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NONREPLICATING WHITE BEARS AND OTHER IRREPRESSIBLE CAUTIONS

by

PHYLLIS GILDSTON

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1998

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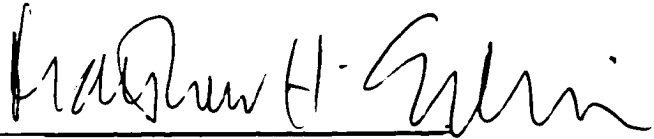
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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

September 10, 1998
Date



Chair of Examining Committee

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Abstract

NONREPLICATING WHITE BEARS AND OTHER IRREPRESSIBLE CAUTIONS

By

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Adviser: Professor Matthew Erdelyi

Three experiments were conducted to test the robustness and generalizability of the rebound and initial enhancement effects. The first study was a close replication of the original "white bear" experiment (Wegner, Schneider, Carter and White, 1987) which uncovered the rebound phenomenon. As they spoke their thoughts aloud in that study, subjects were asked not to think about a white bear for five minutes and then to think about the creature for the next five minutes. Other subjects were asked to suppress thoughts of a white bear but only after first being asked to think about it for five minutes. Thus, order of instruction, to think or not to think, was manipulated to determine if it mattered whether you suppressed thoughts of a target stimulus initially or only later after first being given the opportunity to express thoughts about that target stimulus. The rebound effect refers to an inordinate subsequent preoccupation with any thought that one attempts initially to banish from consciousness. Specifically, after a period of thought suppression, normal subjects had thoughts about white bears more often in the expression period following suppression than a comparison group of subjects who were instructed to express their thoughts about the stimulus immediately after its introduction. Other studies (e.g., Lavy and van den Hout, 1990) have reported finding a contrarian initial enhancement effect, which occurs when the initial suppression group actually has a larger number of the forbidden thoughts during the initial suppression period than does the

initial expression group during its initial expression period. The attempt to suppress deliberately has been tagged as the source of both effects; the more one tries to keep a thought out of mind, the more it will try to insinuate itself—sooner or later. The second and third experiments in the current study used longer, contextual stimuli (one a strange tale from another culture, and the other, a dry prose text). Neither effect was observed in either the replication or extended contextual experiments.

Acknowledgements

I wish to thank Professors Arthur Reber and Eli Osman for the gracious time and effort they expended to speed my work along. Sincere thanks are also in order for my two outside readers, Professors Benzion Chanowitz and Dorothea Halpert, for their contributions to this project. Professor Halpert also helped to guide the dissertation in its early stages. Most especially I wish to thank my inventive, ever-patient and always more than helpful adviser, Professor Matthew Erdelyi, without whom this project could not have been conceived, no less delivered. Finally, to my husband and best friend, Dr. Harold Gildston, for his witty forbearance and impatient support, I say, "I dost."

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NON-REPLICATING WHITE BEARS AND OTHER IRREPRESSIBLE CAUTIONS

Introduction

In 1987 Daniel Wegner and colleagues (Wegner, Schneider, Carter and White) published a seminal study on the ironic consequences of deliberate thought suppression. Taking a cue from Dostoyevski who is said to have dared his younger brother NOT to think about a white bear and thereby put him in a state of confusion, Wegner et al. (1987) asked their subjects as they spoke their thoughts aloud not to think about a white bear for five minutes and then to think about the creature for the next five minutes (initial suppression group: S₁-E₂). Other subjects were asked to suppress thoughts of a white bear but only after first being asked to think about it for five minutes (initial expression group: E₁-S₂). Thus, order of instruction, to think or not to think, was manipulated to determine if it mattered whether you suppressed thoughts of a target stimulus initially or only later after first being given the opportunity to express thoughts about that target stimulus.

These researchers (Wegner et al., 1987) uncovered and elaborated an important memory phenomenon, the rebound effect. The rebound effect refers to an inordinate subsequent preoccupation with any thought that one attempts initially to banish from consciousness. Specifically, after a period of thought suppression, normal subjects had thoughts about white bears more often in the expression period following suppression than a second group of normal subjects who were directed to express their thoughts about the target stimulus immediately after the stimulus was proffered.

Wegner et al. (1987) also determined experimentally that intentional suppression is rarely 100 percent successful, although most subjects clearly have the skill to suppress

at will. Other studies (e.g., Lavy and van den Hout, 1990), have reported finding a contrarian initial enhancement effect, which occurs when the initial suppression group (S_1 - E_2) actually has a larger number of the forbidden thoughts during the initial suppression period than does the initial expression group (E_1 - S_2) during its initial expression period. The attempt to suppress deliberately has been tagged as the source of both effects: the more you try to keep a thought out of mind, the more it will try to insinuate itself--sooner or later.

Detecting the rebound effect in the laboratory was certainly a finding of moment since, in one sense, it runs counter to a respected body of research initiated by Ebbinghaus ([1885] 1964). According to Erdelyi (1990), Ebbinghaus' experiments on intentional forgetting were the forerunners of all other research on the directed repression of thought since Ebbinghaus intentionally avoided thinking about the stimulus material. The commonsense conclusion of the experiments Ebbinghaus conducted on himself is that one forgets over time. That finding can also be replicated to demonstrate that there appears to be a pattern to the time-line of retention, which pattern is reflected in the well-known curve of forgetting plotted from Ebbinghaus' table (see Figure 1).

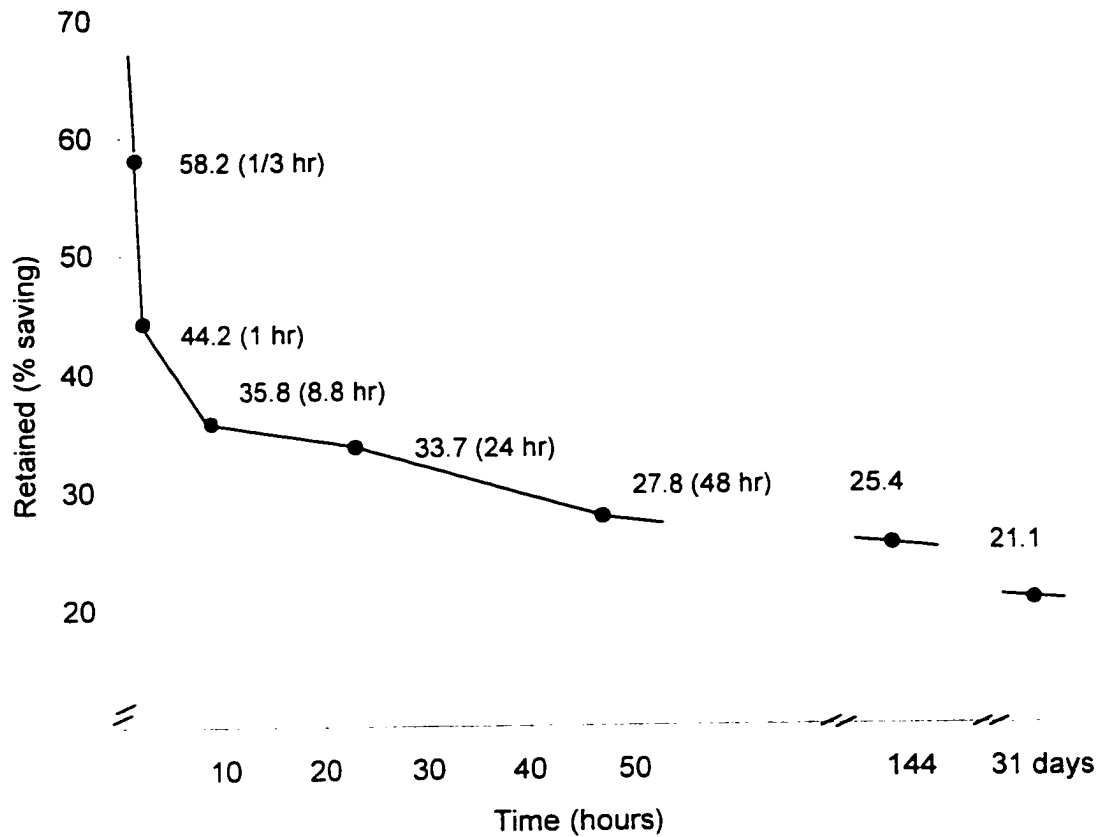


Figure 1. Ebbinghaus's curve of forgetting (plotted from Ebbinghaus [1985] 1964)
 (From Erdelyi, M. E. (1990). *Repression, reconstruction, and defense: History and integration of the psychoanalytic and experimental frameworks*. In J. L. Singer (Ed.), Repression and dissociation: Implication for personality theory, psychopathology, and health (pp. 1-31). Chicago: University of Chicago..)

Ebbinghaus told himself, in essence, not to think about a sizable list of nonsense syllables he had first learned to perfect mastery. Then, in a between-stimulus paradigm, he used equivalent but different lists of nonsense syllable stimuli and retested himself only once on each list at progressively later and later time periods. The percent of the list retained was reduced in each successive time period.

Almost a century later, Erdelyi and Kleinbard (1978) published the results of their study on memory, wherein they came up with a curve of retention which almost mirrored the Ebbinghaus curve (see Figure 2). How could that be?

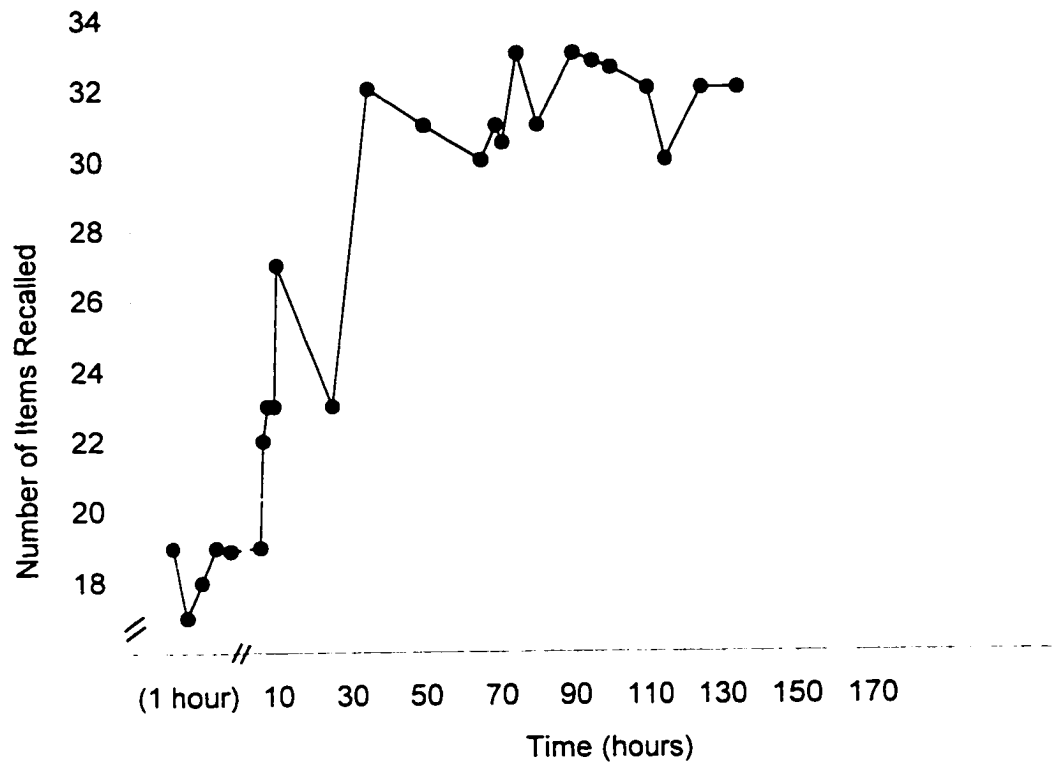


Figure 2. Level of recall over time with repeated testing (Erdelyi and Kleinbard 1978, study 1).

(From Erdelyi, M.E. (1990). *Repression, reconstruction, and defense: History and integration of the psychoanalytic and experimental frameworks*. In J. L. Singer (Ed.), Repression and dissociation: Implication for personality theory, psychopathology, and health (pp. 1-31). Chicago: University of Chicago.)

Erdelyi (1990) considered the possibility that differences in methodology and materials accounted for the uncovering of this opposite but equally repeatable function. Instead of nonsense syllables, Erdelyi and Kleinbard (1978) used meaningful pictures. Instead of single-point testing of equivalent lists they used a multiple testing model, wherein subjects were repeatedly called upon to make every effort to remember the same stimulus list in successive trials over time. Also, unlike Ebbinghaus' one hundred percent initial level of retention, subjects in their study began at a level under fifty percent.

Erdelyi (1990) concludes that:

Retention at any time, as Ballard (1913) demonstrates in his seminal monograph "Oblivescence and Reminiscence," is the balance between two contradictory tendencies of memory, reminiscence and oblivescence (forgetting). A variety of factors can cause this balance (retention) to be either negative, in which case amnesia is observed, or positive, in which case hypermnesia (improvement) is obtained (pp. 2-3).

Erdelyi (1990) goes on to assert that the critical component which differentiates his and Kleinbard's (1978) experiment from those of Ebbinghaus (1885) is not the meaningful picture stimulus, or the use of recall to measure retention, or the low level of initial retention, or even the method of multiple testing on the same materials. He makes that claim because, as he notes, using such materials and methods one will still come up with forgetting curves similar to those of Ebbinghaus. What was essential to his results, he insists, was the directive to think actively about the target stimuli rather than just allow these stimuli to be "left to themselves" [(1885) 1964, 4, 65] and precluded from

"review" [4] as Ebbinghaus had done--and in this instance to think about the stimuli as often and as hard as possible.

Thus, if you avoid thinking about something over a long period of time you become progressively more amnesic for the material even if you make a single effort to retrieve it every time you lift the no-think ban at progressively later and later times. But intensive and repeated efforts to retrieve the same information, even after forgetting has occurred, can ultimately produce hypermnesia (Erderlyi and Kleinbard, 1978).

How does the rebound effect uncovered by Wegner et al (1987) fit into this complex framework of laboratory data? If one is asked first not to think about a stimulus and time passes, you would expect that some forgetting would occur so that when the subject is then asked to think about that same stimulus he might have even fewer thoughts than if he had been allowed to express those thoughts initially. Expressing one's thoughts about a stimulus immediately after being exposed to it would appear to lead to a greater number rather than a fewer number of thoughts about that stimulus than if one has to wait a period of time before finally expressing such thoughts. The rebound effect is thus the opposite of what one would expect a la Ebbinghaus.

We are left with a puzzle. Wegner and colleagues (1987) have attempted to explain it by reference to a negative cueing hypothesis. Being told what to avoid thinking about has two important sequential effects. First, it sets up a mental set wherein it is hard to follow the instruction. How can you not image, at least initially, a purple cow or a white bear when you are told not to? Second, once the effort to block the image or thought is engaged and there is nothing specific to focus one's thoughts on instead, one has to distract oneself to bar the forbidden thought from mind. The difficulty with most

self- distraction, they claim, is that it is often scattered, arbitrary, and (or) related to environmental cueing. As the subject searches for distractions, for example, items in the immediate environment may attract attention momentarily, allowing the unwanted thought to pop up more frequently in the same environment during a period free of the need to suppress. This paradoxical effect occurs because those items functioning as distractions during the suppression time-interval become discriminative stimulatory cues in the subsequent expression period.

Some support was afforded this notion of negative cueing in a later study by Wegner and colleagues (Wegner, Schneider, Knutson, and McMahon, 1991) which resulted in the rebound effect only when the same set of pictorial slides was displayed in both the suppression and expression periods, creating, purportedly, similar cueing environments. (Ironically, however, this finding, which tends to support Wegner et al.'s (1987) theory to explain the rebound effect, is, simultaneously, an experimental refutation of the generalizability of the rebound effect.)

When given the negative cue to avoid thinking about something, one must search for distractors and in that search one chances upon numerous different networks that may lead back to the to-be-avoided thought. Because one's thoughts jump from topic to topic without focus--thereby activating and connecting so many disparate neurological webs--it is more likely that a negatively cued thought will wiggle its way in every now and then despite one's attempts to suppress it.

Secondly, not only does negative cueing make it hard fully to accomplish the suppression task (in the suppression period) but, once the directive to suppress the thought is shifted to encourage entertaining the thought (in the expression period), the

negative cueing from the preceding suppression period leads to carry-over of the large number of disconnected networks associated with the thought, increasing the likelihood that thoughts about the previously shunned topic, image or information package will flow more copiously.

Such might not be the case if one is given a positive cue. A positive cue--the directive to think about something specific--sets up a relatively more circumscribed network of associations upon which one can concentrate, whereas a negative cue leaves one floating in a sea of related networks. In a separate experiment, Wegner et al. (Experiment 2, 1987) demonstrated that providing subjects with a single focused distractor (in this case the directive to think about a red Volkswagon whenever the thought of a white bear came to mind) to replace the unwanted thought, eliminated the rebound effect. The results of that experiment gave strong support, according to Wegner et al (1987), to the negative cueing hypothesis. On the other hand, the effect may be viewed as more qualified, raising questions about overall reliability.

Methodological Issues in the Rebound Effect

The Stimulus.

Despite their positive findings, Wegner et al. (1987) admitted that it is not known whether the rebound effect generalized to stimuli other than white bears. They state: "The nature of the thought being suppressed--whether it is emotional or not, easily imagined or not, familiar or not, complex or not, and the like--would seem to be an important determinant of suppression effects (p.12)."

It is noteworthy that "white bear" has no particular personal salience for young adults living in an urban environment. Nevertheless, it must be acknowledged that this

simple stimulus is imagistic and somewhat of a novelty and may thus take on sufficient salience to rebound.

It is not only stimulus type which may be of importance to the issue of generalizability but also the amount of information embedded in the stimulus. The stimulus "white bear," for example, evokes a single unitary image from just two words. Such a single- item "list" is not very difficult to remember--especially for the short period covered by the experiment. Two words--or one chunk--fit very comfortably into Miller's (1956) seven chunks of information that humans are able to handle with ease, whereas long lists of nonsense syllables or meaningful visual stimuli or stories involve more than seven clusters of information, plus or minus two.

Confounds in the Experimental Design.

There is also a methodological problem with Wegner et al.'s (1987) experimental design. In the original study instructions to suppress (S) were followed by instructions to express (E) for subjects in one condition (S₁-E₂) whereas instructions were given in the reverse order to subjects in the second condition (E₁-S₂). The rebound effect was thus observed when comparing E₂ versus E₁, i.e., the number of reported thoughts about a white bear in a second 5- minute expression time-block (minutes 6 through 10) with the number of reported thoughts about a white bear in a first 5- minute expression time-block (minutes 1 through 5.) Because Wegner et al.'s (1987) original study confounds time periods compared (E₂ versus E₁), order of testing rather than suppression-expression activity could conceivably underlie the rebound effect.

