the suppression of exciting thoughts.

Experiment 1

Method

Overview and design. Subjects delivered think-aloud reports for tape recording as they responded to a series of instructions to suppress or express thoughts. SCL was measured continuously, starting with a 3-min baseline period in which the subject was asked to report whatever came to mind. Two 3-min periods followed in which the subject was first asked to think about a target and then asked not to think about that target or vice versa. In both cases, the subject was instructed that "if the target thought comes to mind, please mention it." After another baseline, this sequence was repeated for another target, and so on, so that each subject both suppressed and expressed four targets: an exciting thought (*sex*) and three less exciting ones (e.g., *dancing*). A final baseline period completed the session.

Skin conductance measurement. The subject's SCL was measured by the standard procedure for finger electrode placement recommended by Fowles et al. (1981). After the subject's fingers were scrubbed with alcohol, electrode conductivity gel was applied, and Ag/AgCl electrodes were adhered with Velcro fasteners to the second phalanges of the first and third fingers of the subject's nondominant hand. These electrodes were attached to a J & J Enterprises IG-3 Preamplifier and Model T-68 for digital readout of SCL. Readings taken every 10 s were averaged for each 3-min period. The final measure for each suppression or expression period was the deviation of SCL during that period from the mean SCL in the baseline periods that occurred immediately before and after the pair of suppression and expression periods for that target thought.

Subjects and procedure. Trinity University undergraduates (16 men and 30 women) participated in return for extra credit in their introductory psychology classes. Each was tested individually in a small room. The experimenter explained that the subject would be asked to think aloud, verbalizing thoughts continuously into a tape recorder. Instructions for reporting the stream of consciousness were given (see Pope, 1978), and the physiological measurements were explained while the preparations were made. The experimenter then moved to an adjacent room and gave instructions by intercom for the rest of the experiment.

The experiment consisted of a series of thirteen 3-min periods for which the subject was given thought instructions by the experimenter. Order of instructions and targets was counterbalanced across subjects, with the restriction that each subject begin with a baseline period ("Please think about anything at all and report whatever comes to mind"). The subject was then given a specific instruction either to suppress a target thought (e.g., "Please continue, but now do not think about sex; if the thought comes to mind, please mention it") or to express that target thought (e.g., "Please continue, but now think about sex; if the thought comes to mind, please mention it"). The other specific instruction for that target thought (i.e., suppress or express) was given in the next period; the sequence of baseline, first instruction for a target, and second instruction for a target was then repeated for each of the remaining targets until a final baseline period was reached.

The target thoughts were chosen to include one exciting thought—*sex*—and several less exciting thoughts for comparison. Pretesting of an array of topics revealed that thinking about sex produced reliable increments in SCL for most subjects. The comparison topics included *dancing*, the subject's mother (*Mom*), and the Trinity University dean of students, a woman known personally to all subjects (*Dean*).

Results and Discussion

The key finding of this study is shown in Figure 1. This display of the mean SCL deviation from the baseline for each com-

bination of target thought and instruction (expression or suppression) reveals a dramatic effect for target thought. When the target thought was sex, SCL deviated from the baseline more than for any other target thought. Moreover, the SCL deviation was as large when subjects were trying not to think about sex as when they were trying to think about it.

The significance of this pattern was examined in a 2 (subject gender) \times 2 (order of instruction) \times 2 (suppression vs. expression) \times 4 (target thought) analysis of variance (ANOVA) with repeated measures on the last two variables. The only significant effect in this analysis was the main effect for target thought, $F(3, 126) = 10.62, p < .001$. A Newman-Keuls analysis of mean differences among target thoughts showed that the SCL deviation for sex ($M = 0.62$) was reliably greater than that for dancing ($M = -0.34$), Mom ($M = 0.05$), and Dean ($M = -0.26$), $p < .05$ in each case. The remaining means did not differ from each other.

