Modern Psychological Studies

Volume 4 | Number 1 Article 4

1996

Exploring three correlates of thought suppression: attention, absorbtion, and cognitive load

Carolyn I. Vicchiullo
Moravian College

Dana S. Dunn
Moravian College

Modern Psychological Studies
1996, Vol. 4, No. 1, pp. 21-39

Exploring Three Correlates of Thought Suppression: Attention, Absorption, and Cognitive Load

Carolyn I. Vicchiullo and Dana S. Dunn
Moravian College

Previous studies evaluating the probability of successful thought suppression (attempts to rid our minds of repeated unwanted thoughts) have relied solely upon internal mental distracters (Wegner, 1989), characterizing thought suppression to be a controlled rather than an automatic process. As an alternative approach, the effects of attention actively focused on limited external stimuli were studied in order to achieve easy, effortless, and successful thought suppression. Participants included students enrolled in undergraduate psychology courses. Experiment 1 showed that the presence of cognitive load (computerized tests of perceptual skills) occupied conscious capacity sufficiently so that attempts to suppress both mundane (tree) and exciting (sex) target thoughts were successful. Experiment 2 revealed that the physiological effects of exciting thoughts (measured via electrodermal activity) were higher for participants who were rated as having a predisposition toward successful suppression, although contrary to the results of Experiment 1, cognitive load did not have any effect on suppression or expression of target thoughts. Experiment 3 found that the type of cognitive load (motoric or attentional) was a factor in achieving successful thought suppression. Collectively, these findings suggest that experience seems to be a more effective thought distracter relative to traditional internal mental distracters, but only when attention is captured involuntarily and by an appropriately challenging level of cognitive load.

Experience tells us that trying to willfully eliminate an unwanted thought from our minds is an almost impossible task. Try as we might to command our thoughts to obey our wishes, there always seems to be a mysterious mental force which we encounter that sooner or later obstructs virtually every effort to suppress a particular unwanted thought. There are probably few of us who can triumph over the compelling force of our mind as we helplessly ruminate about an especially exciting event (the purchase of a ticket to win the $50 million lottery) or an imminent catastrophe (the fact that the winning ticket was lost!).

Indeed, research dealing with intentional and internal mind control in this sense has led to the conclusion that successful thought suppression is not only difficult (Wegner, Schneider, Carter, & White, 1987), but also quite futile (Wegner & Erber, 1992). In fact, the notion of incomplete thought suppression is so widely accepted that investigation has centered around its consequences (Wegner & Erber, 1993; Wegner et al., 1987; Wegner, Shortt, Blake & Page, 1990;) and characteristics (Wegner & Erber, 1992; Wenzlaff, Wegner & Klein, 1991; Wenzloff, Wegner & Roper, 1988) rather than on uncovering alternative methods of achieving successful elimination of unwanted thoughts.

Therefore, the intention of this investigation was to use the obstacles presented in thought suppression research thus far as a point of departure for an alternate approach to the dilemma of unwanted thoughts. Drawing upon Csikszentmihalyi's (1978, 1990) theory of optimal experience as a model, suppression's counterpart, concentration, was considered to be a viable avenue for exploration. Thus, a synthesis between these two theories was proposed to replace the traditional mind control suppression model, and it was predicted that participants who were involved in a totally cognitively-absorbing experiential activity would find thought suppression to be (a) easy, (b)

This research is based on an Honors Thesis by the primary author under the direction of Dana S. Dunn submitted to Moravian College. Portions of this paper were presented at the 1995 and 1996 Annual Meetings of the American Psychological Society, the Pennsylvania Psychological Association, and the Lehigh Valley Association of Independent Colleges.

I would like to thank Thank Stacey Zaremba, Jack Dilendik, Dennis Glew, Moravian College, and Joanne Regina, Psychology Dept., St. Luke's Hospital, Bethlehem, PA., for their valuable suggestions and helpful comments, and also to Martin D'Iorio, Good Shepherd Rehabilitation Hospital, Allentown, PA., Auke Tellegen, University of Minnesota, and Daniel Wegner, University of Virginia, for sharing their time and expertise. I am also grateful to Marie Ciferri and Christy Shoup for assisting with data collection and to Jackie Giaguinto for assisting with subject collection.

Correspondence concerning this article should be addressed to the author, c/o Dr. Dana S. Dunn, Dept. of Psychology, Moravian College, 1200 Main Street, Bethlehem, PA., 18018-6650 or via e-mail: dunn@moravian.edu.

effortless (consequential, such that all irrelevant material would naturally be unavailable to conscious awareness), and (c) successful.

Experiment 1 studied the effect that the absence or presence of cognitive load (computerized tests of perceptual skills) exerts on attempts to suppress mundane (tree) or exciting (sex) target thoughts. Results confirmed that concentration overwhelmingly promoted successful thought suppression. However, there were far more mundane thought occurrences recorded relative to exciting thoughts. Experiment 2 therefore addressed the unanticipated result of the first study. First, following Wegner et al. (1990), the physiological effects of suppression were measured. Electrodermal activity (EDA) was recorded to clarify whether exciting target thoughts might be nonconsciously affecting the sympathetic nervous system—even though conscious exciting thought intrusions were not occurring as often as predicted. A mirror-tracing task provided three incrementally difficult levels of mental load. Data indicated that mundane thoughts were associated with lower EDA activity versus exciting ones, replicating the results found by Wegner et al. (1990). This time, however, cognitive load did not significantly promote thought suppression.

In addition, the absorption ability of participants was evaluated using the Tellegen Absorption Scale (TAS) in order to determine the possibility of a predisposition for successful thought suppression (Tellegen & Atkinson, 1974). Although there can be many definitions of this personality trait, absorption is characterized here as an openness to experience identified by the simultaneous integration and dissociation with task-relevant and -irrelevant stimuli, respectively (Tellegen & Atkinson).

Since the mental load used in Experiment 2 was motoric and suppression was unsuccessful, it was suspected that motoric task as mental load was not sufficiently attentional and challenging in nature to produce successful suppression (M. D'Iorio, personal communication, March 21, 1995; Davidson, Schwartz, & Rothman, 1976). Consequently, Experiment 3 examined the possibility that the type of mental load under which a participant was placed was critically important to the validity of the focused attention hypothesis. However, first it is necessary to understand thought suppression as a mechanism of deliberate mental control.

The Problem of Mind Control

It seems logical to assume that in order to suppress an unwanted thought, all one has to do is consciously think of something else. In support of this belief, studies have shown that when asked to suppress a certain thought, people verbalizing their streams of consciousness enumerate a litany of unrelated items designed to direct their attention away from the unwanted object (e.g., Wegner et al., 1987). However, according to Wegner et al. (1987), such unfocused self-distraction, though instinctively employed by subjects, rendered successful suppression a difficult, even unreachable goal. Repetitive cyclic thought sequences consistently brought participants back to the unwanted thought thereby refueling the search for new distracters (Wegner et al., 1987). In addition, those stimuli used as distracters (e.g., thoughts of inanimate objects, people, places, etc.), as well as the environment in which the suppression took place, began to take on the property of the unwanted thoughts. These internal and external cues were found to eventually act as reminders of the original unwanted thought (Wegner, Schneider, Knutson & McMahon, 1991). These findings suggested that sooner or later effective distracters would disappear. Introduction of an assigned single distracter improved the ability to suppress (Wegner et al., 1987, Experiment 2; Wegner et al., 1990), but it became obvious that even given suitable distracters, strong attentional powers would be essential if suppression were to be more successful (Wegner & Schneider, 1989). Taken together, previous studies suggest that thought suppression as a mechanism of deliberate mental control and thought redirection is likely to be both difficult and unsuccessful.

A Holistic Approach to Consciousness and Attention

In early times, eagerness to adhere to scientific methods prompted structuralists (e.g., Wilhelm Wundt and Edward Titchener) and functionalists (e.g., William James) to view consciousness through a reductionistic lens. Recognition of a concept occurred only to the extent that its elemental neurophysiological components were understood. Attempts to explain consciousness were based on "hard-evidence" answers to empirical questions designed to deal with consciousness on a basic sensory level.

More recently, Csikszentmihalyi (1978, 1990) introduced the idea that consciousness was best perceived as a holistic experiential phenomenon. Csikszentmihalyi considers the person to be a self-governing, goal-directed system. Because the idea of consciousness includes consideration of external stimuli as well as an awareness of inner states, consciousness is represented as an integration of human experience and action.

Central to Csikszentmihalyi's (1978, 1990) theory is the fact that attention is perceived as a process that concerns the whole person interacting with the environment. It is seen as the psychic energy (albeit limited) that is necessary to control the stream of consciousness (Csikszentmihalyi, 1990; Glass, Holyoak & Santa, 1979). Attention can only be given to a certain number of features in the environment. Thus, when the mind is fully focused, any stimuli not occupying the focal area are left unrecognized and unprocessed (Fiske & Taylor, 1991).

Csikszentmihalyi (1978, 1990) extended these observations to develop his theory of optimal or "flow" experience. He believes that attention intensely focused on a limited stimulus field leads to the exclusion of all other material. A state of happiness, peak performance, and a loss of self-consciousness derives from this experiential event, all of which contributes to the total absorption in the episode. According to Csikszentmihalyi, such experiences must be subjectively engrossing to an individual in order to provide such fascination. Listening to music, writing, mountain climbing, even watching a movie might initiate the likelihood for an optimal experience. In addition, once people become involved in a task that is enjoyable or that challenges their skills to such a level at which mastery is possible (with the appropriate effort), a unique consequence ensues: all other unpleasant or unwanted mental material is forgotten while the participant is involved in this state of intense focused attention.