Variations and Issues in Past Efforts at Replication

The Experimental Design

Regardless of whether experiments designed to replicate Wegner et al. (1987) found for or against the rebound or initial enhancement effect, most suffered from the same confounds in time-interval comparisons as the ground-breaking study. Furthermore, most of the studies using duplicative 5-minute experimental blocks had preliminary or intervening tasks which make it difficult to speak of true replication: five minutes of relaxation instead of practice prior to manipulation (Merckelbach, Muris, van den Hout and de Jong, 1991); the intervention of an adjective check list after the practice period and before the first experimental trial (Roemer and Borkovec, 1994); a search for a naturally occurring intrusive thought and then a questionnaire evaluating its anxiety level prior to the first manipulation and then another questionnaire following it (Salkovskis and Campbell, 1994); questionnaires, scales and an interview on smoking, the to-be-suppressed topic, prior to the first experimental interval and an evaluating questionnaire subsequent to it (Salkovskis and Reynolds, 1994); reading and rating stories with and without emotional wording before the initial experimental period, and slide viewing for 20 minutes prior to the second (Muris, Merckelbach, van den Hout and de Jong, 1992); accompanying the experimental blocks with mood music (Howell and Conway, 1992) or a slide show (Wegner et al., 1991); the completion of evaluative visual analog scales following the first manipulated interval (Zeitlin, Mitten and Hodder, 1995).

Additionally, a number of studies of the rebound and initial enhancement effects had varying time-blocks: two 2-minute periods (Clark, Ball, and Pape, 1991; Clark, Winton and Thynn, 1993); thirteen 3-minute blocks (Wegner et al., 1991, Experiment 1); 4-minute time intervals (Wegner, Shortt, Blake, and Page, 1990); two 9-minute blocks (Wenzlaff, Wegner, and Klein, 1991; Kelly and Kahn, 1994); two 5-minute and

one 15-minute manipulated periods (Mathews and Milroy, 1994); two 30-minute blocks (Tinder and Salkovskis, 1994); one year (Haaga and Allison, 1994).

Several of the above studies had a practice period of varying lengths prior to the first manipulated period (e.g., Clark et al., 1991 [2 minutes]; Wegner et al., 1987 [5 minutes], 1990 [3 minutes]) while others had none (e.g., Wenzlaff et al., 1991). Preceding and interposed tasks were equally varied for some of the studies cited, and included such activities as completing self-rating forms and questionnaires, unscrambling anagrams, and discussing attitudes about the to-be-forbidden topic.

Problems of replication may thus hinge on small differences in experimental design which feature mismatches in time-block comparisons, variations in length of experimental trials, and the interpolation of potentially confounding tasks.

The Stimulus

Experiments that have been characterized in the literature as "replicating" have used the same stimulus as Wegner et al. (1987), i.e., "white bear," and (or) different stimuli. With respect to differing stimuli, some major areas to consider in these studies are the experimental effects of: (a) length (b) complexity (c) nature: (1) high versus low imageability; personally relevant versus personally irrelevant; (3) emotionally charged versus emotionally neutral; (4) interesting versus boring; (5) negatively valenced versus positively valenced; (6) abstract versus concrete; (7) novel, experimenter-provided thoughts versus personal intrusive thoughts.

The same stimulus. Comparing the number of experiments which successfully replicated the rebound effect when using the exact stimulus, "white bear," as that used in the seminal and often cited Wegner et al. (1987) study, with the number of experiments

that failed to replicate the effect (including studies by Wegner and colleagues), the non-replicating studies appear to equal or perhaps even outnumber the positive replicating studies.

Four experiments replicated the rebound effect for certain experimental groups, sometimes only under certain conditions. Kelly and Kahn (1994) replicated under the same conditions as Wegner et al. (1987), and Wenzlaff et al. (1991, Experiment 1) replicated for subjects experiencing both mood congruent and mood incongruent periods with an enhanced rebound effect in the mood congruent period. The other two replications were qualified: Wegner et al. (1991) only for subjects who, in both experimental periods, were presumed to be experiencing parallel mind-sets said to be induced by the second showing of slides viewed earlier: Rutledge, Hollenberg, and Hancock (1993, Experiment 2) only for subjects divided post hoc into two groups on the basis of a third, moderator variable.

Only one experiment (Conway, Howell, and Giannopoulos, 1991), using the same stimulus, "white bear," found an initial enhancement effect (in the last minute of a 5-minute suppression period). The rebound effect was not addressed in that study.

In contrast, four studies using the "white bear" stimulus have failed to obtain with normal subjects either the rebound or initial enhancement effect: Merckelbach et al. (1991); Rutledge et al. (1993, Experiment 1); Wegner et al. (1987, Experiment 2) for the initial suppression group given a specific distractor to focus on when the forbidden thought came to mind; Wegner et al., (1991) wherein they obtained only a marginal rebound effect ($p < .06$) when the "mind's environment," conditioned by a series of slides,

was different in the two experimental periods. One must thus consider the possibility that the results of the original experiment by Wegner et al. (1987) are not reliable.

Considering the findings which did not confirm the rebound effect in particular, we may conclude that Ebbinghaus' (1885/ 1964) observations apply. Indeed, almost every study which analyzed minute by minute shifts in the number of target thoughts expressed within experimenter manipulated time periods, whether those periods were periods of suppression or expression, uncovered a significant main effect for a continuing decline in such thoughts over time (Howell and Conway, 1992, Experiment 2, except for a small rebound in the last minute of a 5-minute suppression interval for subjects in the negative target condition; Merckelbach et al., 1991; Muris et al., 1992; Wegner et al., Experiment 1, 1987, for all groups except for the final minute in the expression period following suppression for the initial suppression group; Wegner et al., 1990).

Differing stimuli. Differing stimuli fared no better than the "white bear" stimulus with respect to consistency of results among numerous studies. A few studies with widely varying stimuli obtained the rebound effect: a vivid story about a girl and a rabbit (Clark et al., 1991, 1993); a supposedly neutrally worded story about real-world events (Muris et al., 1992); the same story as previously described which was, in this case, negatively worded, with the rebound effect proving to be significant only for depressed subjects (Wenzlaff, Wegner, and Roper, 1988); thinking about an old cold-flame--a former boy or girlfriend who was no longer desired--but not a hot-flame (Wegner and Gold, 1992); a small, black, life-like model of a spider exposed to spider phobics for 30 seconds (Zeitlin et al., 1995).

On the other hand, a number of studies also employing widely differing stimuli failed to obtain the rebound effect: a personally irrelevant but emotionally worded story about real-world events (Muris et al., 1992); thoughts about sex as well as about supposedly less exciting subjects (Wegner et al., 1990); personally relevant intrusive thoughts (Kelly and Kahn, 1992, 1994); a self-generated real-life worry (Mathews and Milroy, 1994); naturally occurring negative intrusive thoughts (Salkovskis and Campbell, 1994); the emotional content of a past significant loss or an anticipated situation involving criticism or rejection (Roemer and Borkovec, 1994); intrusive thoughts about smoking (Salkovskis and Reynolds, 1994).

Turning from studies focused on the rebound effect to those concerned primarily with the ability to suppress, Lavy and van den Hout (1990) were among the very few researchers to find an initial enhancement effect and they found it for the supposedly impersonal, neutral but less unusual stimulus, "vehicles." They did not even attempt to assess the rebound effect. Salkovskis and Campbell (1994) also found, for smokers trying to suppress thoughts about smoking, an initial enhancement effect (after "correcting" their statistics for a ceiling effect) but no rebound effect. Tinder and Salkovskis (1994) studied personally relevant negative intrusions outside the laboratory and found a type of enhancement effect for the group asked to suppress such thoughts over four days. The rebound effect was not addressed. Finally, Bowers and Woody (1996), using the stimulus of a personal favorite (dream) vehicle, claimed to have replicated Wegner et al.'s, (1987) "paradox of intentional forgetting"--or so they implied in the title to their article. Since neither the rebound or initial enhancement effect was assessed in their experiments--which had a series of four (Study 1) and three (Study 2) 2-

minute suppression periods wherein subjects were able to suppress, albeit imperfectly-- their findings are more applicable to supporting the notion that hypnotic amnesia aids in the task of suppressing thoughts than in replicating the findings of Wegner et al. (1987).

It is of considerable interest that the study's (Bowers and Woody, 1996) initial plan was to use "white bear" as the stimulus but "preliminary data...did not generate as many intrusions as anticipated" (p.382, footnote 1). The authors continue, in the footnote, to state: "We decided that it would be better to use as the target thought something that was intrinsically interesting or compelling."

In sum, stimuli different from "white bear" in, for example, length, content, relevance, interest level, degree of abstraction, etc., produced equally conflicting results for both the rebound and initial enhancement effects.

Methodological Differences

Professedly replicating studies of the rebound and initial enhancement effects have differed considerably not only in experimental design and, frequently, in the stimulus used, but also in methods and procedures. To clarify the issue, the most important variables to review are the wording of instructions, the manner of accessing thoughts, the procedure(s) used for counting target thoughts, and the environment within which the experiment takes place. Some of these methodological differences have, themselves, been subjects of experimentation.

Instructions. One of the issues that comes up repeatedly in the discussion sections of experiments on thought suppression is the impact of different instructions on outcomes. Wegner et al.'s (1987) expression instructions ("...try to think about a white bear" [p. 7]) were criticized (Lavy and van den Hout, 1990; Merckelbach et al., 1991),

for example, for being "forced" and thus unnatural. Hence a number of studies (Clark et al., 1991, 1993; Lavy and van den Hout, 1990; Merckelbach et al., 1991; Muris et al., 1992; Salkovskis and Reynolds, 1994) "liberalized" the instructions ("...you can think about anything including a white bear [or whatever the stimulus might be]") to make the instructions more akin to everyday life. Liberalizing the instructions did not lead to uniformity of results, however.

Muris et al. (1993) proposed that even the wording of instructions in the practice period may tilt results. Pope's (1978) instructions on how to verbalize one's stream of consciousness (used in the practice period of many of the studies reviewed), mentions both internal and external cues but many more internal items. If other examples are added to the list, their focus--internal or external--might significantly affect the strategies used in subsequent experimentally manipulated periods.

The major variations among expression instructions are: (a) subjects are directed to focus on the target thought (Wegner et al., 1987; Wenzlaff et al., 1991); (b) subjects are permitted to think about anything, including the target thought if they so choose (Lavy and van den Hout, 1990); (c) subjects are asked to simply notice and report when the target thought happens to occur (Salkovskis and Campbell, 1994); (d) subjects are given freedom to have their minds wander where they will (Mathews and Milroy, 1994) while probes for subjects' thoughts are generated at specific but unpredictable intervals; (e) subjects are given the freedom to think about anything at all with no restrictions after being exposed to a stimulus (Clark et al., 1991).

A similar variability is found in the wording of suppression instructions: (a) subjects are directed to try to suppress the target thought (Wegner et al., 1987, 1991;

Wenzlaff et al., 1991); (b) subjects are asked to suppress the target thought but to make no attempt to focus on anything else in particular (Clark et al., 1993; Lavy and van den Hout, 1990; Salkovskis and Campbell, 1994); (c) subjects are told to suppress the target thought by focusing on some other specific thought or thought complex generated by the subject (Salkovskis and Campbell, 1994); (d) subjects are requested to suppress the target thought by focusing on an externally provided distractor (e.g. every time you think of a white bear, despite your attempt to keep the thought at bay, think of a red Volkswagon instead [Wegner et al., 1987]); (e) subjects are directed to engage in a specific activity of distraction (e.g., breathing exercises taught prior to the experiment) whenever the target thought comes to mind (Salkovskis and Reynolds, 1994); (f) subjects are given a 9-digit or a 2-digit number to rehearse (the memory for which is to be tested subsequently) while attempting to suppress the target thought under this increased cognitive load (Wegner and Erber, 1992); (g) subjects are encouraged to finish as much as possible of a test (Salkovskis and Reynolds, 1994) or task (Wegner and Erber, 1992, Experiment 1) while they suppress the target thought.

Unfortunately, the picture is unclear as to exactly how different instructions may contribute to the conflicting morass of results on experiments designed to test the reliability of either the rebound or initial enhancement effect.

Accessing thoughts. One may ask what is the optimal method for accessing thoughts in general. Is it better to have subjects utter their thoughts aloud or write them down? Do we need to access all thoughts within a specified time-interval or just the target thoughts in which we are interested? If we elect to do the latter, what is the most accurate way to get at those target thoughts?

Howell and Conway (1992), for instance, say that their think-aloud task is more spontaneous and thus potentially less rehearsed and less organized than attempting to write down one's thoughts. In fact, they point to this methodological difference as an explanation for why their depressed subjects had more positive intrusive thoughts after induction into a positive mood via music (as well as more negative intrusive thoughts after induction into a negative mood), whereas the depressed subjects in the Wenzlaff et al. (1991) study were only significantly influenced by mood music in a period of suppression when the thought was negative. They believe that the written format in the Wenzlaff et al. (1991) study may be less sensitive than the oral, and thus only reveal effects when they are stronger.

To give another example, Salkovskis and Campbell (1994) had their subjects click a counter every time they had the target thought. They justified their decision not to allow simultaneous verbalization of thoughts by stating that the use of a counter requires less effort and hence less of a cognitive load than does thinking aloud--which task may burden subjects with the obligation to allow no silences.

The procedures used in the replicating studies are: (a) directing subjects to speak their thoughts aloud (e.g., Clark et al., 1991, 1993; Conway et al., 1991; Lavy and van den Hout, 1990; Muris et al., 1993; Rutledge et al., 1993; Wegner et al., 1987, 1990, 1991); (b) directing subjects to write down their thoughts (e.g., Kelly and Kahn, 1994; Wenzlaff et al., 1988, 1991); (c) directing subjects to answer questionnaires about their thoughts (e.g., Roemer and Borkovec, 1994; Salkovskis and Campbell, 1994); (d) directing subjects to characterize the nature or extent of their thoughts on a scale (e.g., Clark et al., 1991, 1993; Howell and Conway, 1992).

Some of these varying procedures have themselves been selected for study to determine if they might differentially affect experimental results. Subjects in Wegner et al.'s (1987, 1991) and Clark et al.'s (1991) studies, for example, rang a bell to signify the occurrence of the target thought as they spoke their thoughts out loud into a microphone. In the experiments by Wenzlaff et al. (1988, 1991), check marks replaced bell rings and written stream-of-consciousness reporting substituted for oral verbalizations. Check marks were included "to catch any reportable thoughts that happened too quickly for written acknowledgment" (Wenzlaff et al., 1991, p. 501).

Two studies (Shackelford, Wegner, and Schneider, 1987; Wenzlaff et al., 1988) addressed the issue, the first experimentally and the second by reference to results. Both concluded that it is unlikely these differences in methodology are significant.

Muris et al. (1993) compared verbalization with silent thinking. Earlier experiments performed at Limburg University in the Netherlands (Merckelbach et al., 1991; Muris et al., 1992) had merely asked subjects to press the button of an event marker whenever the target thought came to mind. Muris et al. (1993) hypothesized that thinking aloud might provoke subjects to shift the focus of their attention to items in the immediate environment. In addition, subjects may feel they must continue to verbalize as they try to suppress the target thought. The easiest path to take in order to comply with that instruction might be to describe non-target objects in the environment. No differences attributable to one method or the other were uncovered in their experiment nor was a rebound or initial enhancement effect found for either method.

Counting target thoughts. Another variable procedure is the manner of counting and (or) evaluating intrusions and expressions of the target thought once it is presumed to

be accessed: (a) Subjects are told to ring a bell and the number of rings is tallied (e.g., Howell and Conway, 1992; Rutledge et al., 1993; Wegner et al., 1987); (b) subjects are directed to press an event marker or golf counter and the number is noted (e.g., Merckelbach et al., 1991; Muris et al., 1992, 1993; Salkovskis and Campbell, 1994; Salkovskis and Reynolds, 1994); (c) subjects are directed to make a checkmark on paper and the marks are counted (Kelly and Kahn, 1994; Wenzlaff et al., 1988, 1991); (d) subjects are instructed to talk into a tape recorder and experimenters subsequently listen to the tape, code mentions of the target thought, and then sum them (e.g., Clark et al., 1991, 1993; Howell and Conway, 1992; Lavy and van den Hout, 1990; Muris et al., 1993; Rutledge et al., 1993; Wegner et al., 1987, 1990, 1991); (e) subjects are directed to write down their ongoing thoughts which experimenters subsequently read, code and sum (e.g., Kelly and Kahn, 1994; Wenzlaff et al., 1988, 1991); (f) subjects are instructed to jot down a word or phrase to identify the thought of the moment at computer prompted intervals and, after the experiment, categorize the thought with the experimenter (Mathews and Milroy, 1994).

When experimenters code mentions of the target thought, one may query how accurate is their assessment. This issue has not been addressed in most of the published studies. In periods of suppression, one may also question the precision of the correlation between the target thought and subjects' bell-rings, counter-clicks or check-marks. As Muris et al. (1993) correctly noted, one must always consider the possibility that self-reports on cognitions could be unreliable. Subjects must be able to identify the sometimes fleeting intrusion of the thought they are trying to suppress; they must be

willing to signify its occurrence; they must be cooperative in the experimental task.

Subjects might fail on any or all of these requirements.

The test environment. The environment within which the experiment takes place also shifts considerably from study to study. Could this variable be of significance? As reviewed earlier, Muris et al. (1993) suggested that, when thinking aloud with their eyes open, subjects may describe non-target items in the immediate environment in an effort to suppress the target thought. Although Muris and colleagues (1993) did not themselves find either a rebound or initial enhancement effect, they postulated that, since subjects typically remain in the same room for both the suppression and expression periods, external environmental cues may trigger more target thoughts for externally oriented subjects (a call to individual differences) in the expression period following suppression. They thereby attempted to provide some explanation for the rebound effect found in other studies.

The only significant finding in the Muris et al. (1993) study related to a post hoc analysis of the data. That is, on a post-experimental task concerned with recognizing which objects were actually in the laboratory during the preceding experiment, the half of the subjects who were most accurate compared with the half scoring lowest, had more thoughts about white bears in both the suppression and expression periods.