The absence of any other reliable effects in the ANOVA is worthy of note. Specifically, there were no main or interactive effects of subject gender, which indicates that the effect was general across men and women. There were no main or interactive effects of order, which indicates that the counterbalancing of instruction orders had no influence. And also, there was no sign of an interactive effect of target thought and suppression versus expression instruction, $F(3, 126) = 1.15$. The target thought of sex promoted SCL deviations independent of whether subjects were attempting suppression or expression of the thought. Indeed, as shown in Figure 1, suppression of sex even yielded a (nonsignificantly) greater SCL deviation than did expression of sex in this setting.

Also note the lack of a main effect for suppression versus expression. In this study, suppression per se had no influence on SCL. Thus, although some theoretical accounts assume that SCL is associated with any inhibition of behavior or thought (e.g., Fowles, 1980; Pennebaker & Chew, 1985), this was not observed under the conditions of the present experiment. Rather, SCL elevation was observed only during the suppres-

SKIN CONDUCTANCE LEVEL
(DEVIATION FROM BASELINE IN μ MHOS)

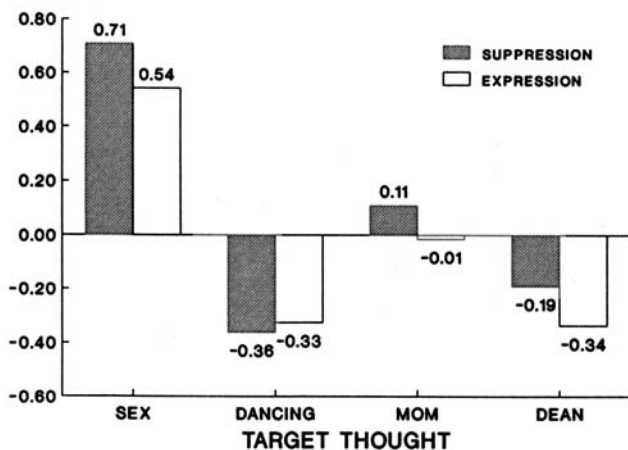


Figure 1. Deviation of skin conductance level from baseline (in μ mhos) during the suppression or expression of four target thoughts.

Table 1
Experiment 1: Thought Measures During
Suppression and Expression

Task	Target			
	Sex	Dancing	Mom	Dean
Mentions of target				
Suppression	3.22	3.87	3.52	2.61
Expression	5.57	9.04	6.22	3.87
Time talking about target ^a				
Suppression	33.9	20.9	33.5	31.1
Expression	93.2	98.4	111.5	79.4

Note. For these analyses, $n = 23$.

^a Time is in seconds.

sion of the thought of sex. So, although SCL might be associated with inhibition, our research apparently supports this conclusion only when the inhibition is focused on a thought that is already exciting.

Analyses were also conducted for two measures of thought occurrence—mentions of the target thought and amount of time (in seconds) spent talking about the target thought. Two coders reached an acceptable level of agreement on each measure (intercoder $r = .97$ for target mentions; $r = .92$ for time on target). Means for these analyses are shown in Table 1.¹ Both measures revealed that expression instructions yielded far greater thought about the target than did suppression instructions, but that even under suppression the thoughts did not go away. Mentions were more frequent during expression ($M = 6.17$) than during suppression ($M = 3.30$), $F(1, 19) = 16.17, p < .001$; but a consistent moderate rate of mentioning ($M = 2.61$ – 3.87) occurred for all target thoughts even in suppression. Time on target was also greater during expression ($M = 95.6$) than during suppression ($M = 29.7$), $F(1, 19) = 17.13, p < .001$; but again by this measure there was a consistent tendency to spend time on target during suppression for all targets ($M = 20.9$ – 34.0). There were no significant differences among targets by either measure in suppression or in expression.