In this experiential context, mental control could be possible and even effective. If we followed William James' advice and exercised our will to focus attention selectively, only those stimuli that would capture attention appropriately would have effective influence on specific intentions (Wegner & Erber, 1993). Indeed, this combination of consciousness and will should be particularly effective when trying to suppress an unwanted thought.

Experience as a Thought Distracter

Attention is the mechanism that is responsible for selecting the particular information that will enter consciousness. It is influenced by complex mental operations (e.g., retrieval of memory, comparison, deciding on a course of action) which compete for a part of its energy, resulting in limited processing capacity (Csikszentmihalyi, 1978). During a state of optimal experience, attention is required to be fully and intensely focused on a narrow stimulus field. It is therefore possible that the cognitive energy necessary to fuel the completion of a particular experiential task will consume the balance of available attentional capacity. As a result, all extraneous stimuli will automatically be cut off from awareness—in short, simply forgotten (Csikszentmihalyi, 1990). This phenomenon is supported by self-reports of individuals who, while engaged in a state of flow, claimed that they were able to effortlessly forget even the unpleasant aspects of life when in this condition (Csikszentmihalyi, 1978). Moreover, this state of flow is compatible with the concept that cognitive load—especially cognitive overload (Wegner & Erber, 1993)—results in automatic and therefore consequential thought suppression. Attention and experience are thus related in that optimal experience requires concentration.

Recall that the primary purpose of a thought distracter is to redirect attention away from an unwanted thought. In light of the previous information regarding the state of flow, experience would seem to be an ideal thought distracter. If *external* distracters (experientially absorbing activities) replace *internal* distracters (thoughts of irrelevant information necessary for the operation of the intentional mental control paradigm), relatively effortless and successful thought suppression should then result.

Finally, experience as a thought distracter has two additional advantages. First, it has the benefit of not becoming a reminder of the original unwanted thought (cf. Wegner, 1989; Wegner et al., 1987; Wegner & Erber, 1992). A complete break from any associations linked with the unwanted thought would be accomplished. Total emersion in an activity challenging one's skills should break the connection with forbidden thoughts or any thoughts not connected with the actual activity. Second, as a thought distracter, experience completely fills up conscious capacity; there is no room for anything else (Csikszentmihalyi, 1978, 1990). Compared to mind control which requires intentionality and effort of thought redirection on a metacognitive level, optimal experience bypasses that process automatically eliminating unwanted thoughts.

In short, since a review of the existing literature on thought suppression revealed unsuccessful attempts at attaining this goal, an alternative method of achieving successful suppression was suggested and an experiential model of suppression was proposed. To that end, the following study tests the tentative conclusion that under conditions of intense cognitive load, thought suppression would be easily and effortlessly achieved.

Experiment 1

Method

Design and Overview. The effects of concentration on thought suppression were examined. Specifically, the purpose of this study was to investigate whether an experiential distracter would be more effective in achieving successful thought suppression than traditional internal mental distracters. Thus, it was predicted that if conscious capacity was intensely involved in a cognitively-absorbing experiential activity, intrusions of target thoughts would be successfully eliminated. Automatic exclusion of peripheral stimuli would allow successful suppression to occur with relatively little or no effort.

Because of the relatively subjective and experiential nature of this theory, bringing the investigation into the laboratory for examination presented a challenge. Typically, most data concerning experiential studies have been collected via the experiential sampling method (Csikszentmihalyi 1978, 1990) in which participants were randomly interrupted during their day to self-report their thoughts. However, a more scientific method of data collection was sought here in order to yield results that were as reliable as possible.

The objective was to simulate an intrinsically motivated activity and subjective experience by manipulation of extrinsic variables. It was decided that conditions of cognitive load would closely resemble the self-absorbing task necessary to mimic real-life concentration. Also, a slight incentive was employed to compel participants to put as much effort into the tasks as was objectively possible.

Two levels of thought (mundane and exciting) were used in order to test the strength of the focused attention paradigm. The choice of sex as an exciting thought was based on results of a study conducted by Wegner et al. (1990) in which the thought of sex was shown to produce the highest level of psychophysiological reactivity as compared to several less exciting thoughts (e.g., dancing, subjects' mothers, and the Dean). For purposes of this study, that effect was generalized to include the possibility that sex as an exciting thought would also account for the highest number of thought occurrences among participants and so would consequently be the most difficult to suppress.

Participants. Forty-one undergraduates (11 males, 30 females) from introductory and upper-level psychology classes at Moravian College, Bethlehem, PA, volunteered to participate in the study in return for extra credit. The mean age of participants was 24.93 (SD = 9.57). The participant pool in all experiments was considered to be a good enough representative sample of the college population necessary for the purposes of these studies. Many of the volunteers were enrolled in both day and evening courses. Typically, it was not surprising to find the students enrolled in the evening courses to be middle-aged or older in some cases. It was therefore hoped that this variation in age would allow for a diverse set of responses across participants. None of the participants in this study were interviewed for Experiment 2 or 3. Because one male participant misunderstood the instructions and considered every thought that entered his mind as one to be counted, his data were discarded. Consequently, a total of 40 participants' data were analyzed in the study.

Suppression and Load Manipulations. Participants arrived and were interviewed individually in separate rooms. This precaution was taken to insure that participants were not influenced by the responses of other participants.

Participants were randomly assigned to one of two conditions in which they were instructed to suppress either an *exciting thought* (sex) or a *mundane thought* (tree). Within each of these conditions, participants were randomly assigned to one of two levels of cognitive load. Thought targets and thought instructions were counterbalanced across participants. Participants in the *no-load condition* were merely asked to suppress the exciting or mundane thought simply by using any mental distraction technique they subjectively chose. They were left to their own devices to create a diversion that would prohibit the entrance of the unwanted target thought into consciousness. In addition, they were instructed to close their eyes so that the main external stimuli available would be of an auditory or tactile nature (following Knutson & Lansing, 1990). Participants were asked to perform their specific assignments for a period of 10 minutes. After the instructions were given, the experimenter left the room, returning only to collect the results, debrief the participants, and to thank them for their participation in the study.

Participants in the *cognitive load condition* were also asked to suppress either an exciting or a mundane thought; however, these participants were also told that their perceptual abilities would be tested. Each was placed in front of a computer terminal and required to perform cognitive tasks assessing perceptual skills by following instructions that were integrated into a software package. The programmed experiments consisted of four tests based on a combination of elements including psychophysics (method of constant stimuli and signal detection), feature detection (pattern recognition) and information processing (comparing visual and semantic information). In order to create additional motivation for the participants to become as absorbed as possible in the tasks, each was told that the other participants had no trouble in completing the tasks in the 10 minute time period, and that their scores would be compared with the scores of others who had taken the tests. In actuality these tasks would take well over the 10 minute time period to complete, but these incentives were deemed necessary to insure motivation to perform a cognitively-absorbing assignment in a laboratory setting.

Volunteers were told that the results of the tasks would be tabulated at the end of each section so that the experimenter was not required to be present; but in reality, participant performance was not recorded. Participants were also informed that the software had the capability to record their scores so they were not to stop to record their own scores when they finished a particular segment of the experiment. Since the instructions in the program were self-explanatory, participants were told to use their best judgment if they encountered difficulty during the test period. At the end of the 10 minute time period, the experimenter returned to collect the results, debrief the participants, and thank them for their participation in the experiment.

Dependent Measures. In all conditions, participants were provided with paper and pencil, and requested to place a check mark on the paper whenever they experienced awareness of their target thought breaking into consciousness. It was reasoned that because the no-load participants had their eyes closed and could not see the paper and pencil, these items would not be taken as cues associated with the unwanted thought. Similarly, because the cognitive load participants were visually fixated on the computer monitor, it was not expected that the paper and pencil would remind them of the unwanted thought.

Materials. Software, "Computer Lab for Memory and Cognition," used for the cognitive load condition was provided by Conduit-Laboratory in Cognition and Perceptions, The University of Iowa, Oakdale Campus, Iowa City, IA, 52242; Applesoft in ROM, 48K DOS 3.

Results

Since there were no statistically significant gender differences, $F < 1.00, p > .05$, this variable will not be discussed further. However, successful thought suppression was indeed impressive, as the total number of exciting and mundane thought occurrences significantly decreased from 194 in the no-load condition to 29 in the load condition (see Table 1).

A 2 (high vs. low cognitive load) x 2 (mundane vs. exciting target thought) analysis of variance (ANOVA) was conducted on thought occurrences. A significant main effect for thought targets was found, $F(1,36) = 14.12, p < .0009$. Unexpectedly, mundane thoughts ($M = 15.80$) were found to occur more frequently than exciting thoughts ($M = 3.60$). As predicted, a main effect for cognitive load was also found to be significant, $F(1,36) = 26.26. p < .0001$. Consistent with the hypothesis, participants in the load condition experienced far fewer thought occurrences ($M = 1.04$) relative to those in the no-load condition ($M = 9.07$). Moreover, a significant interaction between thought target and cognitive load qualified both main effects, $F(1,36) = 14.60, p < .0008$. Thought targets interacted with cognitive load such that participants assigned to the exciting thought and mundane thought conditions experienced far fewer thought occurrences when involved in a cognitively absorbing task. However, a more substantial reduction in thought occurrences was evident in the mundane thought-cognitive load condition relative to the exciting thought-cognitive load condition.