The studies reviewed had the following variety of environments: (a) A relatively bare environment with purportedly no salient visual or auditory distractors (e.g., Clark et al., 1991, 1993; Mathews and Milroy, 1994; Merckelbach et al, 1991; Roemer and Borkovec, 1994; Salkovskis and Campbell, 1994; Salkovskis and Reynolds, 1994); (b) an environment with purposefully located salient distractors (Muris et al., 1993); (c) an

environment with all possible external visual cues removed (subjects keep their eyes closed) (Lavy and van den Hout, 1990); (d) a sound-manipulated environment such as playing music selections of differing tempi, style, taste, etc. (e.g., Howell and Conway, 1992; Wegner et al., 1991); (e) an environment without other people (e.g., Clark et al., 1991, 1993; Howell and Conway, 1992; Lavy and van den Hout, 1990; Mathews and Milroy, 1994; Roemer and Borkovec, 1994; Rutledge et al., 1993; Salkovskis and Campbell, 1994; Salkovskis and Reynolds, 1994; Wegner et al., 1987, 1990, 1991; Wegner and Erber, 1992); (f) an environment with only the experimenter and one subject (Kelly and Kahn, 1994, with the experimenter behind a partition); (g) an environment with several subjects and an experimenter (e.g., Wenzlaff et al., 1988, 1991).

Subject Differences

Individual differences may explain some of the inconsistencies among thought suppression studies. Characteristics which appear to be key to a better understanding of the topic are characterological repressiveness, hypnotizability, anxiety/worry/obsession, depression, and other experimentally identified variables unique to certain individuals.

Characterological repressiveness. The topic at hand is intentional suppression/repression of thoughts, and in line with Erdelyi's (1993) analysis, no distinctions will be made between the terms. It seems logical, therefore, to search out a personality style which typically engages in such behavior. Indeed such a personality style has been identified, and classified as "repressiveness." The assumption is that repressors are so intent upon avoiding the negatives in life that they sharply limit self-awareness and develop, over time, a style of processing information labeled "perceptual cognition," wherein they repeatedly and fervently eschew reflecting on negative events,

thoughts and feelings by distracting themselves with external events in a superficial and capricious manner (Bonanno & Singer, 1993). They may reject such negatively perceived data consciously or at the stage of preattentive processing (Bonanno and Singer, 1993). One consequence is that they encode the information poorly and thus find it hard subsequently to retrieve it (Bonanno & Singer, 1993; Johnson, 1992). When asked to remember unpleasant experiences from early childhood, for example, they typically have difficulty (Davis & Schwartz, 1987). In fact they have fewer childhood memories altogether (positive memories are forgotten as well) than do non-repressors (Davis, 1990).

Repressors are stoics, rarely complaining of anything. Repressors' cognitive formulations of the bad elements in their lives may be vague and fleeting but, like hysterics, they apparently encode the affective impact of negative events somatically. Several investigators have found that, despite the defensive coping maneuvers of distraction and avoidance, repressors have more stress-related somatic signs and symptoms than non-repressors (Bonanno & Singer, 1990; Weinberger, 1990). At the time of repression they evince stronger bodily reactions (i.e., greater skin resistance and forehead muscle tension), although they report considerably fewer negative affective responses to disturbing stimuli (Bonanno and Singer, 1990, 1993; Weinberger, Schwartz, & Davidson, 1979). Untoward effects on health are possible sequelae (Dattore, Shontz & Cayne, 1980; Jensen, 1987). Clearly success in suppressing thoughts for repressors may be a matter of winning the battles but losing the war. Oddly, there have been no studies examining for the rebound effect in either repressors or hysterics.

Hypnotizability. It is possible that individuals who achieve high scores on tests of hypnotizability may, like repressors, find it easier to suppress unwanted thoughts, but only when they are subjected to suggestions for amnesia in hypnosis (Bowers and Woody, 1996). Bowers and Woody (1996) admit that, when considering the role of hypnotic prowess which, statistically, appears to facilitate thought suppression, even subjects with excellent trance skills vary widely in the capacity to suppress. In a strange non sequitur, they cite their results as confirmation of Wegner's (1994) theory that conscious efforts to control one's thoughts necessarily lead to a monitoring process which cycles the unwanted thought back into consciousness more frequently than if no conscious cognitive efforts were put forth to suppress it. Yet they made no experimental attempt to assess the rebound effect even though they give the impression in the title and text of their article of having replicated the "paradoxical" phenomenon.

Anxiety/worry/obsession. In contrast to repressors, we can take a look at the personality styles characterized primarily by perceptive vigilance or reflective cognition (Bonanno & Singer, 1993; Johnson, 1992; Singer & Bonanno, 1990). Chronically high-anxious individuals, formerly characterized by Byrne (1961) as "sensitizers," react in exactly opposite fashion from repressors when confronted with threatening stimuli. They attend intently to such stimuli. Initial perceptual vigilance fades into memory loss over time, however, purportedly because further cognitive processing is aborted, in the manner of a defense mechanism, to protect from further hurt (Mogg, Mathews & Weinman, 1987). There are thus both similarities and differences between repressors and the high anxious. Again, however, no studies to assess the possible existence of a rebound or

enhancement effect have been undertaken with clinically diagnosed high-anxious individuals.

Chronic worriers lie somewhere on a continuum between Generalized Anxiety Disorder (GAD) and normal functioning. Worry itself has been tagged as one of the pair of primary diagnostic features of GAD, the other half being excessive anxiety itself (DSM-IV, American Psychiatric Association, 1994).

Comparing the effects of the priming and suppression of worry in high and low middle-aged worriers. Mathews and Milroy (1994) come to conclusions that are very different from and, in fact, contrary to the findings and conclusions of Wenzlaff et al. (1988) and Wegner et al. (1990) that "...thought suppression may be a necessary part of the development of phobia, panic and inappropriate anxiety" (p.417). Mathews and Milroy (1994) suggest that the opposite may be the case. They contend that the weight of the evidence shows that "attempts to prevent oneself from worrying are not harmful and help to decrease both distress and later intrusive worrisome thoughts" (p.844).

In their experiment, Mathews and Milroy (1994) found that high worriers had somewhat more neutral or pleasant thoughts after suppressing than after expressing a specific worry. They cite a study of treatment outcomes for worriers (Borkovec, Wilkinson, Follensbee and Lerman, 1983) wherein the results support their own findings. Summarizing their position, they state that, since a period of suppression had so little effect on the subsequent frequency of worrisome intrusive thoughts for their high worry subjects (i.e., there was no rebound effect), "it makes implausible the suggestion that voluntary attempts at suppression are responsible for the intrusive quality of worry, as postulated by Wegner and colleagues in their discussion of anxiety disorders (e.g.,

Wegner et al., 1990)" (p. 849). Another experiment (Metzger, Miller, Cohen, Sofka and Borkovec, 1992) also found that letting the mind wander and not focus on worrisome topics had psychological benefits.

Wegner et al. (1987) also concluded from their research that suppression results in obsession for unwanted thoughts, even for normals. The rebound effect is described by them as a laboratory analogue of clinical obsession since it implies more involvement with the thought after suppression than if one made no attempt to suppress.

Merckelbach et al. (1991) partially replicated Wegner et al.'s (1987) study because they mistrusted Wegner et al.'s (1987) generalization of findings to obsessives. They were not able to replicate the rebound effect. Yet, despite that fact, they assumed the reliability of Wegner et al.'s (1987) results, and thus attempted to explain them in light of their own findings. Their conclusion was that the rebound effect does not model obsessive thought and that the original finding was possibly the product of an artificial, forced set of expression instructions. They neglected to suggest, as they well might have, that the effect found by Wegner et al. (1987) could be unreliable.

In spite of the widespread theorizing in studies on thought suppression about the implications of the rebound effect for obsessive thinking and obsessives, no experimental studies of the phenomenon have been performed directly with this clinical sub-population.

Depression. Although depression is a state almost everyone experiences from time to time, relatively normal depressed individuals can be distinguished from depressives or manic-depressives (Cf. Coyne, 1994).

According to some researchers (Wenzlaff et al., 1988; Wenzlaff, 1993), depressives' attempts to distract themselves typically result in replacing one negative thought with another, primarily because negative thinking is salient for them. Because networks of negative thoughts are interconnected, the unwanted thought rebounds after suppression, coming back to mind more frequently than if it had not been suppressed.

Wenzlaff (1993) garnered support for his theory from an earlier finding he and co-workers had of a rebound effect for depressed subjects who were dealing with negative intrusive thoughts related to an experimenter-provided negative situation in which they were to imagine themselves (Wenzlaff et al., 1988). He concluded (1993) that the clinically depressed should abandon thought suppression altogether.

The theory was indirectly strengthened by an experiment (Conway et al, 1991) on positive versus negative feedback in normals and dysphorics. During a 5-minute experimental suppression interval in which subjects were to try not to think about the test they just took, dysphorics, in contrast to normals, were found to exhibit significantly more negative intrusions if they had been informed that they had failed the test (which negative feedback was random and not actually related to the test) and fewer positive intrusions if informed that they had done much better than average.

In sum, the small literature on depression and depressives with respect to thought control suggests that they may be less successful in suppressing dysphoric content and also, perhaps, more likely to experience the rebound effect for such thoughts.

Other individual differences. Most of the experiments cited have been performed in college laboratories with college students. One particularly interesting study (Rutledge, et al. 1993) uncovered a moderator variable that appeared to account for the

differences between those subjects in the experiment who produced rebound and those who did not. Rutledge et al.(1993) at first found no rebound effect and no initial enhancement effect using two different stimuli, the thought of a white bear and the thought of a test the students were to take two days hence. The latter finding confirmed the results of Rutledge and Alvarado (1991) which also used an upcoming test as a more ecologically meaningful stimulus (than a white bear) with which to verify the rebound effect.

The Rutledge et al. (1993, Experiment 1) study was an exact replication of the Wegner et al. (Experiment 1, 1987) experiment in every detail. What differed was the type of institution from which the subjects were drawn. Lincoln University (in Jefferson City, MO) has an open-admissions policy, whereas the subjects from the "Wegner" studies were drawn from highly competitive institutions. Thus Rutledge et al.(1993) elected to look at the differences in admissions criteria for the respective institutions, hoping to find a moderator variable that might explain the inconsistencies among findings. They ultimately found (Experiment 2) that the small number of subjects who performed extremely well on the math component of the American College Testing (ACT) Assessment Program Scales were also those subjects who evidenced a 50% or better increase in white bear thoughts relative to the number of such thoughts the same subject entertained about white bears in a baseline period of expression. These subjects were labeled "rebounders."

The authors (Rutledge et al., 1993) point out, however, that a most important result of their study was the relatively small number of rebounders. Only 16 of 84 subjects fell into the "rebounder" category. Rutledge et al. (1993) call into question the

universality of the rebound effect and highlight the likelihood of individual differences for the phenomenon.

Another consideration offered by Rutledge et al. (1993) is that the single moderator variable they uncovered for the rebound effect appeared to be related not to overall scholastic ability but to a circumscribed and relatively narrow cognitive domain, possibly centered, they theorized, in keen visualization or visual memory skills that could logically be associated with the math subtest. They speculated further that good visualizers may have more trouble than most in suppressing the image of a white bear and they may, perhaps, be found in greater numbers in Trinity University, the source of the subject pool for Wegner et al.'s (1987) experiment.

In conclusion, it seems reasonable to suggest that the ability to suppress/repress as well as the consequences of attempting to do so--including a possible rebound--could well be related to individual differences. It could be that there is a negative correlation between different classes of subjects. Repressors, the highly hypnotizable, and run-of-the-mill worriers may excel in suppression with positive consequences for all but the repressors. Depression, high anxiety, and obsession, on the other hand, may make it difficult to suppress, and efforts to do so may even eventuate in rebound.

Experimental Questions

Numerous experimental studies have been performed, aiming to verify whether normals experience the rebound effect, a negative and ironic consequence of thought suppression (Cf. Wegner, 1994). An ancillary search for an initial enhancement effect during suppression (e.g., Lavy and van den Hout, 1990) has also been pursued, albeit less eagerly. Conflicting results suggest that perhaps neither memory phenomenon can be

reliably generalized to normals but one or the other may occur in specialized subpopulations (Cf. Rutledge et al., 1993). Nor can the results reliably be used to explain the etiology of or prescribe treatment for clinical populations (Cf. Merckelbach et al., 1991; Nolen-Hoeksema, 1993).

Among the experimental variables that differ from study to study and may thus have confounded outcomes are: criteria for successful suppression; environmental factors: manipulated time intervals and tasks; instructions: instrumentation; nature, length, and complexity of stimuli: nature of requested responses: interpretation of responses: methods and procedures: subject pool: experimental design.

The question arose as to what would happen if the Wegner et al. (1987, Experiment 1) study were replicated but the variables of length, complexity of thought, and interest level were systematically manipulated by the selection of different types of stimulus materials. To provide the beginning of an answer to that question, two experiments were designed to increase the length of the stimulus but to use meaningful contexts to tie together chunks of information. Further, in making the selections, an attempt was made to bypass any tendency of normal subjects to project themselves significantly into the subject matter--at least no more than they might with the image of "white bear."

The original stimulus, "white bear," consisted of 2 words, was easily imagined, culturally distant, and personally irrelevant. The stimulus in the second experiment was a 334 word classic Amer-Indian tale, "War of the Ghosts" (see appendix A for the full text), which has found its way into the literature from time to time (Bartlett, 1932; Erdelyi, 1991; Wegner and Schneider, 1989). It may also be characterized as culturally

distant and not personally relevant but it taxes memory and imagination much more substantially than does "white bear." The stimulus of approximately the same length in the third experiment was a dry treatise from a dictionary about the origin and use of the term ISV, the International Scientific Vocabulary (see appendix B for the full text). In all probability, the dictionary selection can be described as less interesting and thus perhaps less memory captivating than the War of the Ghosts. It has no significant cultural content nor is it personally relevant. It requires, however, a different cognitive effort to understand and remember from that imposed by a strange story such as the War of the Ghosts, which has a beginning, middle and end.

It was hypothesized that the subspan memory target, "white bear," might follow the Wegner pattern but that the two more complex stimuli would follow Ebbinghaus because they were considerably longer and thus taxed memory more significantly. (Actually the first expectation was under a cloud in view of the bumpy replication history of the effect.)

Establishing the reliability of a rebound effect is important because of the implications it has for aspects of day- to-day living and the clinical management of mental health patients. Can suppression of thoughts lead to increased preoccupation with these very thoughts and, in turn, move on to obsession, depression, CNS stress, and the like? And is that a possibility for everybody or just for certain sub-populations, such as repressors or the clinically depressed? These are crucial queries.

The Original White Bear Experiment

At this point, a more detailed description of Wegner et al.'s (1987) influential study is presented, allowing for a better understanding of their degree of support for both

the difficulty to suppress and the rebound effect. By doing so, the rationale for the design of the following experiments should become clearer.

Four issues were probed in the original white bear experiment (Wegner et al., 1987):

1) How well, in general, are subjects able to suppress the thought of a "white bear" in a suppression period, whether that period precedes or follows a period of expression?

2) Does order of instruction, to suppress or express initially, make any difference in the exercise of the ability to suppress in a suppression period and (or) in the number of reported thoughts in an expression period?

3) How consistent are subjects from the first five minute time-block to the second in the reported numbers of thoughts each has about a white bear, irrespective of the instructions? That is, on the basis of individual differences, will a positive correlation be found between serial time-blocks across conditions?

4) Irrespective of order of instruction, is there an underlying and diminishing time-course of thought accessibility (as one might expect from the findings of Ebbinghaus [1985/1964])?

As regards the first question, Wegner et al. (1987) found that there was a significant difference between numbers of thought tokens in the suppression and expression periods, with the suppression periods having the fewer number. (Thought tokens were defined as bell rings alone, mentions alone, and bell rings and simultaneous mentions.) Thought suppression was judged, nevertheless, to be a difficult task: "...it is noteworthy that suppression is never complete. Participants indicated thinking about a

white bear...more than once per minute even when instructed not to think about a white bear (p.7)." Similar results were reported for their second experiment even when subjects were given a distractor to focus on whenever the thought of a white bear intruded.

In answer to the first part of the second question, Wegner et al. (1987) found that order of instruction had no effect on the ability of subjects to suppress. There was, however, a significantly greater number of total target thought-units (all bell rings alone, all mentions alone, and all simultaneous bell rings and mentions) signaling thoughts about a white bear, in the expression period following suppression (S_1-E_2) as compared with the expression period preceding it (E_1-S_2). This result was labeled the rebound effect (i.e., $E_2 > E_1$).

In a second experiment, which replicated the findings in the first experiment with respect to the ability to suppress and the rebound effect, Wegner et al. (1987) included another measure, thought duration--the number of seconds devoted to talking about a white bear--which also produced a marginal rebound effect ($p < .06$).

To answer the third question, concerning within-subject consistency in the number of reported thoughts about bears from the first to the second time-blocks, no relation was found in the first experiment (Wegner et al., 1987) between the number of subjects' thoughts about white bears in the suppress-the-thought and express-the-thought periods when the directive to suppress occurred first (S_1-E_2). There was, however, a significant correlation ($r = .55$) when the order of the time-blocks was reversed (i.e., in the E_1-S_2 condition). Evidently, they hypothesized, the rebound effect so markedly increased reported thoughts about white bears in the expression period following suppression (S_1-E_2) that the expected within-subject consistencies from period to period

never materialized in that particular order condition. The same correlation analysis applied in the second experiment produced similar results.

To answer the fourth question about minute-to-minute memory accessibility trends within subjects, a fourth methodology was used in the original study (Wegner et al., 1987) to confirm the rebound effect. When examining total bell-rings only (there is no explanation as to why mentions only and simultaneous bell rings and mentions were dropped from this particular analysis), bell rings per minute increased over the 5-minute period of expression when it followed the suppression period but not for any of the other three 5-minute time-intervals (i.e., not in the suppression period following expression, nor in the suppression period preceding expression, nor in the expression period preceding suppression), where they indeed decreased over time, as would be expected from progressive forgetting, and (or), as Wegner et al. (1987) explained it, from "disinterest and fatigue" (p.7).

Research Objectives

The purposes of this research were as follows:

1. To retest for both the purported difficulty with suppression and the subsequent rebound effect found by Wegner et al. (1987) using "white bear" as the stimulus.

Instead of using bell rings and oral speech, checkmarks and a written stream of consciousness format was adopted as per Wenzlaff et al. (1988) in their study of depression in relation to thought suppression, and also as employed by Wenzlaff et al. (1991) in their research on the role of thought suppression in the bonding of thought and mood. Checkmarks were included as in the Wenzlaff et al. (1991) study, "to catch any reportable thoughts that happened too quickly for written acknowledgment (p. 501)." It

should be noted that in the unpublished replication experiment performed by Schakelford, Wegner, and Schneider (1987) using bell rings alone, bell rings and verbalizations, and verbalizations alone, the replicating results of zero-order within-subject correlations between time intervals were cited to "cast doubt on the possibility that the bell-ringing requirement in the original study had any special influence on the occurrence of the rebound effect (Wegner et al., 1987, p. 8)." Furthermore, in the study of the role of thought suppression in the bonding of thought and mood, Wenzlaff et al. (1991) once again reconfirmed the rebound effect of the first experiment in the Wegner et al. (1987) study, using checkmarks and written thoughts as the response modes instead of bell rings and verbalizations. Thus, it is unlikely that these differences in methodology are significant.