These measures indicated no unusual patterns of thought mentioning or unusual patterns of duration associated with the exciting thought in this research. This is important because subjects might have expended more effort to think or not to think about the exciting thought than the unexciting ones, and this might have given rise to differences in SCL. Although the frequency of thought mentions is not a perfect measure of such effort, it is one way of examining this. As it happened, subjects appeared to think about sex just as much as they thought about other topics when they were given expression instructions. Also, they appeared to have just about the same low level of success when they tried to hold back thoughts of sex as they had when they tried to hold back thoughts of other things after they had been given suppression instructions. By these measures, thoughts of sex seemed to be no more difficult to suppress or

¹ Tape-recorded protocols for half the subjects were inaudible because of an equipment malfunction. These analyses are reported for the remainder ($n = 23$).

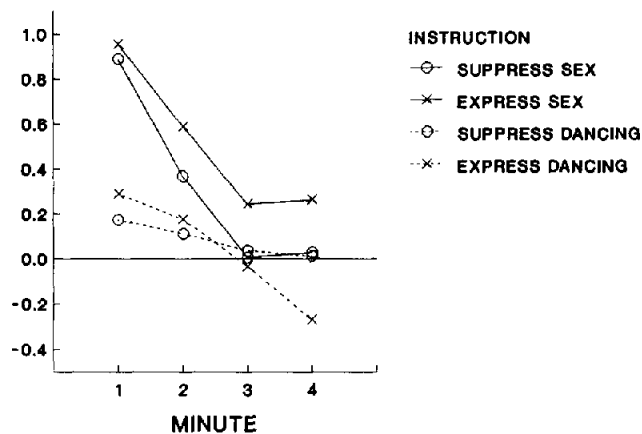
**SKIN CONDUCTANCE LEVEL
(DEVIATION FROM BASELINE IN μ MHOS)**


Figure 2. Deviation of skin conductance level from baseline (in μ mhos) during 4 min of suppression or expression of thoughts of sex or dancing.

express than did any of the less exciting topics; therefore, such variations are unlikely to be responsible for the observed SCL effects.

This study thus provides evidence that the mere suppression of an exciting thought is itself initially exciting. One possible reason for this effect is that the thought of sex is always exciting. In this study, subjects' SCLs may have increased because the subjects became excited whenever the topic of sex was mentioned. If this were the case, then any instruction involving the topic of sex might be exciting, and the excitation that was apparently due to suppression would no longer be noteworthy. To test this interpretation, subjects in an additional sample were asked to suppress the thought of sex, as in this study, or merely to mention it once out loud and then to go ahead with their think-aloud task. These subjects showed elevated SCLs during suppression, as compared with mere mentioning, and their results thus indicate that the observed effect is not attributable to an orienting reaction alone.²

Several other questions can be asked about these results, however, and it is important to examine the conditions under which the phenomenon may be expected to occur. One question of importance is the role of the thought-reporting requirement in the production of the effect. Subjects who are having difficulty in suppressing thoughts of sex may get embarrassed as they report them to an experimenter. This, rather than the suppression of an exciting thought, may be what drives the observed increase in SCL. A further concern is the degree to which the observed effect is stable over time. Suppression of an exciting thought probably does not arouse a person permanently. The first few minutes of suppression are likely to be the key period in which recurrent intrusions of the thought—and consciousness of the task of suppressing it—might instigate bodily excitement. A second experiment was designed to gauge the influence of time and privacy in this paradigm.

Experiment 2

Method

Overview and design. Subjects verbalized their thoughts as they followed instructions to suppress or to express the thought of sex or the

thought of dancing. SCL was measured continuously during the 4-min period following each instruction and during two 4-min baseline periods and was averaged for each minute. Each subject made verbal reports either under the same public conditions as in the prior study or under conditions of privacy. These variables combined to produce a 2 (public vs. private) \times 2 (expression vs. suppression) \times 2 (sex vs. dancing target thought) \times 4 (minute) design.