Discussion

Results of this study present compelling evidence that concentration positively facilitates suppression: Only 13% of all thought occurrences took place in the load condition relative to 86% in the no-load condition. The prediction that the number of thought occurrences in the no-load condition would be greater than the number of thought occurrences in the load condition was so clearly demonstrated that it may be concluded

Table 1

Means and Standard Deviations for Thought Occurrences as a Function of Cognitive Load

Condition	*n*	Thoughts	*M*	*SD*
No-Load				
Exciting Thoughts	10	36	3.60	2.67
Mundane Thoughts	10	158	15.80	9.41
Cognitive Load				
Exciting Thoughts	10	15	1.50	1.65
Mundane Thoughts	10	14	1.40	2.27

was so clearly demonstrated that it may be concluded that thought suppression is unsuccessful when internal mental distracters are used as the singular method of mind control. At best, this technique seems to be effective in keeping an unwanted thought at bay only temporarily—as any number of internal distraction strategies eventually fail to keep the target thought totally out of awareness (Wegner et al., 1987; Wegner et al., 1990; Wegner et al., 1991; Wegner & Schneider, 1989). When compared to a conscious effort to use specific internal thought distracters, the experiential model appears to be far more successful.

To further understand the effects of concentration on suppression, participants who experienced occurrences of the target thoughts in the load condition were questioned about the circumstances under which these thoughts became conscious. Of the 29 total reported thoughts in the load condition, 13 thoughts entered participants' awareness while the computer tabulated scores and progressed to the next test. Presumably, cognitive absorption was relaxed sufficiently during these intermissions so that participant's minds were not fully engaged on the narrow stimulus field. This cognitive relaxation allowed the target thought to creep back into consciousness, causing suppression to fail. Even more noteworthy was the fact that of the 20 participants assigned to the load condition, 10 reported having no target thoughts whatsoever during the 10 minute period. Consideration of these supplemental facts lend even more credibility to the experiential model of thought suppression. Thus, concentration overwhelmingly promoted successful thought suppression.

Suppression Explained by Capacity Models of Attention. Why were the occurrences of unwanted thoughts in the load condition so significantly decreased? Two possibilities may be considered. The first is Csikszentmihalyi's (1978, 1990) model of optimal experience (flow). Csikszentmihalyi contends that in this state of flow, consciousness only attends to the required amount of stimuli necessary to carry out a particular activity. Consequently, once attention is completely absorbed, we are virtually unaware of anything else around us. Further, Csikszentmihalyi maintains that when the mind is fully engaged in an enjoyable or challenging task, information irrelevant to the immediate objective is simply left unprocessed. If the findings of this current study are interpreted Csikszentmihalyi's terms, it would seem that suppression is a natural consequence of focused attention on a limited stimulus field. There is no effort needed to redirect thoughts away from an unwanted idea. As attention becomes focused on a fully absorbing stimulus, the state of consciousness is altered. Controlled processes, which are normally implemented by the mind on a voluntary and intentional basis, are rendered worthless. Becoming engaged in the task at hand involuntarily blocks irrelevant stimuli from awareness causing successful thought suppression occur automatically.

The second interpretation may be understood by means of Kahneman's (1973) capacity model for attention in selective attention tasks. Kahneman argues that the subjective demands of a task on a person are a fundamental component in determining whether one can recognize and process multiple stimuli simultaneously. Kahneman illustrates this point by maintaining that the routine activities of driving and talking are two relatively cognitively-undemanding tasks which are successfully accomplished simultaneously. However, driving in heavy traffic is more demanding, and so it would be expected that conversation would decrease during heavy traffic conditions.

In other words, for a stimulus to be completely recognized and processed, Kahneman (1973) posits that "cognitive resources" are necessary, and perceives that these resources are limited. Further, he believes that the more complex the stimuli, a greater amount of cognitive resources are demanded for processing. If all these resources are eventually exhausted, any additional stimuli will go unprocessed—even unnoticed. In like manner, when participants in the load condition were presented with a demanding task (i.e., computerized tests of perceptual skills) it is reasonable to assume that all available "cognitive resources" were totally consumed so that all other incoming stimuli (i.e., exciting or mundane target thoughts) were left unrecognized, allowing thought suppression to occur easily and effortlessly. Thus, the findings of this study are consistent with Csikszentmihlayi's (1978, 1990) theory of optimal experience and Kahneman's capacity model for attention.

The Enigma, Examination, and Elicitation of Exciting Thoughts. One unexpected result of this study demanded investigation: exciting thoughts only accounted for 22.9% of all thought occurrences across both load conditions relative to mundane thoughts (77.1%). Why would exciting thoughts be easier to suppress, even in the no-load condition? For example, when participants were asked to try not to think of sex, reactions ranged from "that will be no problem at all" to "I had so many other important things on my mind." In contrast, these almost resistant responses were absent in the mundane thought condition. Participants in this condition reported a great deal of difficulty in keeping thoughts of a tree under control. In fact, one participant remarked that everything she thought of reminded her of a tree.

It must be noted that sex was not randomly chosen as the exciting target thought—there were actually two reasons. First, sex received one of the highest ratings for six basic semantic characteristics (i.e., concreteness, imagery, categorizability, meaningfulness, familiarity, and number of attributes or features; Toglia & Battig, 1978). In addition, it is also rated as one of the highest scoring words for pleasantness. These traits, according to Toglia and Battig, can predict the level of emotional response expected from a particular word. Specifically, words that have high ratings in these qualities elicit significant emotional responses; conversely, words with low ratings produce little or no emotional responses.

Second, as mentioned earlier, results of a study done by Wegner et al. (1990) found that the thought of sex was responsible for producing the most intense degree of psychophysiological activity in participants compared to several other target words (e.g., Mom, the Dean, and dancing). Therefore, it seemed only logical to assume that sex would produce the greatest number of thought occurrences as well.

Assuming that all participants were honestly reporting any occurrences of target thoughts, reason as to why exciting thoughts were easier to suppress than mundane thoughts could not be established. However, suspicion arose as to whether there was any unconscious activity resulting from the suppression of exciting thoughts. It was therefore decided to replicate the results of the Wegner et al. (1990) study in which the suppression of exciting thoughts was examined.

EDA was chosen as the index of autonomic activity since arousal can be measured by recording the increases or decreases in skin conductance. Relationships between attention and arousal have been found to exist to the extent that the amount of effort demanded by a task will affect the amount of arousal that is experienced by a participant (Kahneman, 1973). In addition, results of shadowing studies have indicated that electrodermal responses were elicited in participants who heard shock-associated words in a nonshadowed channel (Dawson & Schell, 1982, 1983). This provided supplementary evidence that even though participants were not reporting high numbers of exciting thought occurrences, they might instead be experiencing arousal to the exciting thought.

The Link Between Cognition, Attention, and Absorption. A final issue concerns individual susceptibility to suppression. There is the possibility that individual differences in personality traits may account for why some people may be more likely to suppress more successfully than others. It has been proposed that the personality trait of absorption could be considered a key characteristic possessed by people who are successful suppressors, and that this trait might even be used as a predictor of the best candidates for successful suppression (D. M. Wegner, personal communication, October 29, 1993). In addition, a significant relationship between absorption and the ability to focus attention has been advanced by Miller & Foxworth (1992) as a result of their attempt to validate the Focus Conscious Attention (FCA) scale, a subscale of The Feelings, Reactions, and Beliefs Survey (FRBS).

Absorption is the personality dimension defined as the ability to experience deep involvement in attentional processing. It is identified by the simultaneous integration and dissociation with task-relevant and -irrelevant stimuli, respectively, resulting in the predisposition to enter an altered state of consciousness (Roche & McConkey, 1990; Tellegen & Atkinson, 1974). Although absorption has been neglected in the past, this quality has been brought to the fore as a result of investigations of the attributes of highly hypnotizable individuals. Studies indicate that some people possess the ability to become totally immersed in an activity so that distracting stimuli are ignored. "Imaginative involvement," as it is called by J. R. Hilgard (as cited in Roche & McConkey, 1990), allows for a readiness to become unaware of events that may divert attention from a deeply involving incident by the intrinsic use of factors such as daydreaming, a heightened sense of the attentional object, and curiosity—all activated by idiosyncratic and unconventional techniques.

Further, the relevance of absorption is illustrated by the fact that high-absorption participants should be able to suppress unwanted thoughts more easily relative to low-absorption participants. Performances of high- and low-absorption participants has revealed that there are actual physiological differences between these two groups—provided that attentional processes are stressed at the appropriate level of cognitive demand (Davidson et al, 1976). Under conditions that compelled attentional resources to be willfully directed (as opposed to effortless direction), high absorption participants display the ability to selectively restrict the use of cortical areas of the brain not involved in processing relevant information. In this group, cortical areas of the brain responsible for processing relevant information are not stimulated (Davidson et al., 1976). For example, if asked to be happy, high absorbers would instinctively do the reverse and try not to be sad.

The Tellegen Absorption Scale (TAS) is the measure most often employed to assess this trait (Roche & McConkey, 1990). It is one of eleven primary scales of the Multidimensional Personality Questionnaire developed by Tellegen and Atkinson (1974; see also Tellegen, 1981, 1982). Participants are required to furnish a "True" or "False" response to a 34-item self-report measure designed to assess imaginative activity. According to Tellegen (personal communication, July 19, 1994), scoring is quantitative and is measured on a continuum as indexed by the number of "True" responses (0 - 34) to the items on the questionnaire.