The current experiment also aimed to replicate studies of shifts in responses over time (cf. Wegner et al. 1987; Wegner et al., 1991; Wegner et al., 1990). To that end subjects were asked to draw a horizontal line across the page at the end of each minute.

Wegner et al.'s (1987) original study had the following design. Instructions to suppress were followed by instructions to express for subjects in one condition (S_1-E_2) whereas instructions were given in the reverse order to subjects in the second condition (E_1-S_2). The rebound effect was thus observed when comparing the number of reported thoughts about a white bear in a second five-minute expression time block (minutes six through ten) to the number of reported thoughts about a white bear in a first five-minute expression time block (minutes one through five).

Because Wegner et al.'s (1987) original study had a mismatch in the actual time periods compared, this experiment included a third condition, expression for five minutes

followed by the instruction to continue expressing for another five minutes (E_1 - E_2). The expansion of the experimental design allowed for comparisons between expression periods that were both within the same absolute time- block (6th through 10th minutes) to control for time-related effects such as fatigue, boredom, and the like.

Two other studies (Wegner et al., 1991; Wenzlaff et al., 1991) also made comparisons between expression periods that were in parallel time-blocks as will be done in this study. In both of those studies, however, the comparisons are confounded by the addition of a second experimental manipulation--a showing, simultaneously, of a series of slides in the first experiment cited and the playing of mood music in the second. Hence the decision to include the third expression-expression (E_1 - E_2) condition free from additional experimental manipulations serves, in a sense, as a cleaner control for the possible effects of fatigue and boredom.

2. Two additional experiments were designed to test the boundaries of generalizability of Wegner et al.'s (1987, Experiment 1) findings, which, as underscored earlier, went against the Ebbinghaus grain:

A. A second experiment was designed to determine if a longer and more contextual stimulus would produce difficulties in suppression along with a rebound effect. A classic Amer-Indian story, The War of the Ghosts (see Appendix A) with a beginning, middle, and end, was selected. It was assumed that its content is as unrelated to subjects' lives as is the singular image of a white bear. Nevertheless, remembering or forgetting meaningful, interconnected wholes is closer to real life reminiscences and obli-
vescences than amnesia or hypermnesia for a single image, lists of nonsense syllables, or a stack of unrelated pictures. It was expected that Ebbinghaus (1885) would prevail

because the stimulus was significantly longer and more complex than is the single simple image and two-word span of “white bear.”

B. A third experiment was designed to determine if the rebound effect could be obtained from an equally long and contextual stimulus of an entirely different nature but one that is still unrelated on a personal level to the subjects' lives. The selection was a dry passage which informs subjects about the criteria for the classification of dictionary words as members of the International Scientific Vocabulary. (See Appendix B for the full text.) But again, the aim was to stimulate holistically rather than with unrelated bits. Once again, Ebbinghaus (1885) was expected to win out for the same reasons.

General Method

Subjects

A statistically suitable number of undergraduates taking introductory psychology classes at Brooklyn College of the City University of New York signed up for the experiment to meet, in part, a course requirement for participation in such experiments. They convened with the experimenter in small groups, averaging four students per batch. The assignment of condition to batch was systematically shifted to encompass the entire school day.

Procedure

The subjects were briefed on the general purpose of the experiment and were asked for and had to give informed consent, in writing, in order to participate. All subjects read a set of instructions on how to report their thoughts as the experimenter read aloud to them the same instructions. (See Appendix C for briefing and general instructions) The instructions followed those set down by Pope (1978), with modifications to increase clarity, such as including additional examples of possible types of thought that might come to mind. It was made clear that, because the subjects could be assured anonymity, they could feel free to write absolutely anything that came to mind.

The subjects wrote for five minutes prior to any experimental manipulation. During that period (and subsequently during the experimental periods) they were asked to draw a horizontal line across the page at the end of each minute so that the experimenter would know "how far they had gotten" up to that point and they were urged not to let the process distract them from continuing to express their thoughts.

The practice period was instituted to insure more reliable results in the experimental periods. In that subjects denied such a prior practice period before they began the suppression task were reported to admit to significantly fewer target thought intrusions in the suppression time-block (Wegner et al., 1987). Wegner et al. (1987) theorized that the practice period familiarizes the subjects with the task of expressing their thoughts and thus allows them to feel more comfortable about admitting to difficulties during their attempts to suppress. Alternatively, they suggest that "perhaps the initial reporting helps people set aside their immediate concerns in the setting and get involved in the experimental task (p. 8)."

Experiment 1

The practice period was followed by the first experimental five-minute time-block which was preceded by the following instructions for the initial suppression group (S₁-E₂):

So, in the next five minutes, please continue to write your thoughts as you did before, with one exception. Try NOT to think about a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. If, despite your best efforts NOT to, you DO think about a white bear, even for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember, TRY not to think about a white bear but let us know about it if you do--even if you're writing about something else--by making those big checkmarks. [SHOW SAMPLE]

Ready? Begin.

Subsequently the participants were given instructions for the next five minutes wherein their task was to "try to think about a white bear." (See Appendix D for complete instructions.)

Subjects assigned to the initial expression group (E₁-S₂) were given essentially the same instructions but in the reverse order (see Appendixes E and F for complete instructions). Subjects in the expression-expression (E₁-E₂) group were asked after the first 5 minutes to continue to try to think about a white bear (see Appendixes G and H for complete instructions).

Results and Discussion

Analyses were completed for (a) checks only designating thoughts about a white bear, (see Figures 3-5), (b) mentions only about a white bear (see Figures 6-8), (c) Checks and mentions combined (see Figures 9-11), and (d) percent of mentions about a white bear (see Figure 11). (Figures 3-11 follow immediately in a block but will be referred to individually and in groups throughout this section.)

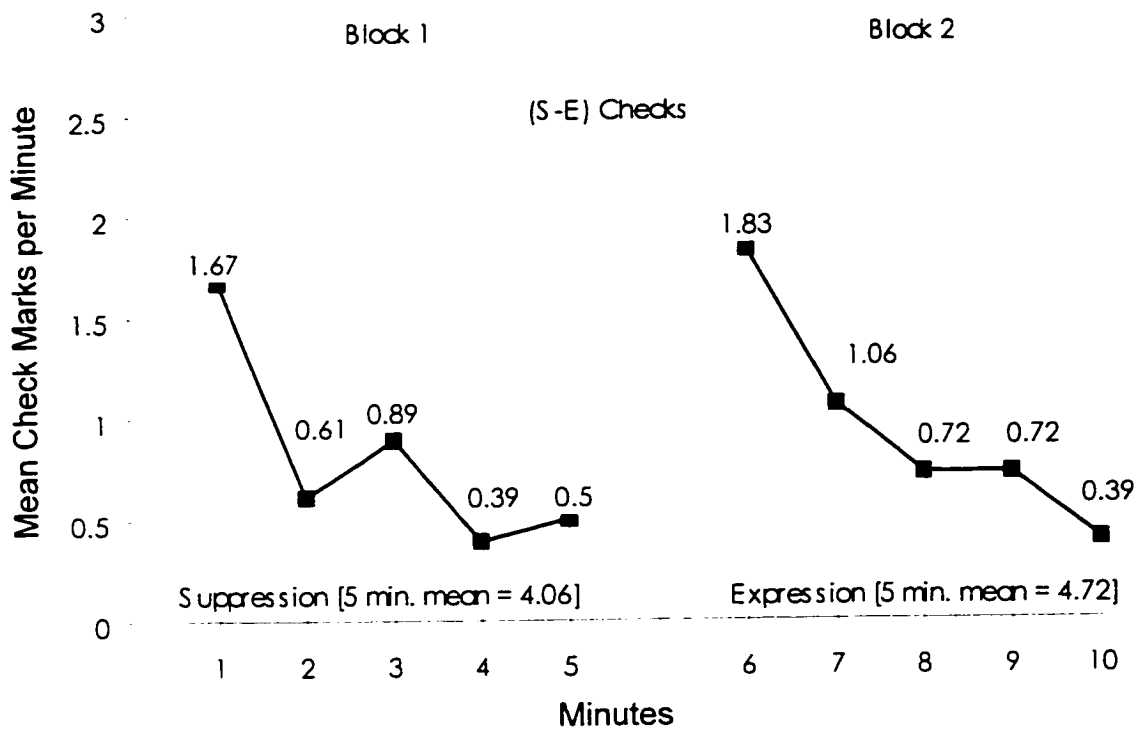


Figure 3. Checks per minute over two 5-minute periods for the suppression-expression condition (S_1-E_2) for white bear stimulus.

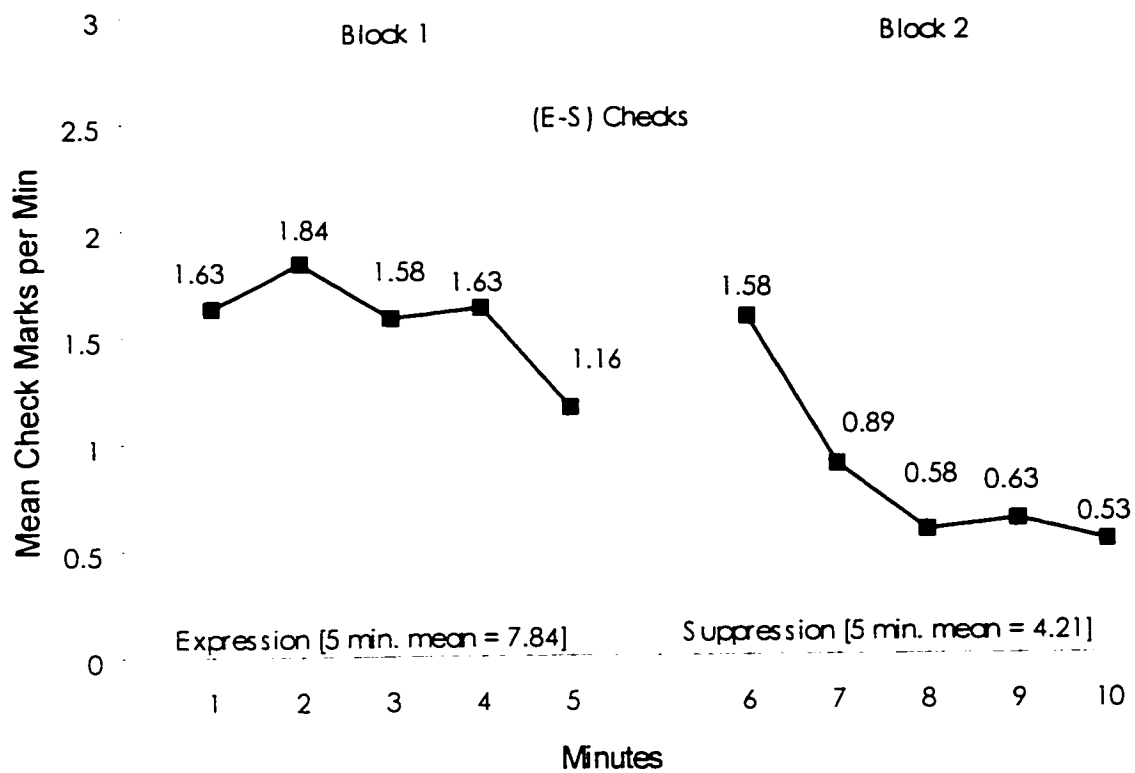


Figure 4. Checks per minute over two 5-minute periods for the expression-suppression condition (E_1 - S_2) for white bear stimulus.

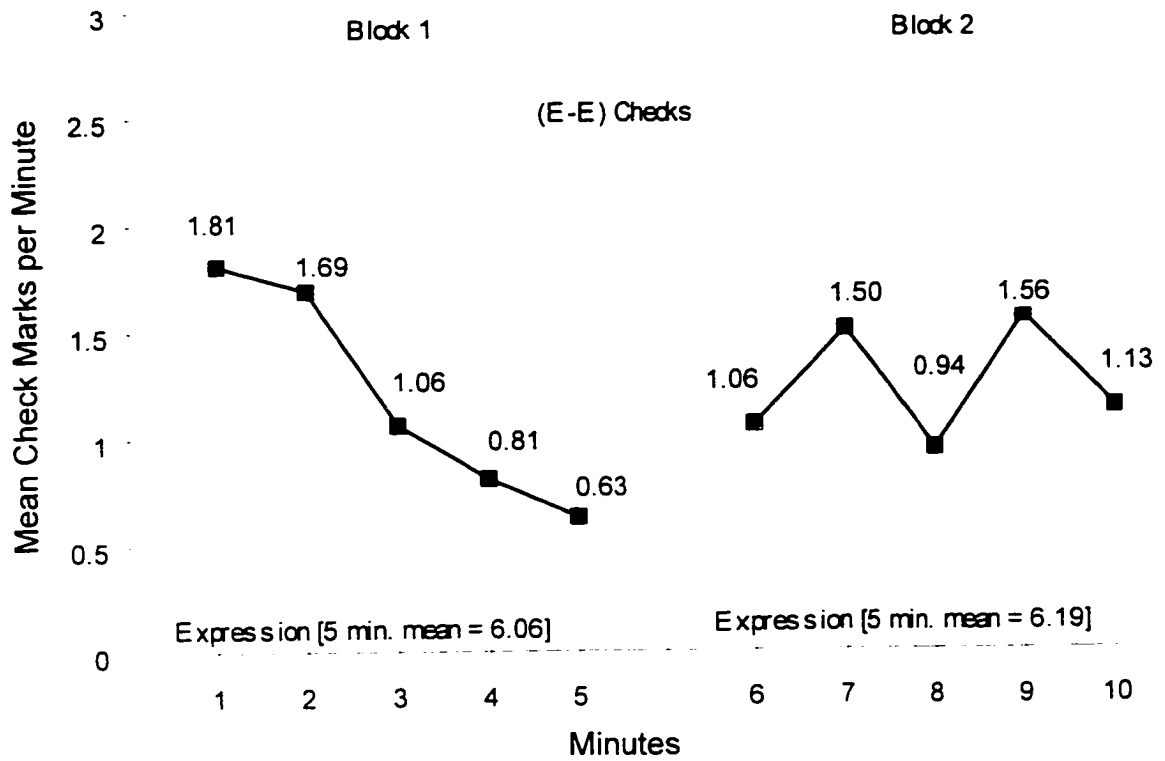


Figure 5. Checks per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for white bear stimulus.

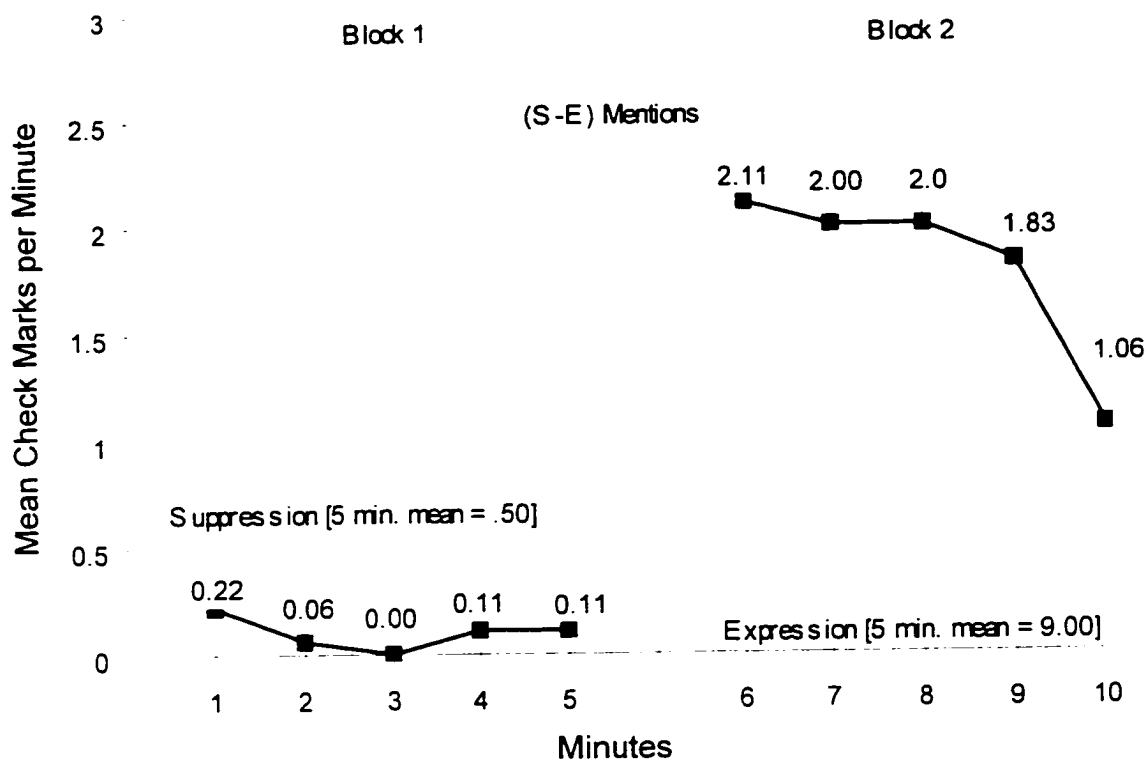


Figure 6. Mentions per minute over two 5-minute periods for the suppression-expression condition (S_1 - E_2) for white bear stimulus.