Subjects and procedure. Undergraduate student subjects (28 men and 29 women) participated individually. Each subject was randomly assigned to public or private think-aloud conditions and was informed of this assignment. Subjects were given instructions on how to report their thoughts. Subjects in the public condition were informed that they would be monitored and recorded during the experiment by means of a prominently displayed microphone. On the other hand, subjects in the private condition were informed that they were participating in a comparison group that would not be monitored or recorded. Each of the subjects in the private condition observed as the experimenter disconnected the microphone and stored it in a box. The experimenter explained that these subjects were still encouraged to speak out loud (to provide a valid comparison with others who were speaking in the public condition) but that the experimenter would only be able to hear through the wall whether the subjects were speaking, not what was being said.

The experimental period began with a 4-min baseline interval in which the subjects were instructed by intercom to begin reporting their thoughts. In a subsequent 4-min period, the subjects were instructed either to suppress or to express one of the target thoughts (sex or dancing). In the next 4-min period, the subjects were instructed to perform the other task for that target. Following a second 4-min baseline, two more task periods were completed in which the same instructions were administered for the remaining target thought. Order of target thought and instruction was counterbalanced across subjects. SCL was measured by the same means as in Experiment 1, with the exception that readings were taken continuously on a J & J Enterprises I-330 Physiological Monitoring System and IBM PC and were automatically averaged over 1-min intervals.

Results and Discussion

The principal findings are displayed in Figure 2. The subjects showed heightened SCL early in the process of suppression of sex, as well as in the expression of sex, as compared with their SCLs during the suppression and expression of dancing, but this difference diminished over the 4-min period.

The ANOVA showed a marginally significant difference between mean SCLs for the topics of sex ($M = 0.42$) and dancing ($M = 0.06$), $F(1, 53) = 3.77$, $p < .06$. This main effect tendency was accompanied, however, by a significant trend for the topics of sex and dancing to yield different SCL patterns over the 4-min periods. An interaction of topic and minute, $F(3, 159) = 5.32$, $p < .002$, was further decomposed into orthogonal polynomial trends; these revealed a significant linear trend difference between topics, $F(1, 53) = 5.07$, $p < .03$. When subjects were given the topic of sex, they evinced a steeper SCL linear slope than when they were given the topic of dancing. Because there was no significant interaction between suppression versus

² Twenty-four subjects suppressed the thought of sex in one period and mentioned the word once and then continued thinking aloud in another. A 2 (gender of subject) \times 2 (order of periods) \times 2 (suppress vs. mention) \times 4 (minute) ANOVA on SCL deviation from a prior 2-min baseline revealed a significant main effect for suppressing ($M = 0.40$) versus mentioning ($M = -0.58$), $F(1, 20) = 6.27$, $p < .05$.

expression and this effect, $F(3, 159) = 1.69, p > .15$, it is apparent that suppression and expression behaved similarly in this respect. Whether subjects were thinking about sex or trying not to think about sex, they had an initial high SCL that dissipated over time to the same level as when they were merely thinking or trying not to think about dancing. No main or interactive effects were found for the privacy manipulation (all F s < 1) or for subject gender (in a separate analysis that included this variable), so no significant exceptions to this conclusion were observed in any condition of the experiment.

As in the prior study, subjects' tape-recorded protocols were analyzed for indications of thought occurrence. For those individuals in the public condition (for whom tapes had been made) two coders counted mentions of the thought targets (intercoder $r = .97$) and timed the seconds spent in verbalization on the targets (intercoder $r = .91$) for each minute of the study. These measures showed several parallel significant effects. First, as compared with expression, suppression yielded fewer target mentions per minute ($M = 3.37$ vs. 0.62), $F(1, 23) = 159.35, p < .001$, and yielded less time spent on target per minute ($M = 36.51$ s vs. 2.84 s), $F(1, 23) = 221.37, p < .001$. Second, per minute there were fewer mentions of sex ($M = 1.71$) than of dancing ($M = 2.29$), $F(1, 23) = 8.76, p < .01$; and fewer seconds were spent talking about sex ($M = 17.41$) than about dancing ($M = 21.93$), $F(1, 23) = 4.60, p < .05$. Finally, these measures showed that the target thought occurs with decreasing frequency over time in both suppression and expression conditions. Mentions generally decreased from the 1st through the 4th minute (M s = $2.92, 1.86, 1.93, 1.28$, respectively), $F(3, 69) = 11.61, p < .001$, as did seconds of talk (M s = $24.37, 20.83, 17.26, 16.16$, respectively), $F(3, 69) = 11.12, p < .001$. As in Experiment 1, then, the thought measures suggest that there was no particular difficulty in suppression of the sex topic that might have accounted for subjects' heightened SCLs during this task.