However, even though the TAS and other measures were designed to assess this dimension of absorption (Coan, 1972; McCrae & Costa, 1983, 1985; Tellegen, 1981, 1982; Tellegen & Atkinson, 1974), the extent to which these scales can be trusted to reflect an accurate rating of the trait has proven to be problematic. When the TAS was developed, most studies concerning its psychometric validity were conducted mainly on the external component of construct validity rather than on the substantive or structural components. Internal reliability of the external component (r = .88 and a 30-day-test-retest reliability of r = .91) has been reported by Tellegen (1982). In addition, some have found strong correlations between the TAS and measures of hypnotic experiences, but only with this one dimension. However, it is difficult to find any other validity or reliability ratings of the TAS. Consequently, the psychometric properties of the TAS have been called into question. The content of the events described in the 34 items designed to determine absorption ability has been challenged. The perception as to whether absorption should be considered a trait or a state also casts doubt on how this construct should be measured. Furthermore, differences in administration (alone or with other items), response format (dichotomous format or Likert-type format), length of the scale given (short or long version), and variations in scoring methods limit the significance of findings from research which has used the TAS (Roche & McConkey, 1990). But despite the shortcomings of the TAS, it is the best instrument designed thus far for measuring the construct of absorption. In view of these flaws, restraint will be exercised when interpreting the results of the TAS.

The central purposes of Experiment 2 were to (a) test the strength of the focused attention paradigm supported by the findings of Experiment 1, (b) replicate the results of Wegner et al.'s (1990) study in which exciting thoughts were found to produce the most psychophysiological activity, and (c) assess whether high absorbers found it easier to suppress thoughts than low absorbers.

These ideas were tested by (a) assigning participants to one of three incrementally difficult conditions of mental load, (b) measuring EDA, and (c) by asking participants to complete the TAS—dividing participants into high and low absorption groups whose thought occurrences could then be compared to their absorption status.

It was hypothesized participants in the highest cognitive load condition would find thought suppression to be easier and more successful than those in the lowest level of cognitive load. This prediction was based on the theory that the more complex the stimuli, the more conscious capacity is taken up for processing thereby leaving no attentional resources available to attend to irrelevant stimuli, that is, unwanted thoughts (Kahneman, 1973). It was also hypothesized that psychophysiological responses to an exciting thought would be greater relative to mundane thoughts as measured by participants' EDA. This assumption developed by recognizing the possibility that the participants in Experiment 1 might not have been aware of any conscious exciting thought intrusions, but were nonetheless undergoing unconscious emotional excitation (Wegner et al., 1990). Finally, it was predicted that a prerequisite for successful thought suppression would be manifested by a high score in the trait of absorption. This prediction was based on findings of previous research that high-absorption participants were thought to be able to focus attention totally on a particular stimulus (Miller & Foxworth, 1992; Tellegen & Atkinson, 1974).

Experiment 2

Method

Participants. Forty undergraduates (9 males, 31 females) from introductory and upper-class psychology classes at Moravian College Bethlehem, PA, volunteered in the study in return for course credit. Mean age of this group was 21 (SD = 5.29). None of the participants in this study were interviewed for Experiment 1 or 3. One participant withdrew from the study shortly after it began; therefore, data from 39 participants were analyzed.

Procedure. Participants were seen individually by the first experimenter who explained that participants would be invited to complete a questionnaire, test their motor skills, measure their ability to concentrate, and assess the level of stress that all these tasks might generate.

In order to assess the level (high or low) of absorption ability, all participants were asked to complete the Tellegen Absorption Scale (TAS), one of the primary scales derived from the Multidimensional Personality Questionnaire (Tellegen 1981, 1982;

Tellegen & Atkinson, 1974). After the questionnaire was completed and returned to the experimenter, each participant was led to another location and seated in a chair which was placed in front of a mirror-tracing apparatus.

Participants were then told that their motor skills would be tested and were asked to perform a mirror-tracing task (Humphries, Thomas & Nelson, 1991). Participants were asked to trace the image of a star as seen in a mirror on duplicate sheets of the star placed perpendicular to the mirror and which could not be seen by the participant. Incrementally challenging levels of tracing difficulty were considered to be viable manipulations of mental load and were designated as follows: Tracing the stimulus clockwise with the participant's dominant hand (low level of load); tracing the stimulus clockwise with participant's non-dominant hand (intermediate level of load); and, tracing the stimulus counterclockwise with participant's non-dominant hand (highest level of load).

The participant was then asked to indicate his or her dominant hand for proper EDA electrode placement. To assuage any apprehension about this phase of the study, participants were apprised of the operation of the EDA electrodes by being informed that their purpose was to simply detect and record any changes in the skin's electrical conductance during the experiment. While each participant was being prepared, instructions for the mirror-tracing task were given. The first experimenter sat directly adjacent to the participant and gave verbal instructions and a demonstration of how to perform the task. The participant was asked to look at a stimulus sheet held by the experimenter as instructions were given by physically showing the participant the exact direction in which they were to trace their stimulus sheets. The experimenter kept track of the beginning and end of each trial by placing a mark on a transparency of the stimulus and later transferring it onto the participant's actual stimulus sheet.

Instructions were based on the level of difficulty of the condition to which participants were assigned. Group 1 (low level of load) was told: "When you are instructed, please pick up your pen with your dominant hand, place the pen at the top of the star, like this, and begin tracing between the lines made by the two stars in a clockwise direction." Group 2 (intermediate level of load) received the same instructions—except they were asked to trace with their non-dominant hand in a clockwise direction. Participants in Group 3 (highest level of load) were asked to trace with their non-dominant hand in a counterclockwise direction. Participants were not given the opportunity to practice tracing the star in order to avoid (as much as possible) practice effects. Thought instructions and thought targets were counterbalanced across participants.

After the participant was told that thought instructions would be given as the experiment progressed, a second experimenter, who operated the computer, began the procedure by asking the participant to "Please begin tracing, but do not think of anything." At the end of that baseline interval, directions were given to continue tracing and to suppress the first target thought (e.g., "Please continue tracing but do not think of a tree. If you think about a tree or anything connected with a tree, please tell us"). After 2 min, participants were given the same instructions, but were asked to think about a tree. During the second baseline interval, directions were given to "Please continue tracing, but do not tell us your thoughts". Identical thought instructions were given for the next two periods, but the second thought target (sex) was used. To end the experiment, participants were requested to repeat the baseline requirements. Each participant was fully debriefed and thanked for their participation.

EDA Measurement. Each participant's EDA was measured by using the standard instructions provided in the Guide for the Biofeedback Microlab Software Package (HRM Software—Apple version, 1989). The sensor cable was connected to the electrodermal activity input on the Microlab Interface. Participants' fingers were cleansed with alcohol (as electrode conductivity gel is not advised for EDA measurements) and the two EDA sensors (23mm Snapon Ag/AgCl permanent electrodes) were attached to the second and third fingers of each participants's free hand (i.e., whichever hand was not being used to perform the mirror-tracing task) by means of velcro strips. Tape was used to secure the sensor cable to the participant's hand in order to reduce sensor movement and to insure accurate measurement. Readings were taken every 10 sec and saved on hardcopy so that an average of each 2 min trial could be obtained.

Following Wegner et al., 1990, EDA was recorded throughout the study beginning with a 2 min baseline reading during which participants were at rest and free of task involvement. Immediately following this baseline period, participants were requested to begin tracing the star stimulus according to the instructions specified for the level of mental load to which they were assigned (low, intermediate or high). For the next two 2 min periods, participants were asked first to suppress (not to verbalize) and then to express (verbalize) the first of two target thoughts (a mundane thought, stone, or an exciting thought, sex). For this experiment, a stone—instead of a tree—was chosen as the mundane target thought. This follows the criteria suggested by Toglia and Battig (1978) used in

Experiment 1 (see Discussion for Experiment 2). Participants were also instructed to verbalize all occurrences of target thought intrusions. A second baseline reading was then taken while participants were (again) at rest. Another pair of 2 min segments ensued during which participants followed the original instructions with the exception of suppressing and then expressing the second target thought. Thus, each participant ultimately suppressed and expressed both the mundane and the exciting thought while executing the mirror-tracing task. A third baseline reading completed the experiment. EDA deviation for each suppression and expression trial was determined following Wegner et al.'s (1990) directions to (a) take the mean of the EDA baseline periods preceding and following each condition and then (b) subtract the EDA condition mean from it.

Mirror-Tracing Apparatus. The instrument (Mirror Tracer, Model #31010, Lafayette Instrument Co.) consisted of a horizontal metal plate with a copy of a six-pointed star (Mirror Tracings Stars, Model #31110, Lafayette Instrument Co.) placed on it which was blocked from the participant's view by an adjustable metal shield. To trace the star, participants had to rely on the image of the star as seen in a mirror positioned behind and perpendicular to the plate on which the star was placed. The image of the star was actually composed of two concentric stars—one approximately one-quarter of an inch inside the other. This configuration created a path within which the participant, using a pen, was required to trace third line. Measures consisted of the number of stars completed and the number of errors counted. An error resulted each time the traced line exited and then re-entered the pathway. One point was given for any single error; five and ten points were given respectively for perseverative sections: 1/2 inch and 1 inch masses of uncountable, tightly compacted errors. The length of each tracing trial matched that of each suppression and expression trial (2 min).

Results

Multivariate analysis of variance (MANOVA) was performed utilizing Conditions (target thoughts [sex and tree] and thought instructions [suppression and expression]) as repeated measures factors. Gender, Cognitive Load Groups (low, medium, high), and Absorption scores were used as between groups factors. The dependent variables were EDA measurement, TAS scores, errors and number of stimulus sheets completed for the tracing task, and thought occurrences.