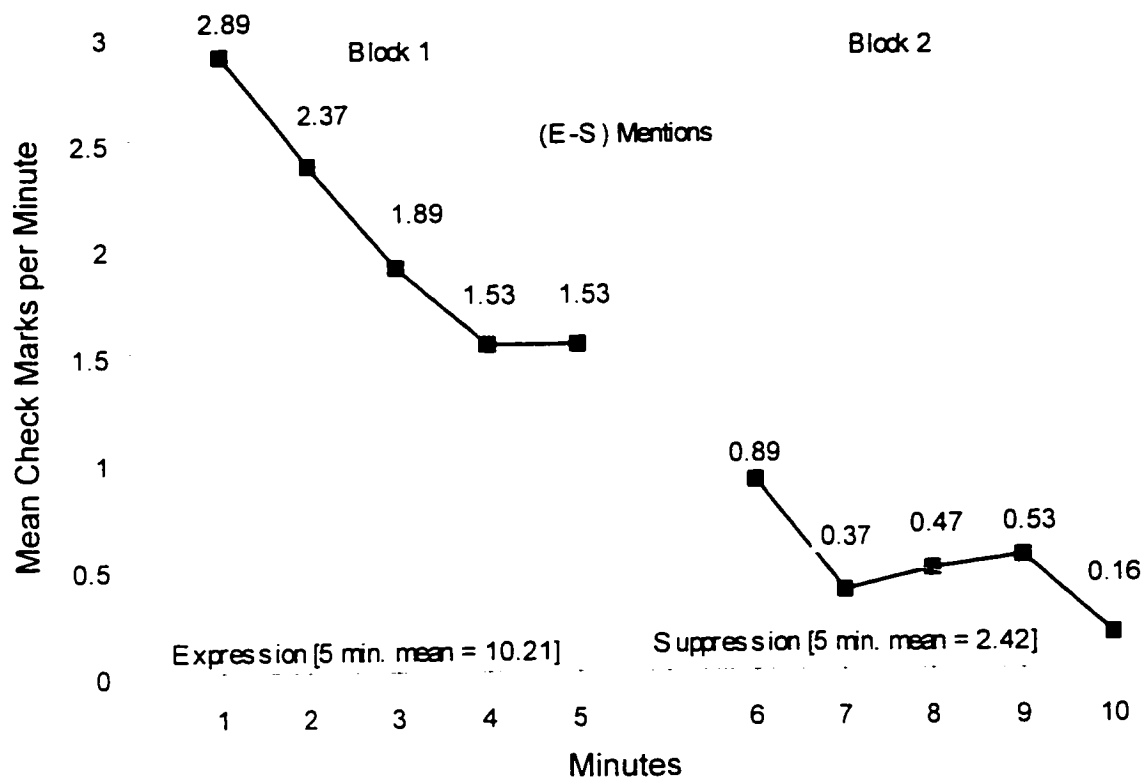


Figure 7. Mentions per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for white bear stimulus.

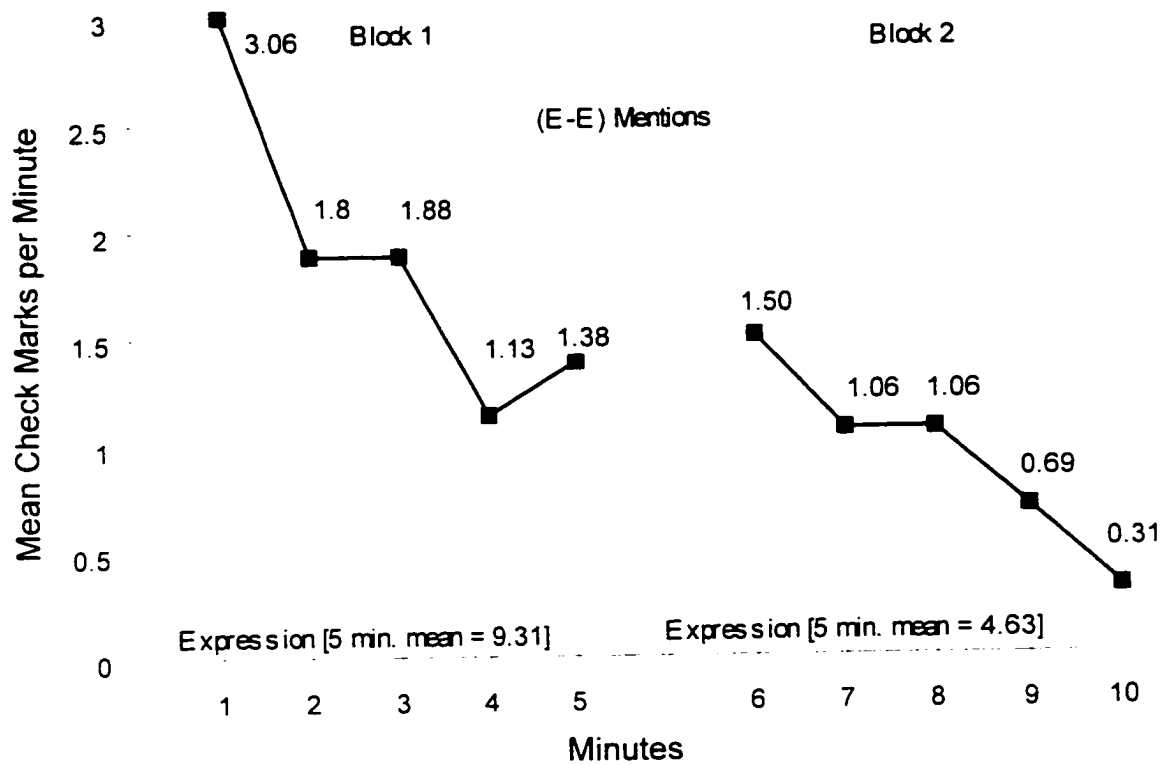


Figure 8. Mentions per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for white bear stimulus.

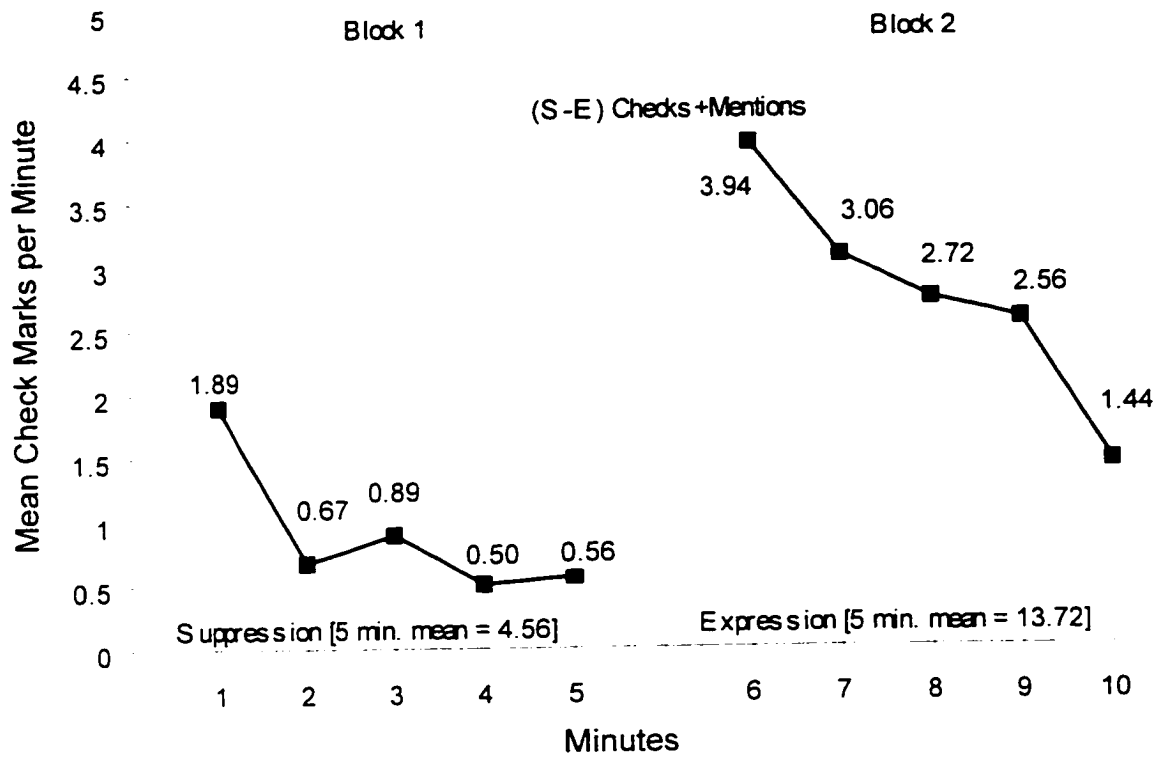


Figure 9. Checks and mentions combined per minute over two 5-minute periods for the suppression-expression condition (S_1 - E_2) for white bear stimulus.

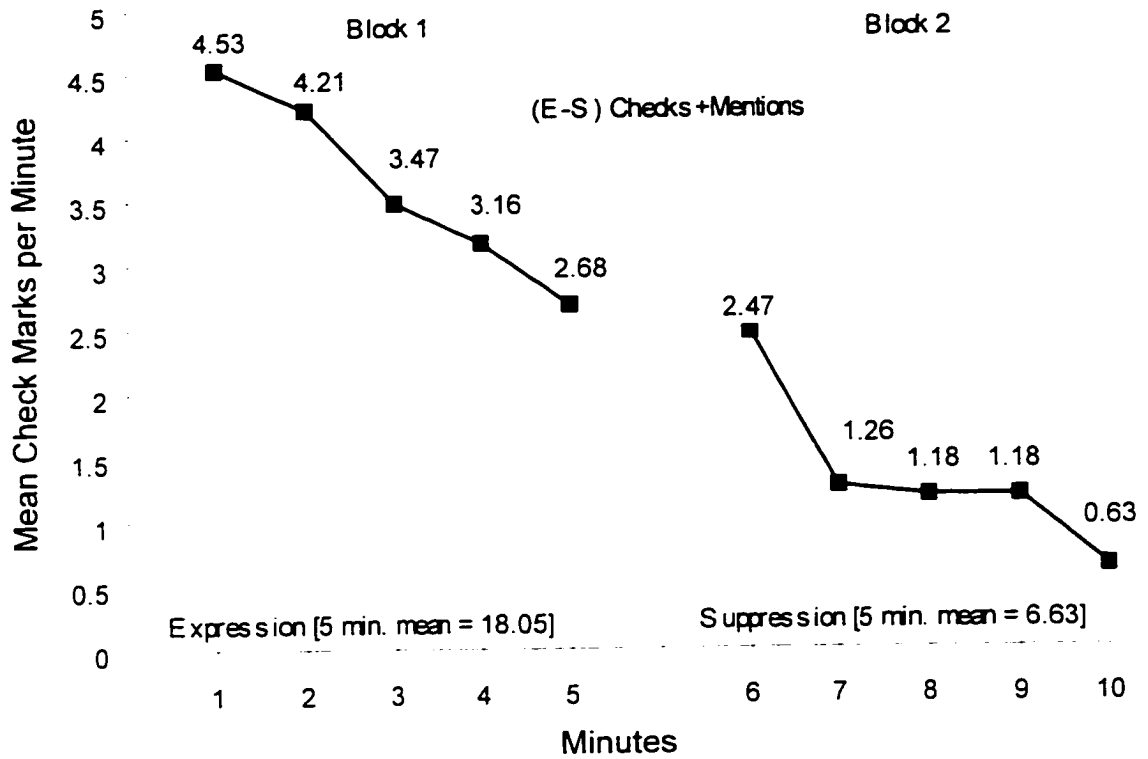


Figure 10. Checks and mentions combined per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for white bear stimulus.

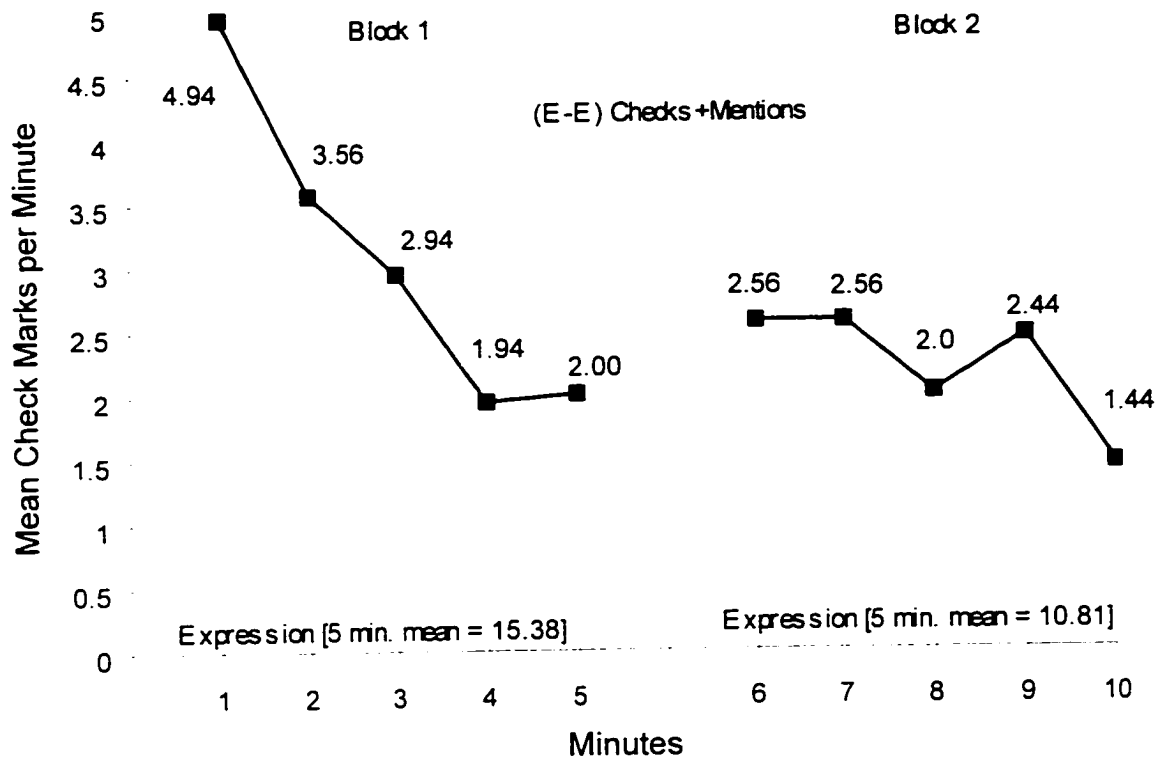


Figure 11. Checks and mentions combined per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for white bear stimulus.

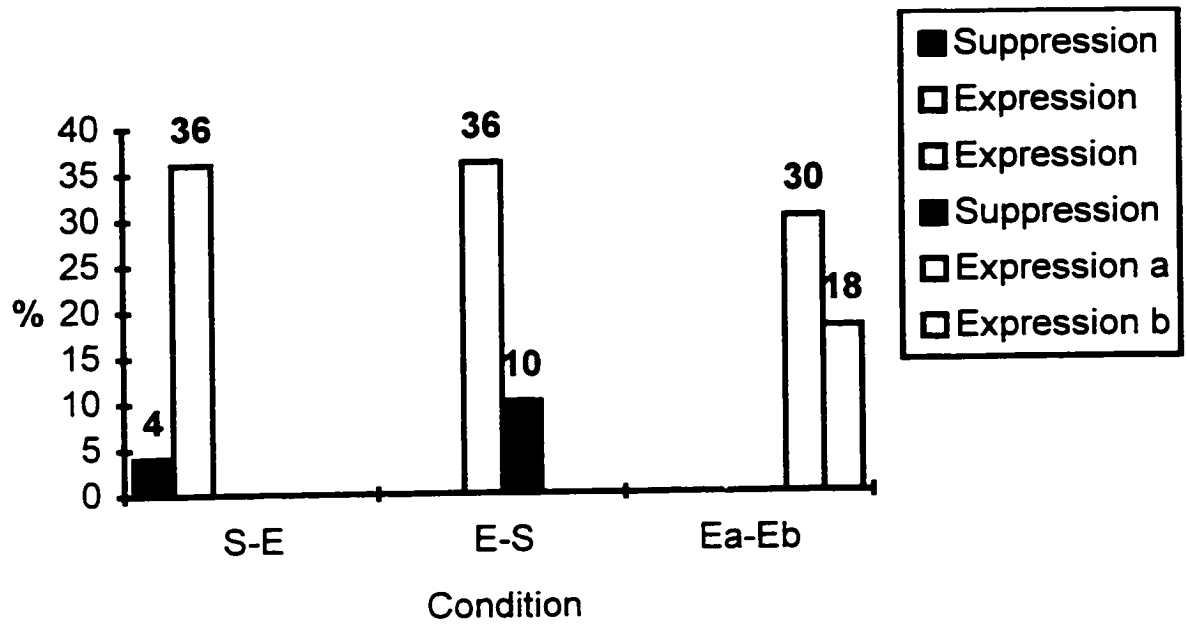


Figure 12. Percent of mentions for the White Bear stimulus.

Following Wegner et al. (1991), criteria were established for what constituted a mention (see Appendix M). Judges blind to experimental condition counted the number of times subjects mentioned a white bear or something related to it. The correlation between a pair of evaluators within each time block averaged .95 with a range of .94 to .96. Table 1 shows the means for each measure by condition.

Table 1

Measure of Thought by Group and Time-block for Experiment 1 (Stimulus: White Bear)

Group	Time-block		
	Sup.	Exp.	Exp. B
Initial suppression ¹			
(S ₁ -E ₂)			
checks only	S ₁ = 4.06	E ₂ = 4.72	
mentions only	S ₁ = .50	E ₂ = 9.00	
checks and men- tions combined	S ₁ = 4.56	E ₂ = 13.72	
Initial expression ²			
(E ₁ -S ₂)			
checks only	S ₂ = 4.21	E ₁ = 7.84	
mentions only	S ₂ = 2.42	E ₁ = 10.21	
checks and men- tions combined	S ₂ = 6.63	E ₁ = 18.05	
Expression expression ³			
(E ₁ - E ₂)			
checks only		E ₁ = 6.06	E ₂ = 6.19
mentions only		E ₁ = 9.31	E ₂ = 4.63
checks and men- tions combined		E ₁ = 15.38	E ₂ = 10.81
1. N = 18	2. N = 19	3. N = 16	

Let us review what the thrust of this experiment was. Initially, however, it is important to remember that Ebbinghaus (1885) was the first experimental psychologist to direct his subject (i.e., himself) not to think about perfectly memorized lists of nonsense syllables between spaced attempts to recall them. Thus the body of his work in this domain can be viewed as the forerunner of all subsequent research on the suppression of thought. What Ebbinghaus (1885) found, of course, was a steady memory decrement over time. Since Wegner et al.'s (1987) rebound results went counter to what one would expect given Ebbinghaus' (1885) findings--that is, they found an increment in memory over time after an initial period of suppression--the primary goal of this experiment was to replicate Wegner et al.'s (1987) study and determine, among other things, if, indeed, the rebound effect would be revealed. The replication was a precursor to executing two additional experiments designed to manipulate the effects of length and interest-level of stimuli wherein subjects would also be asked to suppress from their thoughts. The expectation was that the white bear experiment might replicate but that the other experiments might not for the reasons outlined.

The results of this experiment do not confirm Wegner et al.'s (1987) findings but do support Ebbinghaus' (1885). What can account for the non-replication found in this experiment? Before an attempt is made to answer the query generally, specific results will be reviewed to explain how and why the findings in this study differ importantly from those of Wegner and his colleagues (1987).