These results strengthen the generalizations suggested by Experiment 1. The findings show that the public nature of subjects' thought reports in the first study was probably not responsible for the observed effects. The public versus private manipulation introduced here had no appreciable effect on the pattern of findings. The results do indicate, however, that the observed pattern in the first study does have temporal limits. The heightened SCLs found in those subjects assigned to think or not to think about sex remained elevated for only the early part of the 4-min experimental period. By the end of that period, they had returned to levels resembling those in the comparison conditions—when the task involved only the topic of dancing.

What, then, might be the long-term effects of the suppression of exciting thoughts? When people elect to suppress an exciting thought for some time, they probably find that the thought recurs sporadically over long intervals. This means that whenever they are visited by an intrusion, they are once more thrust into the position that subjects encountered in this experiment—facing the task of suppressing an exciting thought. Therefore, later intrusions that occur at intervals beyond the 4-min limit imposed by this study might operate to reintroduce arousal. In the third experiment, we explored such longer term intrusion reactions by observing thought recurrence and SCL over a 30-min interval of suppression.

Experiment 3

Method

Undergraduate student subjects (11 men and 28 women) verbalized their thoughts in two 30-min periods under instructions either (a) to suppress the thought of sex in one period and express the thought of weather in the other or (b) to express the thought of sex in one period and suppress the thought of weather in the other. The order of instructions was counterbalanced within these groups across subjects. The verbalizations were tape-recorded, and SCL was measured continuously and averaged by minute during the 30-min period following each instruction and during 2-min baseline periods prior to each instruction. The delivery of instructions and the measurement of SCL followed the procedures of Experiment 2.

Results and Discussion

We conducted an initial analysis to determine whether the expression or suppression of the exciting thought of sex might have an overall influence on SCL across a 30-min session. Mean SCL deviations from the baseline across the 30-min sessions of expression and suppression of sex and weather are shown in Table 2. Although the *sex* target SCLs appear to be elevated, a 2 (subject group) \times 2 (*sex* vs. *weather* target thought) ANOVA revealed no significant effect for target thought, $F(1, 37) = 2.22, p = .15$. Thus, the target thought of *sex* did not yield a significant elevation of SCL above that for the target thought of *weather* over a 30-min period of expression or suppression.

It is reasonable to expect, however, that as in Experiments 1 and 2, both the expression and suppression of sex should yield elevated SCLs in the first few minutes of the experimental session. To test this, we conducted an ANOVA for only the first 3 min of the sessions. This 2 (subject group) \times 2 (*sex* vs. *weather* target thought) \times 3 (minute) analysis showed a significant influence of target thought, $F(1, 37) = 13.08, p < .001$. Means, as shown in Table 2, reveal that suppression and expression of sex both elevated SCL, as compared with suppression or expression of weather. As in the prior studies, instructions to suppress the thought of sex had an immediate influence on SCL that paralleled the influence of an instruction to express the thought of sex. Also as in the prior studies, measures of target thought mentions and time spent discussing the target thought yielded no evidence that suppression of the exciting thought might be unusually difficult (see Table 2).

We performed the final set of analyses for this study to survey the covariation of thought intrusions and SCL deviations over time. Pearson correlation coefficients were calculated, across the thirty 1-min intervals within each session for each subject, between SCL deviation from the baseline and the target thought measures. Means for these within-subjects correlations are shown in Table 2.