There were no statistically significant gender differences or other between-subject effects, $F < 1$, $p > .05$. A median split was performed on the TAS scores ($Mdn = 21$) to create two subject groups (high vs. low absorbers). Following Wegner et al. (1990), EDA scores were calculated. The resulting EDA scores were then analyzed by a 2 (high vs. low absorption) x 2 (suppress vs. express) x 2 (mundane vs. exciting) ANOVA, where absorption served as a between-subject factor and thought instructions and target thoughts were repeated-measures. A within-subjects main effect for target thought indicated that mundane thoughts were associated with lower EDA activity than exciting ones, replicating Wegner et al. (1990), $F[1,37] = 7.27$, $p < .02$); however, this result was qualified by an Absorption x Target Thought interaction, $F[1,37] = 5.35$, $p < .03$. Low absorbers had lower average EDA activity for mundane rather than exciting thoughts, while high absorbers had relatively higher average EDA levels for mundane rather than exciting thoughts. A marginally significant within-subjects effect for thought instruction indicated that suppression was associated with lower EDA activity than was expression, $F(1,37) = 3.51$, $p < .07$.

Discussion

Experiment 2 produced three principle findings. First, as predicted, participants experienced more physiological activity from the exciting target thought of sex than to the mundane target thought of stone. In this respect, Wegner et al.'s (1990) study was replicated, providing support for the assumption that even though conscious occurrences of an exciting thought may be low or non-existent, there still may be some emotional responses which are generated by an exciting thought. Such a finding hints at the possibility that conscious (thought occurrences) and unconscious (physiological activity) responses to exciting thoughts may, at times, be mutually exclusive: One does not need to be aware of the thought of sex to respond emotionally to it. In fact, to generalize this notion, it may be that any unconscious subjectively arousing thought could cause an emotional reaction which might be responsible for engendering any number of feelings (e.g., anxiety, exhilaration, or depression). This assumption is supported by findings of Wegner et al.'s (1990) study which suggest that phobias and obsessive preoccupations may be motivated by the suppression of exciting thoughts.

The Effect of Absorption on Attention. A second principle finding pertains to the significance of the interaction found among EDA, absorption, and target thoughts: EDA activity was lower for low absorbers when they thought about a stone than when they thought about sex, but higher for high absorbers when they thought about a stone rather than sex. Further, high absorbers experienced just about as many target thought intrusions ($n = 305$) as low absorbers ($n = 289$). Interpretation of these data, however, has proven to be problematic due to the ambiguous performance of participants and the experimental nature of previous research concerning absorption and attention. For example, psychophysiological differences between high- and low-absorbers have indeed been documented—but of critical importance was the degree of participants' attentional involvement and the appropriate level of task demands placed on those participants (Davidson et al., 1976).

Attentional involvement, even in a controlled environment, may be a function of a participant's subjective evaluation of the necessary effort needed to be put forth in order to achieve the specific goals of an experiment. In addition, situational circumstances (e.g., fatigue, preoccupation, motivation) existing at the time of data collection may have interfered with the attainment of an accurate measure of this variable. Thus, it is reasonable to conclude that physiological differences may be contingent upon individual differences—a predicament which makes it difficult to reliably interpret the data.

The relevance of the effect of absorption on attention may also be dependent upon the type of measurement employed. Here again, disparate results make interpretation difficult. In studies using biofeedback procedures to control heart rate and blood pressure, the relevance of absorption was clearly supported, but inconclusive results were obtained in studies using electromyographic activity as a dependent measure (Roche & McConkey, 1990). In other studies, absorption was demonstrated to be irrelevant when skin temperature was used as a dependent measure (Roberts, Schuler, Bacon, Zimmerman & Patterson, 1975), although it has been argued that changes in skin conductance levels are second only to dilation of the pupils in measuring indications of arousal (Kahneman, 1973). Finally, to further complicate matters, it is not entirely clear what the state of arousal is exactly measuring—what the participant is actually doing, the effort that is being put forth to accomplish a task, or the stress level that either of these determinants may generate (Kahneman, 1973). In other words, is the physiological activity due to mental load, unconscious emotional reaction, or to anxiety? In view of all this conflicting information, the interaction among EDA, absorption, and target thoughts cannot be clearly interpreted. Further research is needed in this area in order to accurately determine the cause and the meaning of such activity.

The Relationship between Attention and Arousal. The third principle finding which approached significance was participants' experience of greater physiological response when they expressed a target thought than when they suppressed a target thought. This is important because it contradicts the results of Wegner et al.'s (1990) study in which no main effect was found for suppression versus expression. Increases in skin conductance levels were recorded, but they were apparent only during the suppression of the thought of sex.

This puzzling difference may be explained in the theoretical context of the Yerkes-Dodson Law (as cited in Kahneman, 1973) which describes the correlation between arousal and performance. In keeping with the capacity model of attention (Kahneman, 1973), there is a mutual relationship between attention and arousal. Attentional demands influence the degree of arousal experienced; conversely, the intensity of arousal influences the allocation of attentional output in a hierarchical manner necessary to accomplish various activities. Recall that the participants in the expression condition were asked to do three things: (a) To specifically ***think*** about their assigned target thought; (b) to ***perform*** a mirror-tracing task of a low, medium, or high level of difficulty; and (c), to ***verbalize*** any intrusion of the assigned target thought. Participants in Wegner et al.'s (1990) study were requested to express (or suppress) a target thought while verbalizing their stream of consciousness, but were ***not*** placed under any type of mental load—a factor which may help to explain the difference in results. A request to express a thought, either exciting or mundane, requires much more intentionality and voluntary effort to command the mind to focus on that thought as opposed to a request to suppress that thought (see Experiment 1). Therefore, since more effort is expended when expressing a thought, physiological activity would be expected to increase correspondingly with that necessary elevated level of effort. Presumably, this is exactly what occurred in Experiment 2 as increased arousal was experienced by participants in the expression condition.

The Non-Significant Effect of Mental Load on Suppression. One disappointing finding of Experiment 2 which invites investigation is the absence of a significant between-groups effect of mental load on suppression. The mirror-tracing task was chosen as a measure that could be manipulated in order to yield three increasingly difficult levels of mental load. Since more difficult tasks require more effort and attention (Kahneman, 1973), it was predicted that participants placed in the highest level of load would allocate most of their attentional capacities to the tracing task. The remaining cognitive resources would be so limited—even possibly non-existent—that processing of any other stimuli (i.e., target thoughts) would be impossible. Suppression would therefore occur more easily and successfully for the participants in the high load condition relative to the participants in the low and medium load conditions. However, the results did not confirm this expectation.

Dispositional attributes could account for the non-significant effect of mental load on suppression; characteristics of the participants themselves may be responsible for the failure of the prediction. High absorbers tend naturally to direct their attentional capacities toward internal events (experiential set) while low absorbers prefer an external goal-oriented orientation (instrumental set; Qualls & Sheehan, 1981; Tellegen, 1981). In this experiment, verbal instructions were given to the participants at the beginning of each 2 min trial. During each suppression-expression period, each participant was first asked to continue tracing while carrying out specific thought instructions. High absorbers may have experienced those thought instructions as a hindrance to their inclination to become engrossed in the mirror-tracing task. According to the prediction, this task-oriented focus should have enabled them to suppress target thoughts, but because their concentration may have been disrupted with each thought instruction, this was not the case. Low absorbers, on the other hand, should have perceived the verbal instructions as a constant redirection of their goal, thereby facilitating their performance in achieving successful suppression. However, it is conceivable that because low absorbers are externally oriented, instructing them to perform the mirror-tracing task, suppress or express a target thought, and to verbalize any thought intrusions may have split their attention to such an extent that their performance was hampered. Consequently, any predicted effect of mental load on suppression was prevented.

Cognitive Tasks vs. Motor Tasks. Finally, an analysis of the type of mental load used in this experiment may prove to be an additional possible explanation for the lack of effect of mental load on suppression. Recalling that computerized tests of perceptual skills were used as mental load for Experiment 1 and a mirror-tracing task was used as a mental load for Experiment 2, is it possible that tests of perceptual skills might place more of a cognitive load on attentional processes than the mirror-tracing task? Could there be a difference in the demand that is required of a cognitive task versus a motor task? And if so, could that difference be the variable responsible for the effectiveness of the type of load used to achieve successful thought suppression in Experiment 1, as well as the failure to achieve successful thought suppression in Experiment 2?

The answer may lie in understanding mode-specific cortical patterning. Complex brain behavior interactions, as measured by cerebral psychophysiological methods, have shown that individuals vary significantly in the amount of cortical involvement observed during attentional tasks (Davidson et al., 1976). For example, in one experiment conducted by Spong, Haider, and Lindsley (as cited in Davidson et al., 1976), the greatest response recorded for participants attending to visual stimuli occurred in the occipital cortex, while the greatest response recorded for participants attending to auditory stimuli occurred in the temporal cortex. If this line of reasoning is followed, it can be argued that the two different types of load used in the first two experiments affected two different cortical areas of the brain. This distinction is important because the functions of these cortical areas may disclose a disproportionate outlay of effortful and noneffortful attentional performance which may account for the contradictory results of the two types of mental load used in the first two studies.