Rebound analysis. The most notable results to review are those which speak to the matter of the rebound effect. In experimental terms the question is whether there are

differences in numbers of thought tokens within expression periods depending upon which order comes first, to express or suppress. Only one significant result was found. Checks alone was the only measure among the four types of thought tokens analyzed which was significantly different between the two experimental groups as a function of order of instruction. And this single significant difference went counter to Wegner et al. (1987). In this study, checks alone were measured to occur significantly more often in the expression (E) period of the initial expression group (E_1-S_2 , mean=7.84) than in the expression (E) period of the initial suppression group (S_1-E_2 , mean=4.72, $MSE=1.41$, $F(1.35)=5.80$, $p<.05$). Thus, not only did the rebound effect not materialize herein, but the one significant finding indicated that there were more thoughts (as represented by checkmarks) about a white bear in the group of subjects which had a chance to express first--which is what you might expect from a commonsense point of view with respect to memory. The fresher the stimulus, the more likely it is to be recalled.

The above statistics are taken from a 2 (condition) x 2 (instruction) x 2 (thought measure) analysis of variance (ANOVA) which was conducted on square root transformed scores. (The square root transformation was used in this study as in Wegner et al.'s (1987) original study in order to achieve homogeneity of error variances [Kirk, 1968]. For clarity the reported means are not transformed.)

Remember, further, that Wegner et al.'s (1987) study compared the number of thought tokens in the expression periods of the two experimental groups (S_1-E_2 and E_1-S_2), wherein they found the rebound effect: a significantly greater number of thoughts about a white bear in the expression (E) period following suppression (S_1-E_2) than preceding it (E_1-S_2). One problem with their design, however, is that they compared a

second five-minute time-block with a first five-minute time-block, which comparison did not control for the possible effects of forgetting, fatigue, boredom, and (or) participatory burnout that may occur as subjects proceed from time-block to time-block.

To correct for this omission this study included a third group, a control group (E_1-E_2), wherein subjects were instructed to continue expressing their thoughts about a white bear during a second five-minute time-block after having expressed their thoughts on the same subject for an initial five minutes. T-tests for independent samples were completed to compare the findings in the expression (E) periods of the two experimental groups (groups S_1-E_2 and E_1-S_2) with the expression (E) periods in the control group (E_1-E_2) but produced no significant differences. With respect to the two initial expression (E_1) time-blocks for the initial expression group (E_1-S_2) and the control group (E_1-E_2), the finding provides a reliability check for the number of reported thoughts counted in the expression period of the experimental initial expression condition (E_1-S_2).

In sum, whether one uses the data in this study to make comparisons as Wegner et al. (1987) did with mismatched time-blocks, or whether they are used to compare time-blocks that are exactly matched, minute for minute, the rebound effect does not materialize.

It may also be recalled that Wegner et al. (1987) explored another avenue to buttress further their findings and rationale for the rebound effect. They measured consistency within subjects from task to task and expected to achieve results consonant with the theory that such consistency should obtain "on the basis of a straightforward individual differences interpretation (p. 7)." Such an assumption is open to question, however, considering the nature of their experiment. It would seem that the very essence

of their study lies in the specific instructions they administered, to suppress or express thoughts. Those instructions are geared to obviate any tendency of subjects to perform consistently from time-block 1 to time-block 2. The better participants are in following the instructions (and individual differences may account, ironically, for their skill or lack of same in doing so), the less likely is one to find a correlation.

Nevertheless, Wegner et al. (1987) used their finding that there were significant correlations in all time blocks but one, the expression (E) period of the initial suppression (S_1-E_2) condition, as additional support for the rebound effect. Subjects were so affected by having to suppress information initially, they argued, that an outpour of thoughts about a white bear could not be stemmed come expression time.

In this study, correlations were calculated using square root transformations. None of the thought measures for any of the groups was significant except for checks only in both the initial expression group (E_1-S_2 : $r(19)=.54$, $p<.05$) and the control group (E_1-E_2 : $r(16)=.54$, $p<.05$). Although the initial suppression group (S_1-E_2) did not produce a significant correlation from block 1 to block 2 for checkmarks, the trend was in the same direction ($r(18)=.41$, $p=.09$). Thus these results can hardly be used to buttress the weak infrastructure of a rebound effect for normal subjects.

Time-line analysis. The second most significant matter to explore relates to the nature of the time-line uncovered within each five-minute block. It will be recalled that Wegner et al. (1987) found, consistently, decrements over time for all time-blocks in all conditions but one: the second time-block of the initial suppression condition (S_1-E_2), wherein thoughts about white bears increased progressively, thereby producing the rebound effect. With the exception of this latter finding, their research was in line, as

indicated earlier, with the results of most of the reported research examining this phenomenon. Subjects tend to forget over time.

What, one may ask, was the minute to minute variation within subjects within time-blocks in this experiment and was the pattern and (or) the direction of that variation (if any) important in drawing conclusions about the rebound effect?

Three 2 (condition) x 2 (instruction) x 5 (1-minute segments) ANOVAs on square root transformed thought measures were performed. A main effect for minutes was significant for all three thought measures: checks alone; $MSE=.32$, $F(4,140)=6.22$, $p<.001$ (see Figures 3.4); mentions alone, $MSE=.28$, $F(4,140)=6.23$, $p<.001$ (see Figures 6.7); checks and mentions combined, $MSE=.39$, $F(4,140)=9.48$, $p<.001$ (see Figures 9.10), indicating that, over a five-minute block of time, significant changes occurred in subjects' response rates.

A separate 2 (instruction) x 5 (minutes) ANOVA on transformed thought measures was performed for the control group (E_1 - E_2), which received two set of instructions to express. There was a significant main effect for minutes for all thought measures indicating, once again, that significant changes occurred in subject response rates over time: checks alone, $MSE=.29$, $F(4,60)=3.16$, $p<.05$ (see Figure 5); mentions alone, $MSE=.52$, $F(4,60)=3.81$, $p<.01$ (see Figure 8); checks and mentions combined, $MSE=.41$, $F(4,60)=5.88$, $p<.001$ (see Figure 11). There was only one significant two-way interaction of instruction by time segments for any thought measure, that for checks alone, $MSE=.27$, $F(4,60)=2.65$, $p<.05$, indicating that, in the first period of expression (E_1), there was a significant decrease over time, whereas during the second period of

expression the check responses were essentially flat (with some ups and downs) (see Figure 5).

A trend analysis resulted in the finding that, for the initial suppression group (S_1-E_2), checks alone decreased significantly over time, $MSE=.32$, $F(1,17)=6.65$, $p<.05$ (see Figure 3), in the suppression period (first five minutes), whereas mentions alone decreased significantly over time in the expression period (second five minutes), $MSE=.48$, $F(1,17)=9.24$, $p<.01$ (see Figure 6). When checks and mentions were combined, there was a significant decrease over time for both periods: block 1: $MSE=.34$, $F(1,17)=6.59$, $p<.05$; Block 2: $MSE=1.68$, $F(1,17)=5.71$, $p<.05$ (see Figure 9).

For the initial expression group (E_1-S_2) there was a significant decrease over time for all thought measures in both five-minute periods except for the second five-minute period for mentions alone: checks alone, Block 1: $MSE=.26$, $F(1,18)=4.71$, $p<.05$; checks alone, Block 2: $MSE=.37$, $F(1,18)=7.57$, $p<.05$ (see Figure 4); mentions alone, Block 1: $MSE=.29$, $F(1,18)=13.10$, $p<.01$ (see Figure 7); checks and mentions combined, Block 1: $MSE=.66$, $F(1,18)=14.21$, $p<.01$; checks and mentions combined, Block 2: $MSE=.77$, $F(1,18)=8.53$, $p<.01$ (see Figure 10).

In the control group (E_1-E_2), there was a significant decrease for all thought measures except for the second five-minute period for checks alone: checks alone, Block 1: $MSE=.33$, $F(1,15)=16.73$, $p<.001$ (see Figure 5); mentions alone, Block 1: $MSE=.63$, $F(1,15)=4.45$, $p=.05$; Block 2: $MSE=.34$, $F(1,15)=11.29$, $p<.01$ (see Figure 8); checks and mentions combined, Block 1: $MSE=1.20$, $F(1,15)=13.47$, $p<.01$; Block 2: $MSE=.62$, $F(1,15)=7.08$, $p<.05$ (see Figure 11).

Thus, on the whole, within almost all of the time periods, subjects thought less and less about white bears over time, whether they were instructed to think about them or not to think about them. Furthermore, no finding in the minute by minute analyses supports the rebound effect.

Suppression analysis. Finally, one may wonder if the results of this study confirm the concept that subjects are capable of significant suppression. All data from this study relating to this question confirm what Wegner et al. (1987) found, which is that, although 100% thought suppression may be difficult to achieve for many subjects, most subjects are able to follow the directive to suppress. A main effect for instruction (checks and mentions combined) indicated that the expression (E) period (mean=7.95) elicited significantly more total responses than the suppression (S) period (mean=2.87), $MSE=1.84$, $F(1,35)=37.65$, $p<.001$

Turning to simple comparisons, for checks alone, the overall mean for both conditions for the expression time-blocks of 6.28 was significantly greater than that for the suppression time-blocks which had a mean of 4.14, $MSE=.77$, $F(1,35)=6.09$, $p<.05$. For mentions alone as well, the overall mean in the expression periods of 9.61 was significantly greater than the suppression time-blocks mean of 1.46, $MSE=1.69$, $F(1,35)=41.79$, $p<.001$. For checks and mentions combined the overall means were also significantly different in the same direction, with the expression groups having a mean of 15.89 and the suppression groups a mean of 5.60, $MSE=1.48$, $F(1,35)=37.65$, $p<.001$.

Thus for both types of thought measures counting numbers of reported thoughts about a white bear--checks alone and mentions alone (and also checks and mentions combined)--the means of the summed thought measures across both experimental

conditions, initial suppression (S_1-E_2) and initial expression (E_1-S_2), indicated significantly more reported thoughts during the expression periods than during the suppression periods.

Looking at simple comparisons in the ANOVA between suppression (S) and expression (E) time-blocks for each of the thought measures individually in each of the groups, the initial suppression group (S_1-E_2) and the initial expression group (E_1-S_2), all comparisons were significant but one, checks alone in the initial suppression group (S_1-E_2). The mean of 4.72 for checks alone in the expression (E) period was not significantly different from the mean of 4.06 in the suppression (S) period, $F < 1$. There were significantly more responses for mentions alone during the expression (E) period than the suppression (S) period (9.00 vs. 5.0), $MSE = 2.34$, $F(1,36) = 20.03$, $p < .001$; the same was true for checks and mentions combined (13.72 vs. 4.56), $MSE = 2.25$, $F(1,36) = 11.82$, $p < .001$.

For the initial expression group (E_1-S_2) there were significantly more responses for checks alone during the expression (E) period than the suppression (S) period (7.84 vs. 4.21), $MSE = .75$, $F(1,36) = 9.23$, $p < .01$. For mentions alone, the same was true (10.21 vs. 2.42), $MSE = 2.94$, $F(1,36) = 8.53$, $p < .01$, as it was for checks and mentions combined (18.05 vs. 6.63), $MSE = 2.18$, $F(1,36) = 13.41$, $p < .001$.

A separate 2 (condition) X 2 (instruction) ANOVA for percent of mentions showed that there was only a significant main effect for instruction, (36% vs. 7%) $MSE = .07$, $F(1,35) = 21.19$, $p < .001$ (see Figure 12), indicating that there were significantly more responses in the expression (E) period than in the suppression (S) period.

Clearly, most subjects were able to follow the instruction to suppress. Just as clearly, the opposite of an initial enhancement effect was obtained (Cf. Lavy and Van den Hout, 1990). The directive to suppress, whether issued prior or subsequent to the instruction to express, elicited fewer not more thought tokens from subjects.

There were, however, interesting differences among subjects. For checks alone, 16% of the participants were able to suppress thoughts of a white bear completely in the suppression period. For mentions alone that figure rose to 68%. Thus even though the group means support the notion that subjects thought about a white bear on the average of once per minute in the suppression time-blocks with a mean of 4.56 in the initial suppression group (S_1-E_2) for checks and mentions combined and a mean of 6.63 for checks and mentions combined in the initial expression group (E_1-S_2), there were a number of subjects who appeared to be capable of total suppression. Furthermore, as has already been documented, stating an average number of thoughts per minute over a five-minute time block is misleading, since the bulk of the thoughts in the suppression (and expression) periods occurred in the first few minutes of most of the time-blocks.

Conclusions. In summation one may conclude that, with respect to the stimulus "white bear," a) no rebound effect was uncovered, b) the trend within almost every five-minute block of time was downward c) subjects are certainly capable of thought suppression, and d) no evidence of an initial enhancement effect was measured.

Experiment 2

Essentially the same procedures, instructions, and statistics were used for the longer stimulus, the story of the War of the Ghosts (WOG), as was used for the "white bear" stimulus in Experiment 1. Appendix I details the "Read and Listen Instructions" for this stimulus, which instructions were proffered prior to the order manipulation components of the experiments (see Appendixes J-L for the exact wording of the "think about" and "don't think about" modules.)

Results and Discussion

Analyses were completed for (a) checks only designating thoughts about WOG (see Figures 13-15), (b) mentions only about WOG (see Figures 16-18), (c) checks and mentions combined for WOG (see Figures 19-21), and (d) percent of mentions about WOG (see Figure 22) (Figures 13 through 22 follow immediately in a block but will be referred to individually and in groups throughout this section.).

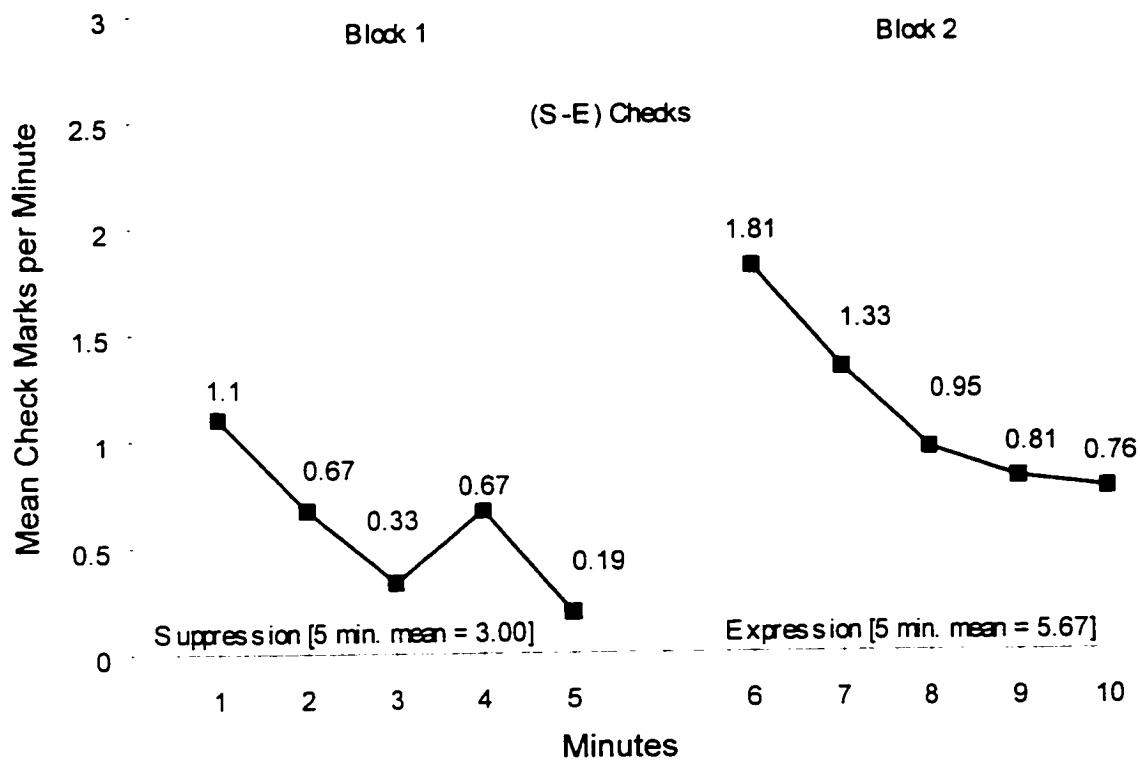


Figure 13. Checks per minute over two 5-minute periods for the suppression-expression condition (S_1-E_2) for the War of the Ghosts stimulus.

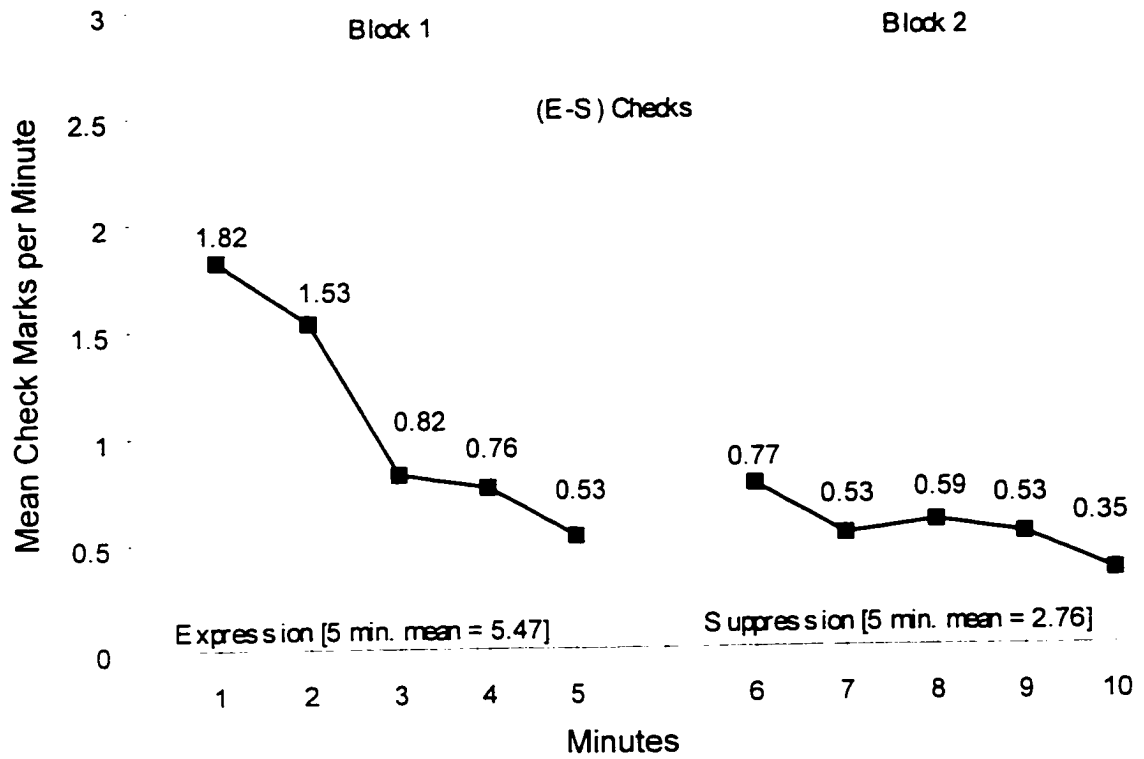


Figure 14. Checks per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for the War of the Ghosts stimulus.