The noteworthy correlations in this array are those calculated for the session in which subjects suppressed the thought of sex. Here there is a significant positive correlation of .17 between SCL and mentions over the 30 min; the mean r (after transformation to Fisher's z) is significantly greater than zero, $t(17) = 3.04, p < .01$. The mean correlation of .15 between SCL and time on target over the 30 min is also significant, $t(17) = 2.70, p < .05$. None of the other mean correlations in the table differ significantly from zero. An alternative analysis of these corre-

Table 2
*Experiment 3: Skin Conductance Level (SCL), Thought Measures,
 and Correlations Between Them*

Measure	Task			
	Suppress sex ^a	Express sex	Suppress weather	Express weather
Skin conductance level ^b				
Overall SCL (30 min)	.39	.70	.20	-.08
Initial SCL (first 3 min)	.68	.91	.15	.02
Thought measures				
Thought mentions (in 30 min)	12.72	57.45	10.85	62.21
Time on target (seconds/30 min)	59.44	669.00	41.25	596.74
Within-subjects correlations over 30 min				
<i>r</i> _{SCL/mentions}	.17*	-.06	.05	.05
<i>r</i> _{SCL/time on target}	.15*	-.09	.07	-.01

^a Subjects who suppressed sex also expressed weather ($n = 19$), and those who expressed sex also suppressed weather ($n = 20$).

^b Mean of deviation from baseline per minute in μ mhos.

* Greater than zero, $p < .05$.

lations was also performed in which r s (transformed to Fisher's z s) were entered into a 2 (subject group) \times 2 (*sex* vs. *weather* target thought) \times 2 (mentions vs. time on target measure of thought) ANOVA. This analysis revealed only a significant interaction of subject group and target thought, $F(1, 37) = 5.02$, $p < .05$. A subsequent contrast of the mean for the suppression of the thought of sex session with the mean of all other sessions was also significant, $t(37) = 2.11$, $p < .05$.

Subsidiary analyses of this kind were also performed in which SCL and the thought measures were each lagged 1, 2, or 3 min behind the other before the correlations were calculated. Such analyses might indicate something about the causal priority of SCL and thought occurrence. No significant correlations were observed in these analyses, indicating that if thought occurrences precede SCL elevations, or vice versa, they do so at a time scale smaller than 1 min and so are not observable with the present data. One other subsidiary analysis examined the correlations within only the last 27 min of each session; these correlations mirrored those observed for the 30-min session. Finally, we conducted a reanalysis of the data of Experiment 2 to examine the association of SCL and topic mentions in that study. The pattern of correlations mirrored these, with a mean r of .24 between SCL and sex mentions over the 4-min suppression interval (mean $r > .0$, $p < .05$), with the r s in the other conditions all being less than .10.

These correlational data suggest that occurrences of a thought during a particular minute are accompanied by elevations in SCL during that minute, but only under very specific conditions. The elevation of SCL in this way seems to occur only when (a) the thought is exciting and (b) the individual has been trying to suppress the thought. This unique combination of conditions appears to make a thought chronically exciting—capable of producing jumps in SCL each time the thought returns. Without these conditions, the effect is absent. Thus, the occurrence of an exciting thought does not spur SCL when the person is intentionally thinking of that thought, and occurrences of a thought that is targeted for suppression do not yield

SCL elevations when that thought is not initially exciting. These results thus lend clear support to the idea that the suppression of an exciting thought produces subsequent intrusion reactions.

General Discussion

These studies indicate that the suppression of an exciting thought—the thought of sex—can promote excitement, as indexed by an elevation in SCL. The three studies provide three temporal perspectives on this elevation: a short interval (3 min) in Experiment 1, a slightly longer minute-by-minute account (4 min) in Experiment 2, and a much longer interval (30 min), also measured minute by minute, in Experiment 3. These perspectives reveal that suppression of exciting thoughts creates initial SCL elevation that dissipates within 3 min. However, evidence was found to suggest that later intrusions of the thought into conscious attention may reintroduce surges in SCL. Such surges were found to be linked with reports of the thought only during suppression of the exciting thought, not during an opportunity to think about it.