A review of the specific perceptual tasks used in Experiment 1 reveals that tests such as signal detection, feature detection, pattern recognition and comparison of visual information were taken. These tasks required the use of cognitive processes that included counting, visual scanning, visual comparison, reading, and spatial organization—to name a few. Such operations are performed primarily by the occipital cortex (visual) and the frontal cortex (higher mental processes), and place an extremely heavy and sustained cognitive load on attentional processes. In contrast, the mirror-tracing task was much less cognitively engaging by requiring participants to draw—a task that, with practice, eventually allowed participants to work by rote. Although the occipital cortex is also involved in this process, the operation is chiefly performed by the parietal cortex and requires not so much a cognitive, but a motorical demand, in terms of mental load (M. D'Iorio; personal communication, March 21, 1995). This neuropsychological perspective fits nicely with Kahneman's (1973) capacity model of attention: most or all of participants' attentional resources were consumed in Experiment 1. Therefore, the load variable seems to explain why successful thought suppression was achieved in Experiment 1 and not in Experiment 2.

Acoustic vs. Semantic Processing. A third study was designed to test the notion that participants would be able to suppress more successfully when working under a challenging cognitive load. Additionally, the mental load chosen for this experiment would have to impose a heavy demand on the same cortical areas that were effected in Experiment 1. A task which necessitated participants to encode, store, and retrieve stimuli would be considered to pose an appropriate demand on cognitive resources (M. D'Iorio, personal communication, March 21, 1995). Consequently, depth of processing (shallow versus deep processing) was selected as the type of mental load for Experiment 3.

Depth of processing is a relatively simple method of analyzing how a stimulus is encoded into memory. Such processing can be thought of as existing on a continuum, simple physical encoding at one end (acoustic) and a deeper encoding (semantic) at the other (Craik & Lockhart, 1972). During acoustic encoding, only the physical characteristics of the stimulus may require attention (e.g., how may vowels are in a word). Because very little processing is necessary to decide the number of vowels in a word, the stimulus is said to be processed on a shallow (nonsemantic) level, and therefore imposes an almost trivial demand on cognitive resources. In addition, stimuli processed on a shallow level will provide a less durable memory code so that recall of stimulus words will be poor (Craik, 1979; Craik & Lockhart, 1972; Hyde & Jenkins, 1973; Parkin, 1984).

During semantic encoding, stimuli are processed on a deeper cognitive level (i.e., a judgment about a word). In order to evaluate the quality of a word, more effort is required in terms of cognitive energy. For example, if asked to determine whether a word is pleasant or unpleasant, participants would need to think about their past experiences concerning that word, what others would think about that word, and comparisons between the two sets of criteria. A deeper analysis of the stimulus is therefore required resulting in a more durable memory code and a greater rate of recall than words processed on an acoustic level. It follows, then, that the nature of the memory code would be an indication of the level of cognitive processing utilized to encode the stimulus (Craik 1979; Craik & Lockhart, 1972; Hyde & Jenkins, 1973; Parkin, 1984).

The purposes of Experiment 3 were threefold: (a) To again replicate the results of Wegner et al.'s (1990) study showing that subjects demonstrated higher physiological activity when suppressing exciting thoughts than when suppressing mundane thoughts; (b) to assess whether high absorbers found it easier to suppress target thoughts than low absorbers; and, (c) to test the demands of a more cognitive load on the ability to achieve successful thought suppression. It was hypothesized that participants' EDA recordings would be high during suppression periods of exciting thoughts versus mundane thoughts; that high absorbers would be more successful at suppression than low absorbers; and, that depth of processing as cognitive load would promote successful thought suppression.

Experiment 3

Method

Design and Overview. In this 2 (exciting thought vs. mundane thought) x 2 (low cognitive load vs. high cognitive load) design, participants were asked to suppress either the exciting or mundane thought while processing a tape-recorded list of 20 words (see Appendix) on either a shallow or a deep level (Parkin, 1984). As in Experiment 2, the TAS was administered to assess participants' level of absorption ability and EDA was measured continuously throughout the experiment. After hearing the word list, a distraction task was introduced before asking the participants to recall as many of the words on the list as possible.

Participants and Procedure. Twenty-four undergraduates (11 males, 13 females) from introductory and upper-level psychology Moravian College, Bethlehem, PA, participated in the study in return for course credit. The mean age of volunteers was 23 ($SD = 6.80$). Again, none of the participants in this study were interviewed for either Experiment 1 or Experiment 2.

Participants were seen individually and were first asked to complete the TAS. Using the same procedure and equipment as in Experiment 2 for measuring electrodermal activity, EDA sensors were attached to 2 fingers of each participant's non-dominant hand. During this time, participants were given a pre-numbered sheet with numbers from 1 to 20 and advised of their assignments. First, a 1 min baseline reading would be recorded during which they were instructed not to move or speak. Approximately 30 sec into that baseline segment, the participants would be receiving directions from the experimenter to listen to a tape recording of 20 words (see Appendix), spaced 3 sec apart. The task of the low-level group was to determine whether each word had the letter "E" in it (acoustic processing). If it did, they were told to write a "Y" for "Yes" next to the corresponding number on the sheet. If the word did not have an "E" in it, they were asked to write an "N" for "no" next to the corresponding number. The task of the high-level group was to determine the emotional quality of each word (i.e., if the word had a good or bad connotation to it; semantic processing). If they thought the word had a good connotation, participants were asked to write a "G" next to the corresponding number; if the word had a bad connotation, they were asked to write a "B" next to the corresponding number.

Additionally, participants were asked to suppress either a mundane (tree) or an exciting (sex) target thought. Since this experiment was designed to be comparison of cognitive resources as explored in Experiment 1, no expression of target thoughts was required of the participants. The choice of mundane target thought in this experiment was "tree" (as in Experiment 1) rather than "stone" (as in Experiment 2). Again, this decision was made in order to follow as closely as possible the procedure used in Experiment 1 so that cognitive functioning could be examined. Participants were also asked to verbalize any instances of target thought intrusions to the experimenter while performing their acoustic or semantic assignments.

A second and final 1 min baseline period completed the trial, after which participants were given a distraction task: they were asked to count up the number of "Y", "N", "G", or "B" responses on their respective sheets and to enter those scores in the appropriately marked boxes. Then, the participants were asked to recall as many of the words on the list as they could and to write them down on the back of the sheet. Recall time did not exceed 2 min in any case. The experimenter then removed the EDA sensors, debriefed the volunteers, and thanked them for their participation.

Results

This experiment investigated the hypothesis that depth of processing would place such an appropriate and sufficient cognitive load on attentional processes that successful thought suppression would result. ANOVAs were performed using cognitive load (low vs. high), target thoughts (exciting vs. mundane), word lists, absorption scores, and gender as between group factors. Dependent measures consisted of EDA measurement, thought occurrences and word recall.

To verify that there were no effects due to the two different word lists, an ANOVA was conducted on each of the dependent measures (i.e., recall, thought occurrences, and EDA). As anticipated, there were no differences (all Fs < 1.00, ps $> .05$).

A cognitive load x target thought ANOVA was conducted on word recall. A significant main effect for load was found, $F(1,23) = 58.39$, $p < .001$. As expected, processing words on a semantic level (M = 11.40) facilitated higher recall of stimulus words than when processed on an acoustic level (M = 6.43; Craik, 1979; Parkin, 1984). A significant main effect for a gender x high absorption score ANOVA was also found, $F(1,23) = 16.98$, $p < .001$, indicating that females in this sample (M = 23.38) were higher absorbers than the males (M = 16.64). There were no other between-group effects.

However, further analyses indicate that only 75% of the participants in this study reported any thought occurrences at all: 67% of participants in the low load condition reported having no thought occurrences and 84% of participants in the high load condition reported having no thought occurrences. It is also interesting to note that EDA was elevated for *both* exciting (M = +4.6) and mundane (M = +4.6) target thought groups. Finally, more thought intrusions were experienced by low absorbers (n = 21) than high absorbers (n = 11).

Discussion

In this Experiment, the assumption that participants placed under low cognitive load would report more target thoughts than participants placed under high cognitive load was tested. Because semantic processing allows for higher word recall due to a deeper level of cognitive analysis (Craik & Lockhart, 1972), it was expected that participants in this semantic processing group would have fewer thought occurrences than participants in the acoustic processing condition (Craik, 1979; Parkin, 1984). However, the results of the ANOVA did not confirm this assumption. It appears that because there was no significant difference between the two groups, both semantic and acoustic levels of processing were effective in producing thought suppression.

This disappointing result notwithstanding, we believe that we have gathered support for the primary hypothesis: the nature of the cognitive load used to facilitate successful thought suppression must be such that it places an appropriate level of demand on attentional resources in order to be successful. In this respect, Experiment 3 was significant. Since 75% of all participants reported having no thought intrusions whatsoever, it is strongly suggested that depth of processing indeed promoted successful thought suppression across both load groups. To further illustrate this point, it was discovered during postexperimental interviews that participants in the exciting thought condition experienced most thought intrusions following the recognition of certain words on the stimulus list as cues to the assigned target thought of sex (i.e., boy, girl, and hot). Although there was a non-significant effect of cognitive load on thought occurrences between groups, it is important to understand that there is still enough substantial evidence to indicate that thought suppression was achieved when depth of processing was used as cognitive load. To the extent that thought suppression is achieved when participants are placed under the appropriate level of mental load, the findings of

Experiment 1 were replicated, and support for the focused attention was reinforced.