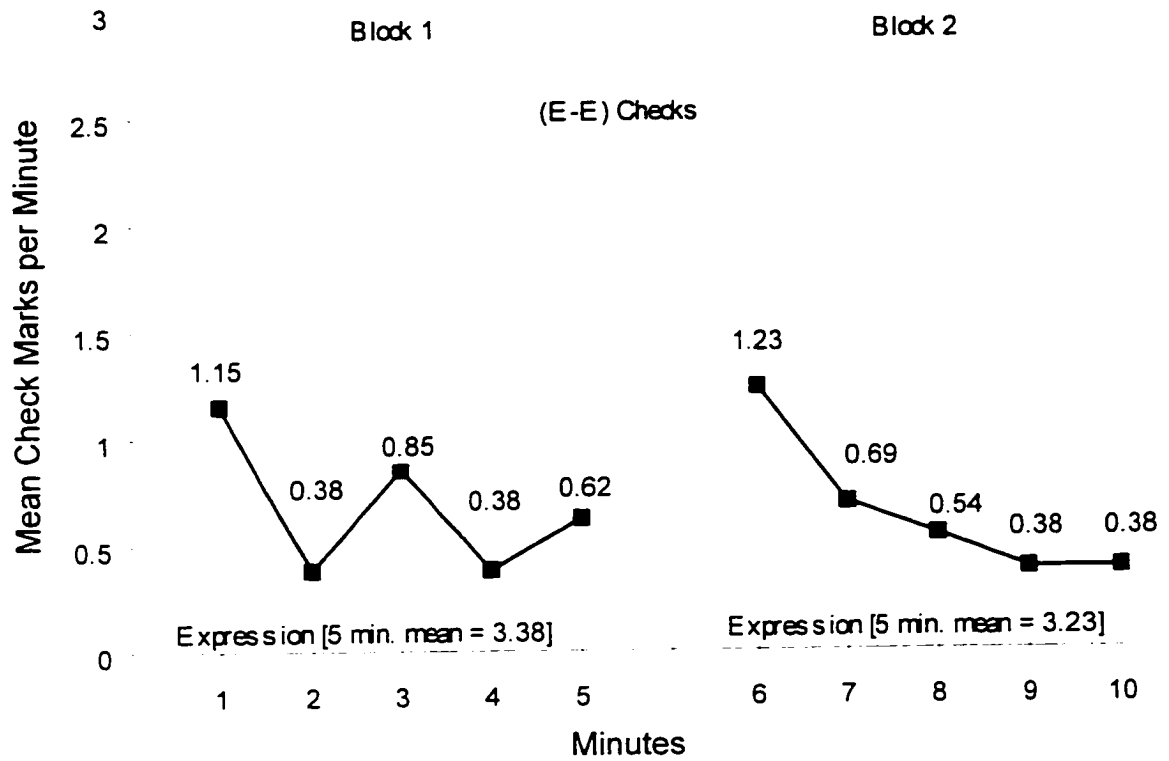


Figure 15. Checks per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for the War of the Ghosts stimulus.

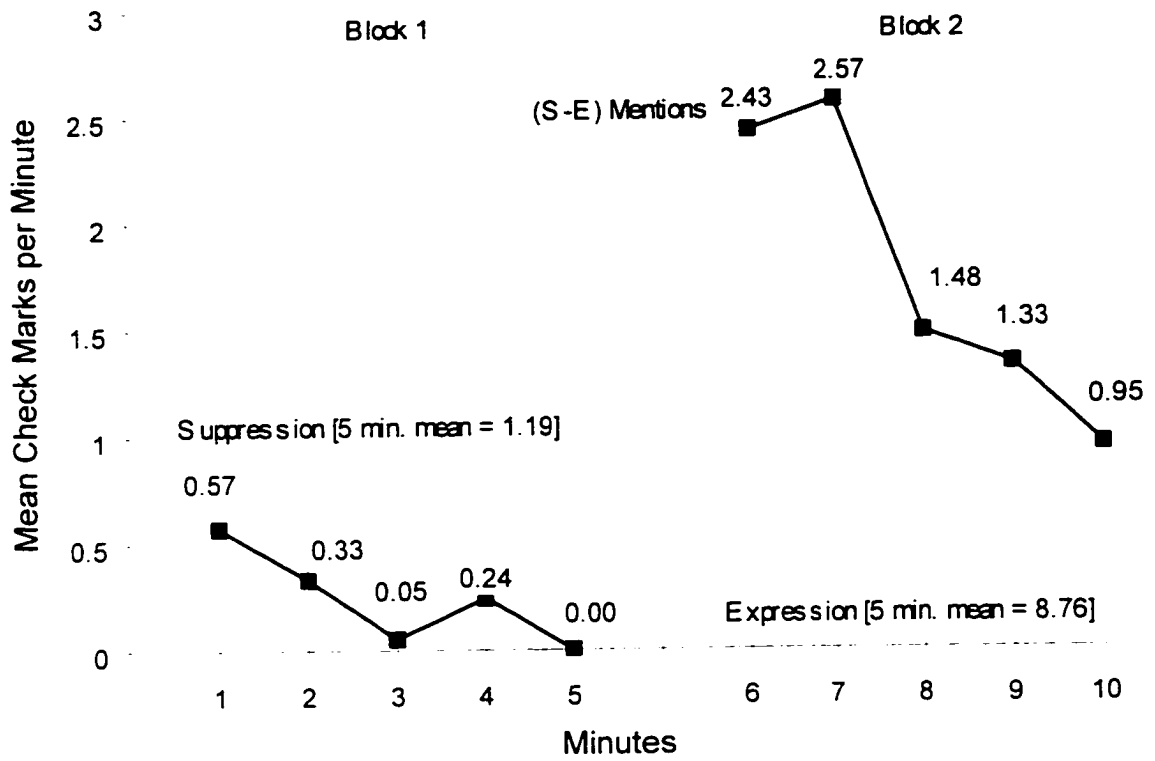


Figure 16. Mentions per minute over two 5-minute periods for the suppression-expression condition (S_1 - E_2) for the War of the Ghosts stimulus.

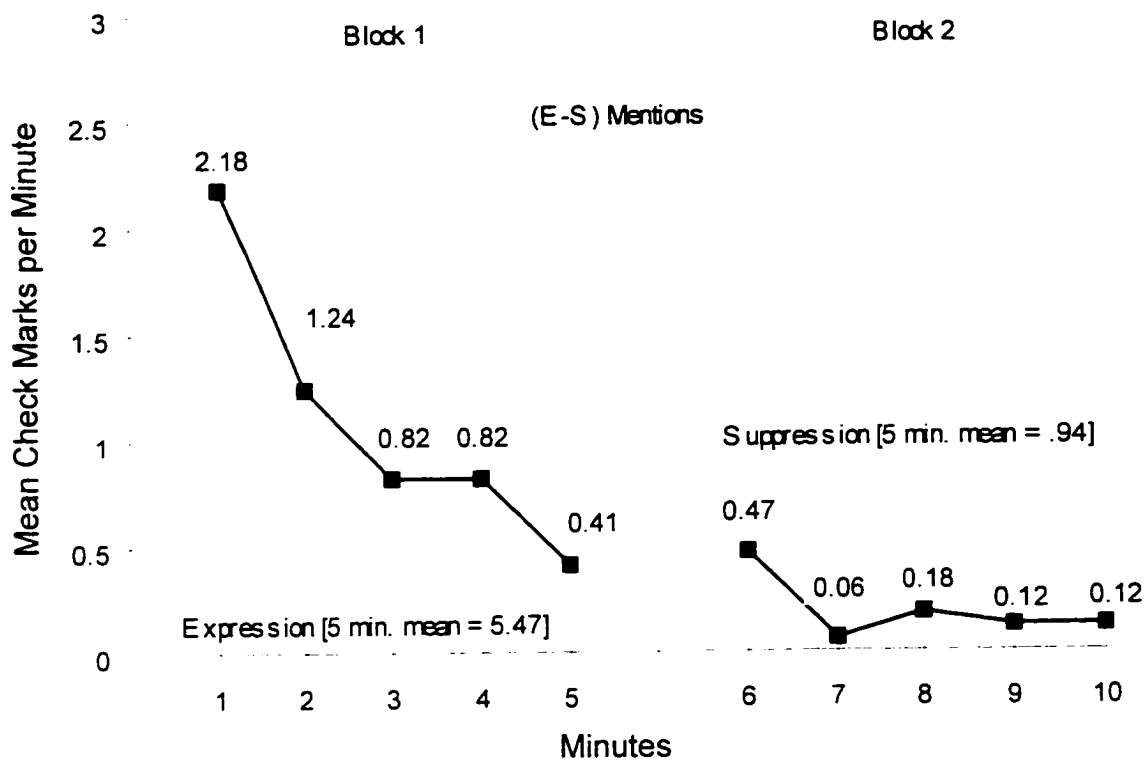


Figure 17. Mentions per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for the War of the Ghosts stimulus.

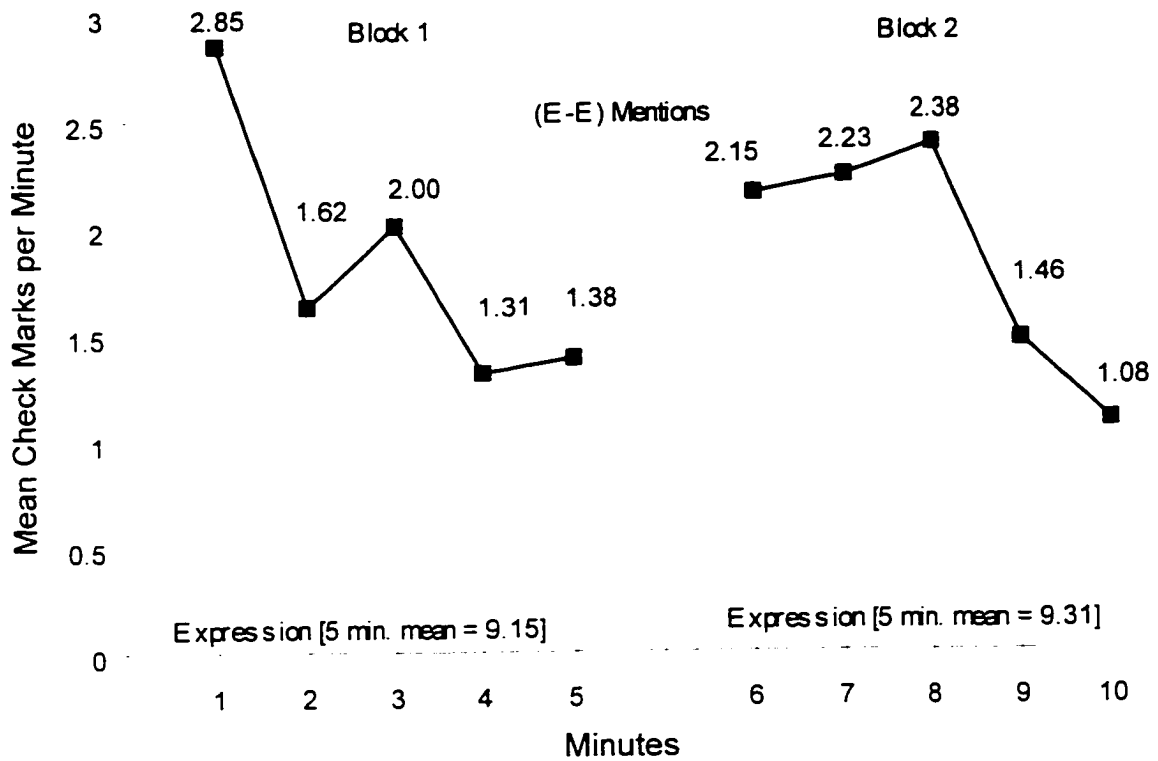


Figure 18. Mentions per minute over two 5-minute periods for the expression-expression condition (E_1-E_2) for the War of the Ghosts stimulus.

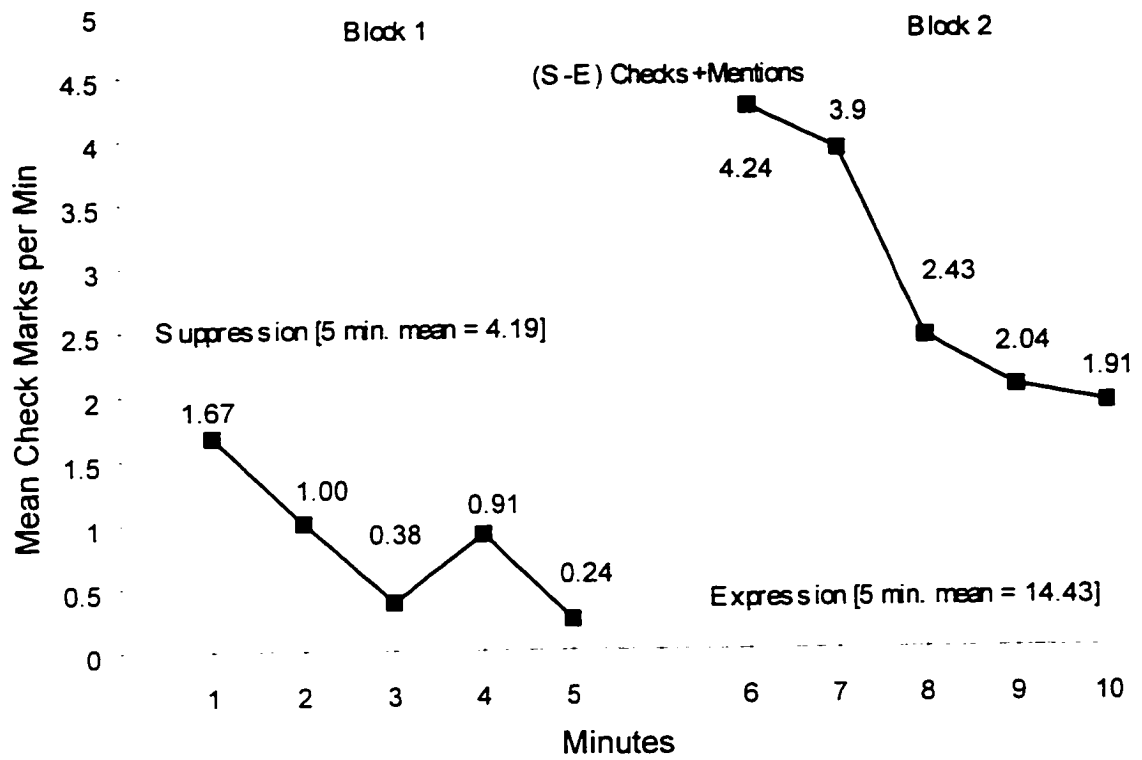


Figure 19 Checks and mentions combined per minute over two 5-minute periods for the suppression-expression condition (S₁-E₂) for the War of the Ghosts stimulus.

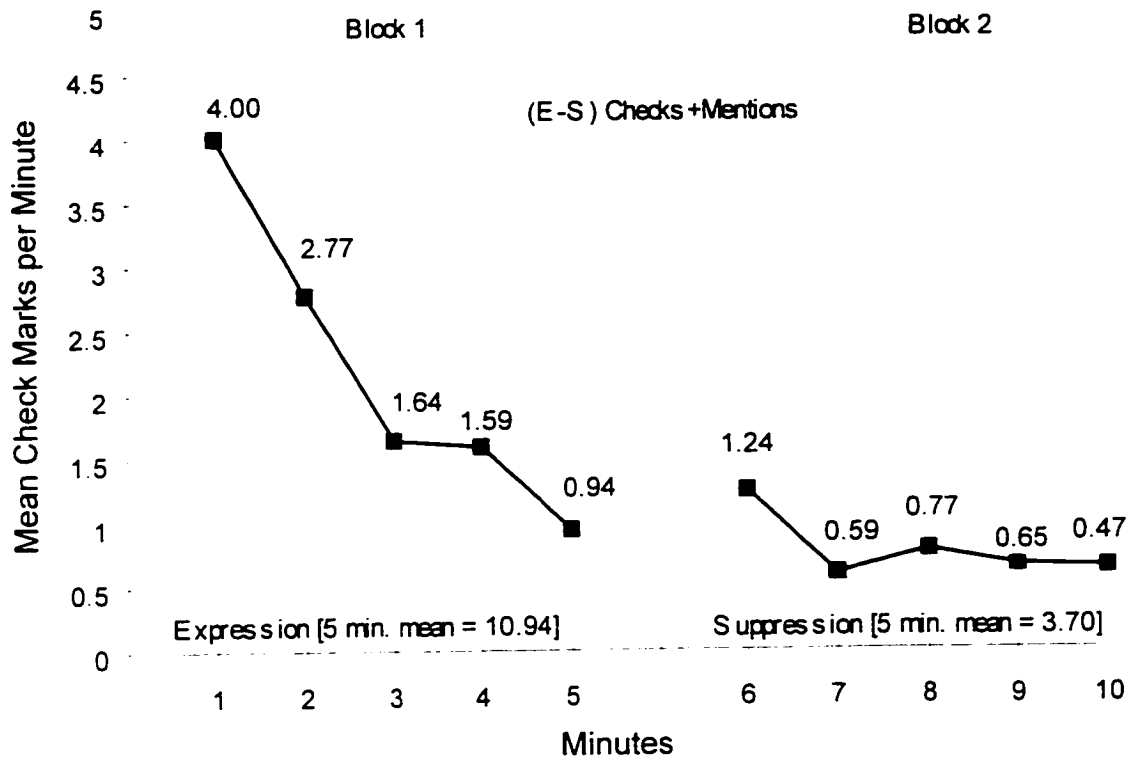


Figure 20 Checks and mentions combined per minute over two 5-minute periods for the expression-suppression condition (E₁-S₂) for the War of the Ghosts stimulus.