Suppression of Emotion

These findings are pertinent to a broad and important issue in psychology—the issue of whether people can willfully suppress their emotions. On one hand, many observers have noted that people can manage or suppress their emotional states quite successfully (e.g., Clark & Isen, 1982; Klinger, 1982). On the other hand, however, are commentators who note that such suppression can be difficult (e.g., Hochschild, 1983) or can be followed by unexpected resurgence of emotional symptoms (e.g., Foa & Kozak, 1986; Pennebaker, 1988; Rachman, 1980; Stiles, 1987; Wenzlaff et al., 1988). The present results appear more supportive of the second view, bolstering the claim that emotions are resistant to conscious attempts at manipulation. The suppression of exciting thoughts seems to undermine the process of emotion control not only by instigating the unwanted

emotion at the outset but by creating conditions ripe for its recurrence.

The acceptance of this general conclusion must be conditioned on several key qualifications, however, beginning with the observation that the present results were obtained with only one emotional stimulus—the thought of sex. The degree to which suppression-induced arousal occurs with other target thoughts is open to question. There is evidence that the observed effect occurs with targets such as thoughts of eating a cockroach, having dental work, or meeting a former lover. Elevation of SCL during suppression of these thoughts occurs among those individuals for whom expression of the thoughts is also exciting (Prasad & Wegner, 1989). Because increments in SCL do not usually accompany sexual arousal per se, their appearance in the present research seems to be more indicative of a general arousal than a specific form of sexual arousal (Wenger, Averill, & Smith, 1968; Zuckerman, 1971). These considerations argue for the generality of the effect across exciting thoughts.

Another important concern is the degree to which these findings might be general across other indexes of sympathetic arousal. Our suspicion is that they may not be general within the constraints of the particular paradigm we have used. As noted earlier, we found in our initial testing of the effects of thinking on psychophysiology that SCL was the only one of several measures that showed sizable and reliable increments for relatively long periods of time (i.e., minutes) when subjects were urged to express an exciting thought. Other measures may respond to the presentation of exciting stimuli; they also may rise when especially sensitive individuals, such as phobics, are asked to think about exciting targets, but their response to mere thinking is often fleeting.

Thus, further research to examine our observed effects, using a more fine-grained analysis of very short term or phasic bodily responses to expression and suppression, may be useful. To the degree that such responses generally can be disentangled from orienting reactions, they might reveal a wider range of psychophysiological responsiveness to the suppression of exciting thoughts. Such measures might also aid in determining more details of the causal sequence underlying our observations of the intrusion reaction. In looking at the moment-to-moment variations in thought occurrence and bodily response during suppression, it could be learned whether the thought indeed intrudes before the bodily response, as we suspect, or the bodily response precedes the thought and somehow prompts its intrusion.

The workings of the intrusion reaction do seem to require additional investigation for other reasons as well. Our impression at this time is that the suppression of an exciting thought introduces a state of mind in which the individual is especially attuned to the return of that thought and that this attunement yields the surge of excitement associated with the thought recurrence. This hypothesis carries with it the additional proviso that during the expression of an exciting thought, there must be some process that prevents the individual from being excited by returns of the thought after the first few minutes. This lack of excitement could be attributable to rapid habituation to the thought during expression or perhaps to the preliminary awareness of upcoming thoughts that is available to the individual as

a result of intending the occurrence of the thoughts. Our data do not rule out the possibility, either, that the intrusion reactions observed during suppression of the exciting thought arise from some special difficulty associated with suppressing such a thought after its appearance. It might be useful to examine the influence of externally prompted intrusions of an exciting thought (e.g., the experimenter mentions sex at random intervals) with and without suppression instructions, to tease apart these various explanations of the intrusion reaction.