Another interesting finding in Experiment 3 was the lack of effect of EDA measurement across both target thought groups. The prediction that greater physiological activity would be experienced by participants in the exciting target thought group—replicating Wegner et al.'s, (1990) study and our Experiment 2—was incorrect, as EDA activity increased in all but three cases (2 participants experienced a decrease in EDA activity and one showed no difference at all). Why might this have happened?

One explanation is possible in terms of Kahneman's (1973) theoretical framework regarding the orientation reaction (OR). The OR is a pattern of heightened physiological responses caused by the anticipation of a stimulus. In this experiment, the stimulus necessary to evoke such a response would be the task requiring participants to process the word list on either an acoustic or semantic level. Unofficial observations made by the experimenter who monitored EDA activity on the computer screen confirm this notion: In 88% of the trials, all physiological activity increased during the period when participants were required to process the word list, compared to decreased levels of EDA activity recorded during pretask and posttask periods of rest. This explanation is consistent with Kahneman's (1973) capacity model of attention, which posits that the amount of arousal experienced is directly proportionate to the amount of effort invested in a task—or in the mobilization to perform a task. Although the mobilization effect is not typically maintained over a long period of time, it is certainly reasonable to presume that this effect can indeed be maintained over a period of 60 sec (the length of each segment in Experiment 3).

In addition, time-pressure is an element that imposes a heavy demand on resources causing increased arousal (Kahneman, 1973). In the experiment, when participants were given instructions, they were told that they would hear a tape recording of word list containing 20 words, each spaced 3 sec apart, and that they needed to make a semantic or acoustic judgment about that word. The time-pressure that was created by this request might have caused some additional arousal that was recorded for this segment of the experiment. A final comment concerns the finding that more thought intrusions were reported by low rather than high absorbers. It was expected that high absorbers would suppress better than low absorbers, and this indeed was the case. In view of this information, we must wonder why these results were obtained in Experiment 3 but not in Experiment 2.

In Experiment 3, participants had only two tasks: To make decisions about some words and to suppress a target thought. It may be that high absorbers were fully able to utilize their preferred experiential set. These high absorbers might have accomplished these tasks by means of focusing their attention solely on the stimulus words themselves. By using their ability to narrow their focus internally on a stimulus, high absorbers were troubled by very few target thought intrusions. In contrast, it is possible that low absorbers were not able to adopt their preferred instrument set. Because there were no external stimuli to constantly redirect their attention to the goal at hand (processing of stimulus words), low absorbers were not able to keep their minds focused on those stimulus words which allowed target thought to intrude more often. This pattern can be supported by the fact that low absorbers recalled fewer words ($n = 72$) than high absorbers ($n = 118$): High absorbers demonstrated relatively greater powers of concentration than low absorbers.

General Discussion

Results of previous research suggest that thought suppression is extremely difficult to accomplish—even futile—if one is using self-distraction methods that are solely dependent upon internal thought distracters (Wegner & Erber, 1992, 1993; Wegner et al., 1987; Wegner et al., 1990; Wenzlaff et al., 1991; Wenzlaff et al., 1988). Nevertheless, these studies have provided some valuable information about the techniques of intentional mind control.

Suppression strategies have included the use of unfocused self-distraction (thinking of an assortment of unassigned, unrelated items; Wegner et al., 1987) and focused self-distraction (using a single assigned distracter; Wegner et al., 1987, Experiment 2; Wegner, 1989; Wegner et al., 1990). However, these attempts at willful and effortful mind control have been shown to invariably fail for several reasons. For instance, when engaging in unfocused self-distraction methods, unassigned distracters generated cyclic thought patterns (Wegner et al., 1987) and environmental cues that eventually led subjects back to the original unwanted thought (Wegner et al., 1991). This situation foreshadowed the unavoidable depletion of effective thought distracters. Assigned single distracters allowed for more successful suppression, but required the possession and implementation of strong attentional powers (Wegner & Schneider, 1989). Consequently, thought suppression as a mechanism of intentional mental control has been proven to be unsuccessful.

Another approach to conquer unwanted thoughts was investigated in this study based on

Csikszentmihalyi's (1978, 1990) theory of optimal experience (flow). A state of flow is typically recognized by self-reports of enjoyment, concentration, or deep involvement described by people engaged in a challenging task—provided the activity is not beyond the individual's capacities (i.e., not too demanding to provoke anxiety or not demanding enough to invite boredom). A condition of happiness, peak performance, and loss of self-consciousness derive from this experiential event, all of which contribute to total absorption in the episode. Most importantly, once a person is experiencing this state of intense focused attention, an altered state of awareness occurs and a unique consequence ensues: All other unpleasant or unwanted mental information is involuntarily forgotten. This dimension of the flow state is a significant by-product of the experience because it implies that enjoyable and challenging activities require complete attention to the task at hand, thereby leaving no room for irrelevant material (Csikszentmihalyi, 1990). It was therefore expected that if a synthesis of thought distraction theory (Wegner, 1989) and optimal experience theory (Csikszentmihalyi, 1990) could be achieved, experience would prove to be the appropriate thought distracter necessary to accomplish successful thought suppression.

Experiment 1 examined whether participants would be able to achieve successful suppression if absorbed in an experiential and challenging activity. Cognitive load for this study consisted of computerized tests of perceptual skills. While performing these tests, participants were asked to suppress either a mundane (tree) or exciting (sex) target thought. As predicted, concentration overwhelmingly facilitated successful thought suppression. Although it was expected that there would be more exciting thoughts recorded than mundane thoughts, this result was not obtained. Experiment 2 was therefore designed to explore the surprising results of the first study by replicating research conducted by Wegner et al. (1990) in which physiological responses to exciting thoughts were found to be significant. To that end, participants' EDAs were recorded to measure whether exciting target thoughts could be producing physiological arousal—even though exciting thoughts were not breaking into consciousness as often as expected. In addition, the possibility that there could be a predisposition for successful thought suppression was addressed by evaluating the absorption ability of participants as measured by the TAS (Tellegen & Atkinson, 1974).

In the second experiment, a mirror-tracing task provided three incrementally difficult levels of mental load. Data indicated that mundane thoughts were associated with lower EDA activity versus exciting ones, replicating Wegner et al's. (1990) results. However, cognitive load did not significantly promote thought suppression. These findings suggested two possibilities: (a) In contrast to the heavy and sustained cognitive load used in Experiment 1, the mirror-tracing task was an easier, motorical task, and so less cognitively demanding; and (b) the amount of cortical involvement during the performance of each task was significantly different. This information was enough to speculate that the load variable was the reason suppression succeeded in the first study and failed in the second.

Using depth of processing as cognitive load, Experiment 3 tested the probability that the type of mental load under which a participant was placed was indeed of critical importance to the validity of the focused attention hypothesis. As anticipated, suppression was again successful. It was concluded that the nature of the cognitive load was of critical importance in placing the appropriate demand on attentional resources in order to facilitate suppression.

Intentionality is the Key

Clearly, these current findings imply that under conditions of appropriate cognitive (or mental) load, successful thought suppression can and does occur. If thought distracters are experiential in nature and the demand of the mental load produced by that experience is such that cognitive capacity is sufficiently occupied, as well as narrowly focused, there is evidence that unwanted thoughts can be banished from our minds. However, the most critical factor is that attention must be captured involuntarily or suppression will fail just as surely as it does when intentional mind control is attempted.

It is essential, however, to make certain that these findings are not interpreted as evidence that in order to rid oneself of unwanted thoughts, all one has to do is concentrate on alternative stimuli. It is not enough to say that one must "concentrate" on something else in order to achieve successful thought suppression. As a mechanism of mental control intended to direct our thoughts elsewhere, concentration is just as susceptible to the same frustrating characteristics and consequences that plague suppression—provided the process is initiated deliberately (Wegner, 1994). Thus, if suppression is a consequence of an individual's spontaneous absorption and interaction with subjectively attractive or challenging elements of his or her environment, we believe it will be successful.

The emphasis on whether control is achieved on a voluntary or involuntary basis is an important distinction that must be made in order to properly understand the implications of the current studies. Recent research in the domain of mental control proposes that under conditions of mental load sufficient to reduce cognitive capacity, not only is suppression inhibited, but the opposite of what is intended ironically occurs (Wegner, 1994). For example, if one is trying to sleep while under load, wakefulness will result; if one is trying to relax under load, anxiety develops. The theory of ironic processes seems to be inconsistent with the results of the research contained herein.

An understanding of what lies at the heart of the ironic process theory will illustrate the difference between the two theories. Wegner et al's. (1990) basic concept asserts that there are two processes that are implemented when mental control is desired: The operating process, which is responsible for filling the mind with the pertinent thoughts and sensations necessary to achieve an intended state, and the monitoring process, which scans the mind for mental contents that are in opposition to that intended state. The operating process is a conscious and effortful operation; the monitoring process is usually an unconscious and autonomous operation—and therefore requires less effort. If the monitoring process finds any undesirable contents, a situation which indicates control failure, its job is to reinitiate the operating process so that the intended state is restored. Because the monitor is constantly scanning the mind for conditions of control failure, most of the mind's resources are continuously dedicated to being watchful for any indications that mental control is failing. When placed under mental load, that capacity to scan for failure is substantially reduced, and the monitor not only searches for incompatible contents but ironically creates them itself.

It is logical to agree that, under cognitive load, there could be an obvious reduction in the monitor's ability to initiate the processes necessary to reinitiate mental control in accordance with Wegner's (1994) theory—but *only* when that control is deliberately initiated. Intentionality is the key. Wegner (1994) himself stresses this fact as well, going so far as to say that the effects of the ironic process theory will not even apply in cases where there is no intention to control.

It can be argued, however, that mental load does not unequivocally inhibit suppression. A clear distinction must be made regarding the conditions under which mental load is used in order to understand why. If load is used in cases where willful mind control is the goal, suppression will certainly fail. If load is considered to be an experience in which one spontaneously interacts with a challenging aspect of the environment, then suppression is most likely to succeed. Participants in all three experiments were asked to suppress target thoughts while under cognitive load, but in each condition, emphasis was placed on task involvement rather than attempts at suppression. Under these experiential conditions of mental load, any type of willful mind control processes are bypassed, causing suppression to be a consequence rather than a goal.

Absorption: Relevant or Irrelevant?

The role of absorption still remains unclear. Tentative predictions that high absorbers should be able to suppress more easily than low absorbers have been sustained here in only one experiment. Mention has already been made of the controversial merit of the TAS as a psychometrically valid instrument. But it is possible that dispositional and situational differences may influence the outcome of the interactions as well. Very little research has been done concerning the stimulus situations necessary for absorption to occur (Roche & McConkey, 1990).

Perhaps some questions that should be addressed regarding this characteristic are ones of individual differences, cause and effect, and selective stimulus suitably. Clearly, results indicate that both high- and low- absorbers demonstrated the ability to suppress successfully when given the proper cognitive demand (Experiments 1 and 3). Should a high-absorber be capable of becoming engrossed in every situation? Must the situation be such that it offers the precise conditions under which a high-absorber can become sufficiently absorbed? Or could there be an interaction of the participant's preferred mental set (instrument or experiential) and the demand of the situation? Future research should address these issues.

Conclusion

This study examined three correlates of thought suppression: Attention, absorption, and cognitive load. We have provided preliminary evidence that cognitive load does promote successful thought suppression if it is used as an experiential thought distracter and if it involuntarily occupies attentional resources at an appropriate level of challenging involvement. In order to investigate the validity of this claim, it may be beneficial to direct future research toward the examination of the strength of target thoughts as well as cognitive load. Target thoughts in this study consisted of mentions of specific words that were to be suppressed or expressed. Working under the assumption that mere mentions of target thought would not prime a participant's consciousness sufficiently to make suppression difficult, it would be interesting to see what effect actual images of target words would have on the ability to suppress under cognitive load (S. Zaremba, personal communication, February 24, 1995). In addition, according to Palmer's study (as cited in Best, 1992), since attentional resources diminish proportionately as the number of stimuli are increased, varying the set size of each condition of cognitive load may play a role in impairing the ability to achieve successful thought suppression, even on an involuntary basis.

Clinical applications of these findings may help people obtain some relief from troublesome or recurring thoughts. Certainly implementation of the flow experience is not being proposed as a viable treatment for forms psychopathology. But for day-to-day occurrences of unwanted thoughts, becoming engrossed in an enjoyable or challenging activity may provide a short term respite. By recognizing times when states of altered consciousness occur, those particular circumstances can be deliberately sought out and used for distraction from bothersome or even obsessive thoughts or feelings. It is not yet known, however, just how long or well this method will work. It may be a matter of subjective motivation and ability. Finally, flow experiences could be used simply to make life more enjoyable or fulfilling. Finding an inner experience that enriches one's life could be quite a valuable discovery.

References

Best, J. B. (1992). Cognitive Psychology (3rd ed.). St. Paul, MN: West.

Coan, R. W. (1972). Measurable components of openness to experience. *Journal of Consulting and Clinical Psychology, 39,* 346.

Craik, F. I. M. (1979). Human memory. *Annual Review of Psychology, 30,* 63-102.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11,* 671-684.

Csikszentmihalyi, M. (1978). Attention and the holistic approach. In K. S. Pope & J. L. Singer (Eds.), *The stream of consciousness* (pp. 335-358). New York: Plenum.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York: Harper & Row.

Davidson, R. J., Schwartz, G. E., & Rothman, L. P. (1976). Attentional style and the self-regulation of mode-specific attention: An electroencephalographic study. *Journal of Abnormal Psychology, 85,* 611-621.

Dawson, M. E., & Schell, A. M. (1982). Electrodermal responses to attended and nonattended significant stimuli during dichotic listening. *Journal of Experimental Psychology: Human Perception and Performance, 8,* 315-324.

Dawson, M. E., & Schell, A. M. (1983). Lateral asymmetries in electro-dermal responses to nonattended stimuli: A reply to Walker and Ceci. *Journal of Experimental Psychology: Human Perception and Performance, 9,* 148-150.

Fiske, S. T., & Taylor, S. E. (1991). *Social cognition.* McGraw Hill: New York.

Glass, A. L., Holyoak, K. J., & Santa, J. L. (1979). *Cognition.* Addison-Wesley: Reading, MA.

Humphries, C. A., Thomas, J. R., & Nelson, J. K. (1991). Effects of attainable and unattainable goals on mirror-tracing performance and retention of a motor task. *Perceptual and Motor Skills, 72,* 1231-1237.

Hyde, T. S., & Jenkins, J. J. (1973). Recall for words as a function of semantic, graphic, and syntactic orienting tasks. *Journal of Verbal Learning and Verbal Behavior, 12,* 471-480.

Kahneman, D. (1973). *Attention and effort.* Englewood Cliffs, NJ: Prentice-Hall.

Knutson, J. F., & Lansing, C. R. (1990). The relationship between communication problems and psychological difficulties in persons with profound acquired hearing loss. *Journal of Speed and Hearing Disorders, 55*(4). 656-664.

McRae, R. R., & Costa, P. T., Jr. (1983). Joint factors in self-reports and ratings: Neuroticism, extraversion and openness to experience. *Personality and Individual Differences, 4,* 245-255.

McCrae, R. R., & Costa, P. T., Jr. (1985). Updating Norman's "adequate taxonomy": Intelligence and personality dimensions in natural language and in questionnaires. *Journal of Personality and Social Psychology, 49,* 710-721.

Miller, M. J., & Foxworth, C. L. (1992). Validating a subscale for assessing aspects of the person. *College Student Journal, 26,* 436-439.

Parkin, A. J. (1984). Levels of processing, context, and facilitation or pronunciation. *Acta Psychologia, 55,* 19-29.

Qualls, P. J., & Sheehan, P. W. (1981). Role of the feedback signal in electromyograph biofeedback: The relevance of attention. *Journal of Experimental Psychology: General, 110,* 204-216.

Roberts. A. H., Schuler, J., Bacon, J. G., Zimmerman, R. L., & Patterson, R. (1975). Individual differences and autonomic control: Absorption, hypnotic susceptibility, and the unilateral control of skin temperature. *Journal of Abnormal Psychology, 84,* 272-279.

Roche, S. M., & McConkey, K. M. (1990). Absorption: Nature, assessment, and correlates. *Journal of Personality and Social Psychology, 59,* 91-101.

Tellegen, A. (1981). Practicing the two disciplines for relaxation and enlightenment: Comment on "Role of the feedback signal in electromyograph biofeedback: The relevance of attention" by Qualls and Sheehan. *Journal of Experimental Psychology: General, 110,* 217-226.

Tellegen, A. (1982). *Brief manual for the Multidimensional PersonalityQuestionnaire.* Unpublished manuscript, University of Minnesota, Department of Psychology, Minneapolis.

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology, 83,* 268-277.

Toglia, M. P., & Battig, W. F. (1978). *Handbook of semantic word norms.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Wegner, D. M. (1989). *White bears and other unwanted thoughts.* New York: Viking/Penguin.

Wegner D. M. (1994). Ironic Processes of mental control. *Psychological Review, 101*(1), 34-52.

Wegner, D. M., & Erber, R. (1992). The hyperaccessibility of suppressed thoughts. *Journal of Personality and Social Psychology, 63,* 903-912.

Wegner, D. M., & Erber, R. (1993). Social foundations of mental control. In D. M. Wegner & J. W. Pennebaker (Eds.), *Handbook of mental control* (pp. 36-56). Englewood Cliffs, NJ: Prentice-Hall.

Wegner, D. M., & Schneider, D. J. (1989). Mental control: The war of the ghosts in the machine. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 287-305). New York: Guilford Press.

Wegner, D. M., Schneider, D. J., Carter, S., III, & White, L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology, 53,* 5-13.

Wegner, D. M., Schneider, D. J., Knutson, B., & McMahon, S. (1991). Polluting the stream of consciousness: The influence of thought suppression on the mind's environment. *Cognitive Therapy and Research, 15,* 141-152.

Wegner, D. M., Shortt, J. W., Blake, A. W., & Page, M. S. (1990). The suppression of exciting thoughts. *Journal of Personality and Social Psychology, 58,* 409-418.

Wenzlaff, R., Wegner, D. M., & Klein, S. D. (1991). The role of thought suppression in the bonding of thought and mood. *Journal of personality and Social Psychology, 60,* 500-508.

Wenzlaff, R. M., Wegner, D. M., & Roper, D. W. (1988). Depression and mental control: The resurgence of unwanted negative thoughts. *Journal of Personality and Social Psychology, 55,* 882-892.

Appendix

Word Lists for Experiment 3

List 1	*List 2*
Queen	King
Bread	West
West	Lamp
Boy	Chair
Cold	Lake
East	Butter
Play	Table
Butter	Girl
Thin	Love
Table	Queen
Girl	Cold
North	North
Chair	Bread
Love	Boy
King	Hat
Lake	Hot
Hat	Thin
Pencil	Pencil
Hot	Play
Lamp	East