There is one other way in which the present findings could be made more general. It would be interesting to learn the degree to which events like those observed here occur outside the laboratory. Our finding that the suppression of thoughts of sex is exciting to people even when they know they are not being observed (Experiment 2) suggests that the results are not laboratory bound in at least one important way. However, open questions remain regarding whether people regularly assign themselves the task of suppression in everyday life, whether suppression is as difficult in a natural environment as it seems to be in the laboratory, and whether the urge to suppress exciting thoughts promotes the kind of recurrent excitement that our results suggest. We suspect that our results do have external validity in this regard, primarily because of the variety of everyday phenomena that appear to follow the pattern of suppression-induced arousal suggested by our findings. Observations of natural anxiety, fear, and phobia become particularly understandable in light of our experiments.

Perpetuation of Emotion

To someone who is caught up in a moment of fear or panic, thought suppression may seem to be the fastest cure. Fears of public speaking or social interaction, like fears of snakes or heights, quickly motivate their victims to avoid the fear-provoking stimuli and so to suppress thoughts of those stimuli. Whatever immediate relief is gained by this strategy, however, appears to be purchased at the high cost of the perpetuation of the emotional reaction. Our results suggest that avoidance through thought suppression can prolong and perhaps even exacerbate emotional reactions such as phobias or situation-specific anxieties.

Clinical evidence on avoidance supports this inference. A telling case study of one young man who was afraid of the dark, for instance, revealed the central role of avoidance in his problem. On being coaxed into a dark room by his therapist, he remarked, "You know, I never stayed in the dark long enough that I could get used to the dark like this. I never let myself get this far. . . . When it was that black, I'd run" (Zane, 1982, p. 16). His immediate response stopped exposure to the phobic stimulus and so kept the emotional reaction fresh and sensitive for each new instigation. Like behavioral avoidance, the suppression of exciting thoughts may prepare the person to experience the emotion at full intensity again and again.

A study of snake phobics by Borkovec (1974) establishes this possibility more clearly. Subjects in this research were encouraged in several therapy sessions to think about snakes as much as they could until they became uncomfortably anxious. Some subjects were then allowed to suppress the thought (i.e., "Visualize yourself turning around and running from the snake"),

whereas others were encouraged to imagine snakes even after this point. The individuals who received this additional exposure to their feared stimulus habituated over four therapy sessions, in that their heart rates during thoughts of snakes declined appreciably. The individuals who were allowed to suppress the thought, however, remained hypersensitive through all the sessions. Their heart rates never declined.

The suppression of exciting thoughts, from this perspective, may be responsible for the perpetuation of unwanted emotional reactions. It is easy to envision an individual whose emotional reactivity to some exciting stimulus—be it sex, snakes, or social situations—is elevated by a seemingly harmless attempt at thought suppression. The person tries to suppress the exciting thought and so introduces a new measure of excitement. With the emotion newly charged, the motive to suppress further is itself energized, and the process recycles to produce yet a more powerful emotional response. Multiple iterations of this cycle could well produce emotions that are curiously robust and perhaps resistant to even the most concentrated therapeutic interventions. In other words, thought suppression may be a necessary part of the development of phobia, panic, and inappropriate anxiety. Unfortunately, what people believe to be the medicine turns out to produce the disease.

A similar conclusion might be reached regarding the perpetuation of positive emotional responses such as infatuations, addictions, or obsessions. If a person is ever tempted to suppress pleasant or enjoyable thoughts—of an illicit lover, for instance, or of an unwanted habit such as smoking or drinking—the same processes illustrated in these studies might apply. Sex, after all, is a fine example of an enjoyable thought that can seem worthy of suppressing in certain circumstances. Like trying not to think of sex, trying not to think of anything that yields positive emotion should promote the perpetuation of a bodily response. So the unwanted positive emotion could be produced by the very attempts one makes to bring it under control. Perhaps this is one way to understand how people like televangelists Jimmy Swaggart and Jim Bakker, men whose entire lives seemed devoted to the suppression of certain exciting thoughts, came to find themselves ravaged by the very excitement they had hoped to suppress.

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