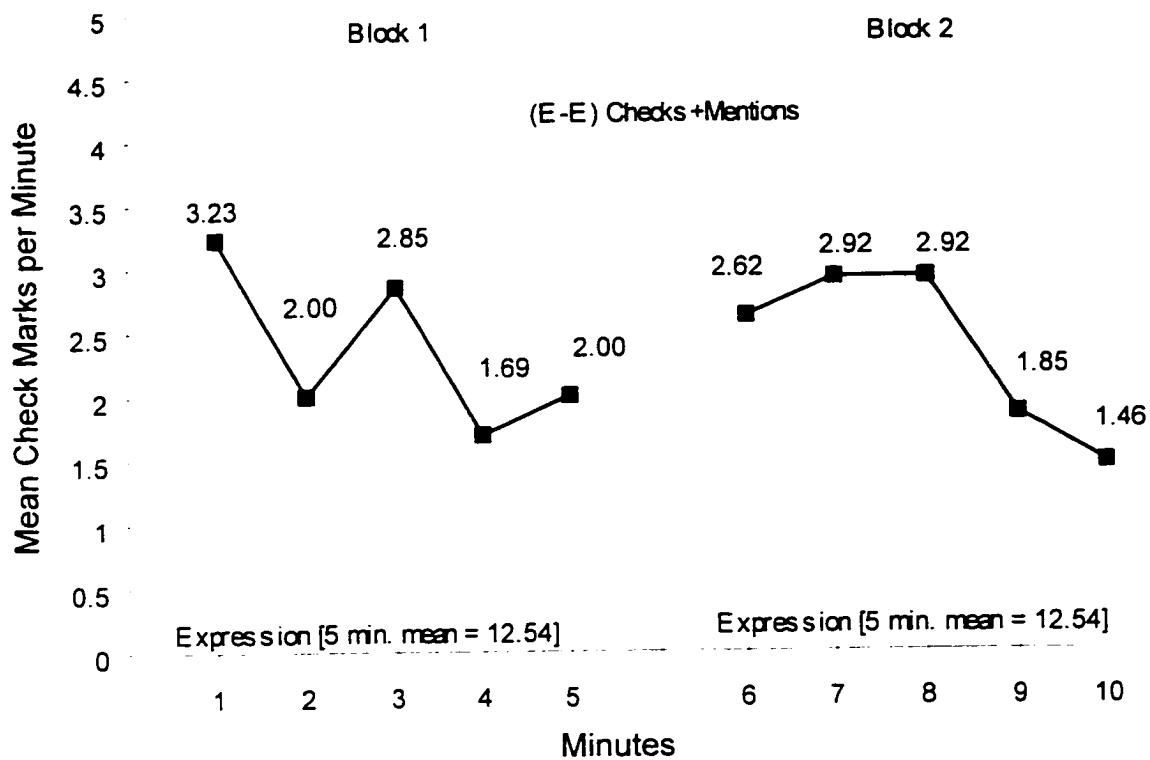


Figure 21. Checks and mentions combined per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for the War of the Ghosts stimulus.

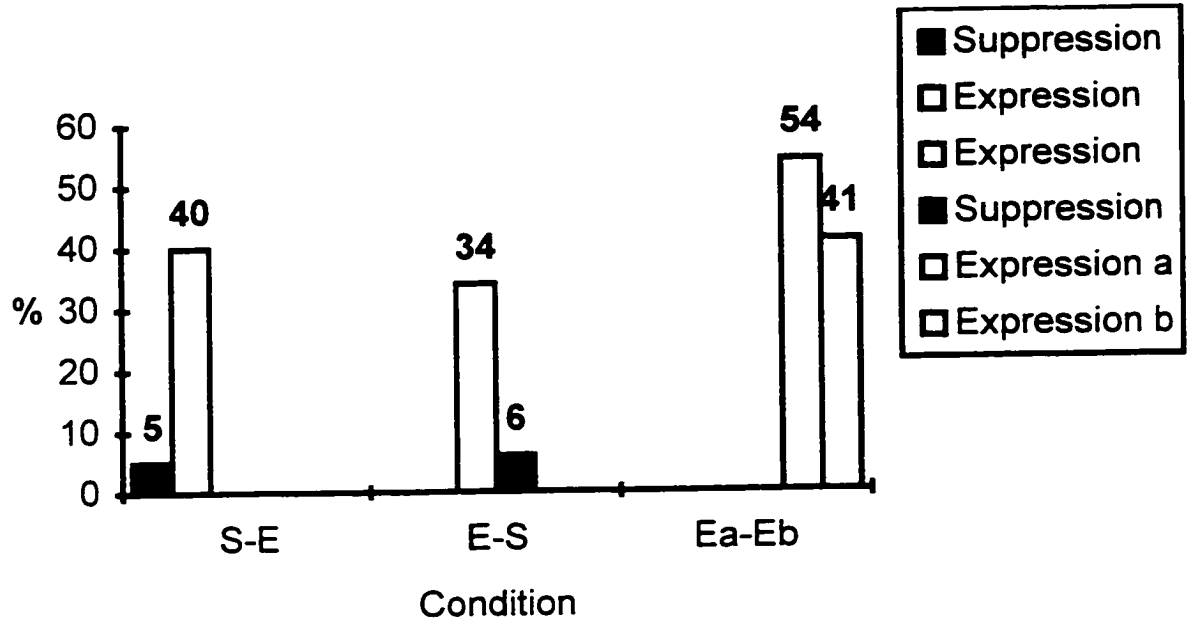


Figure 22. Percent of mentions for the War of the Ghosts (WOG) stimulus.

Judges blind to experimental condition counted the number of times subjects mentioned WOG or something clearly related to the story. The correlation between a pair of evaluators within each time block averaged .93 with a range of .89 to 1.00. Table 2 shows the means for each measure by condition.

Table 2

Measure of Thought by Group and Time-block for Experiment 2 (Stimulus: WOG)

Group	Time-block		
	Sup.	Exp.	Exp. B
Initial suppression ¹			
(S ₁ -E ₂)			
checks only	S ₁ = 3.00	E ₂ = 5.67	
mentions only	S ₁ = 1.19	E ₂ = 8.76	
checks and men- tions combined	S ₁ = 4.19	E ₂ = 14.43	
Initial expression ²			
(E ₁ -S ₂)			
checks only	S ₂ = 2.76	E ₁ = 5.47	
mentions only	S ₂ = .94	E ₁ = 5.47	
checks and men- tions combined	S ₂ = 3.70	E ₁ = 10.94	
Expression expression ³			
(E ₁ - E ₂)			
checks only		E ₁ = 3.38	E ₂ = 3.23
mentions only		E ₁ = 9.15	E ₂ = 9.31
checks and men- tions combined		E ₁ = 12.54	E ₂ = 12.54
1. N = 21	2. N = 17	3. N = 13	

Rebound analysis. Once again, as with the stimulus “white bear,” with respect to the most important issue--the reliability of the rebound effect for normal subjects--the WOG experiment produced no significant findings when the expression periods (E_1 and E_2) of the two experimental groups (S_1-E_2 and E_1-S_2) were compared. Additionally, no significant comparisons for any of the thought measures between the expression (E_2) block of the initial suppression group (S_1-E_2) and the second five-minute time-block (E_2) of the control group (E_1-E_2) were measured. Thus whether mismatched or perfectly matched minutes were compared, the results were not significant for a rebound effect. (Nor were the comparisons between the initial five-minute period (E_1) of the initial expression group (E_1-S_2) and the same period (E_1) of the control group (E_1-E_2) significantly different for any of the thought measures.)

The search for consistency within subjects from one period to the next produced no significant correlations for the initial suppression group (S_1-E_2) for any of the thought measures. On the other hand, subjects in both the initial expression group (E_1-S_2) and the control group (E_1-E_2) correlated from time-block to time-block for most thought measures (although mentions alone in the initial expression group (E_1-S_2) correlated only marginally: $p=.055$): initial suppression group (S_1-E_2), checks only, $r(21)=.36$, $p=.053$ (marginal); checks and mentions combined, $r(21)=.43$, $p<.05$; initial expression group (E_1-S_2), checks only, $r(17)=.66$, $p<.01$; mentions only, $r(17)=.47$, $p<.05$; checks and mentions combined, $r(17)=.64$, $p<.01$; control group (E_1-E_2), checks only, $r(13)=.79$, $p<.001$; mentions only, $r(13)=.66$, $p<.01$; checks and mentions combined, $r(13)=.80$, $p<.001$.

It is evident that the above figures on consistency provide the only parallel findings in this experiment with those of Wegner and colleagues (1987). Remember, however, the argument made earlier about the suspect nature of the theory that lack of consistency measured only in the initial suppression group (S_1-E_2) (which is what Wegner et al. [1987] found) could be seen as support for the rebound effect--considering the nature of the tasks to be performed. Yet it may be of some value to suggest an alternate explanation for the finding. Perhaps being instructed to suppress thoughts immediately after exposure to a stimulus allows one to follow that directive more effectively than if asked to suppress after a period of expression. When one expresses first, after exposure, it is possible that, at least for some subjects, the multiple networks activated in the process of expression bleed into the subsequent suppression period whereas when one suppresses first there are fewer memory stores attempting entrance once the expression time block arrives.

Time-line analysis. Time-lines within time blocks followed Ebbinghaus (1885) for all three groups with only three exceptions, mentions only in the second five-minute period (S_2) of the initial expression group (E_1-S_2), which was only marginally significant $F(1,16)=4.33$, $p=.053$) (see Figure 17), and checks only in both time blocks which were not significant. Decrements in thoughts about WOG over time were significant for all other thought measures in both experimental groups and in the control group.

For the experimental groups, a main effect for minutes was significant for all three thought measures: checks alone, $MSE=.22$, $F(4,144)=15.92$, $p<.001$ (see Figures 13,14), mentions alone, $MSE=.27$, $F(4,144)=15.23$, $p<.001$ (see Figures 16,17), and

checks and mentions combined, $MSE=.29$, $F(4,144)=25.80$, $p<.001$ (see Figures 19,20), indicating that over a five-minute block of time significant changes occurred in subjects' response rates. For the control group a significant main effect was also uncovered for all thought measures for minutes, indicating, once again, that significant changes occurred in subjects' responses over time: checks only, $F(4,48)=3.97$, $p<.01$ (See Figure 15); mentions only, $F(4,48)=6.54$, $p<.001$ (see Figure 18); checks and mentions combined, $F(4,48)=6.94$, $p<.001$ (see Figure 21).

A trend analysis resulted in the finding that, for the initial suppression group (S_1-E_2) checks only decreased significantly over time in the suppression (S) period (first five minutes): $F(1,20)=11.63$, $p<.01$, and in the expression (E) period (second five minutes): $F(1,20)=6.53$, $p<.05$ (see Figure 13). Mentions decreased significantly in both time periods: Block 1: $F(1,20)=6.35$, $p<.05$; Block 2: $F(1,20)=12.67$, $p<.001$ (see Figure 16). as did checks and mentions combined: Block 1: $F(1,20)=12.46$, $p<.01$; Block 2: $F(1,20)=22.84$, $p<.001$ (see Figure 19)

For the initial expression group (E_1-S_2), there was a significant decrease in all thought measures in both five minute periods except for mentions alone (as noted earlier) in the suppression (S) period: checks alone, Block 1: $F(1,16)=16.00$, $p<.01$; Block 2: $F(1,16)=4.97$, $p<.05$ (see Figure 14); mentions alone, Block 1: $F(1,16)=16.16$, $p<.001$ (see Figure 17); checks and mentions combined, Block 1: $F(1,16)=22.56$, $p<.001$; Block 2: $F(1,16)=5.86$, $p<.05$ (see Figure 20). In the control group (E_1-E_2) mentions alone decreased significantly, Block 1: $F(1,12)=8.64$, $p<.05$; Block 2: $F(1,12)=5.66$, $p<.05$ (see Figure 18). Checks and mentions combined also had a significant downward trend: Block 1: $F(1,12)=9.18$, $p<.05$ (see Figure 21), Block 2: $F(1,12)=6.05$, $p<.05$.

Thus, on the whole, as with the “white bear” stimulus, within most of the time periods subjects thought less and less about WOG whether they were instructed to think about the story or not to think about it.

Suppression analysis. Finally, subjects given the WOG stimulus were just as capable of suppression as were the subjects in Experiment 1. A main effect for instruction (all checks and mentions combined) in the experimental groups indicated that the expression (E) periods (mean =6.35) elicited significantly more total responses than the suppression (S) periods (mean=1.98), $MSE=1.17$, $F(1,36)=41.86$, $p<.001$

Turning to simple comparisons, for checks alone, the overall mean for both conditions for the expression time blocks of 5.57 was significantly greater than that for the suppression time blocks which had a mean of 2.88, $F(1,36)=12.63$, $p<.001$. The same was true for mentions alone where the overall mean in the expression periods of 7.12 was significantly greater than the suppression time block mean of 1.07, $F(1,36)=51.45$, $p<.001$, as it was for checks and mentions combined where the overall mean was also significantly different in the same direction, with the expression groups having a mean of 12.69 and the suppression groups a mean of 3.95, $F(1,36)=41.86$, $p<.001$.

Simple comparisons in the ANOVA between suppression (S) and expression (E) time blocks for each of the thought measures individually in each of the groups all yielded significant results except for checks alone in the initial suppression group (S₁-E₂). The mean of 3.00 for checks alone in the suppression (S) period for the initial suppression/group (S₁-E₂) was not significantly different from the mean of 5.67 for checks in the expression (E) period.. For the initial suppression group (S₁-E₂), there

were significantly more responses for mentions alone during the expression (E) period than the suppression (S) period (8.76 vs. 1.19), $MSE=1.37$, $F(1,37)=22.94$, $p<.001$. The same held for checks and mentions combined, (14.43 vs. 4.19), $MSE=1.77$, $F(1,37)=14.35$, $p<.001$. For the initial expression group (E1-S2), there were significantly more responses for checks alone during the expression (E) period than the suppression (S) period (5.47 vs. 2.76), $MSE=.78$, $F(1,37)=9.40$, $p<.01$; as well as for mentions alone (5.47 vs. .94), $MSE=1.74$, $F(1,37)=10.13$, $p<.01$; and also for checks and mentions combined (10.94 vs. 3.70), $MSE=1.82$, $F(1,37)=12.96$, $p<.001$. A significant main effect was also found for instruction, (37% vs. 5%), $MSE=.05$, $F(1,36)=40.61$, $p<.001$ (see Figure 22), indicating that there was a significantly higher percentage of mentions in the expression (E) than in the suppression (S) period.

The results thus support the conclusion that a significant degree of suppression can be accomplished by most subjects. Furthermore, for checks alone, 26% of the participants were able to suppress thoughts of WOG completely in the suppression (S) period. For mentions only that figure rose to 45%. Certainly these results run counter to the concept of an initial enhancement effect.

Conclusions. The same conclusions, therefore, can be drawn for the WOG experiment as for the white bear experiment. Neither a rebound nor an initial enhancement effect was supported by the findings; subjects, on the whole, were capable of significant suppression: thoughts about the proffered stimulus diminished significantly over time in almost all of the time periods measured

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Experiment 3

Virtually the same procedures, instructions, and statistics were used for the dictionary selection as for the "white bear" stimulus in Experiment 1 and the War of the Ghosts stimulus in Experiment 2. Appendix I details the "Read and Listen Instructions" for this stimulus, which instructions were proffered prior to the order manipulation components of the experiment (see Appendixes J-L for the exact wording of the "think about" and "don't think about" modules.)

Results and Discussion

Analyses were completed for (a) checks only designating thoughts about the dictionary selection (see Figures 23-25), (b) mentions only about the dictionary selection (see Figures 26-28), (c) checks and mentions combined for dictionary (see Figures 29-31), and (d) percent of mentions about the dictionary selection (see Figure 32). (Figures 23-32 follow immediately in a block but will be referred to individually and in groups throughout this section.)

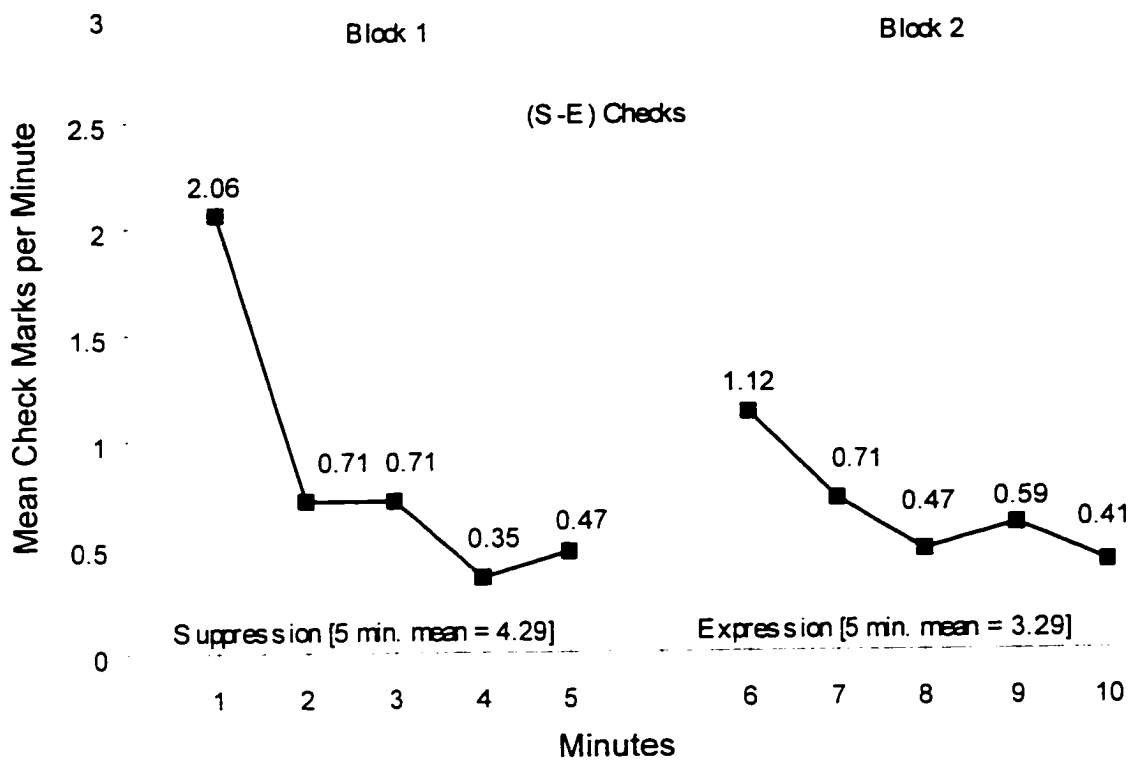


Figure 23. Checks per minute over two 5-minute periods for the suppression-expression condition (S_1-E_2) for the dictionary stimulus.

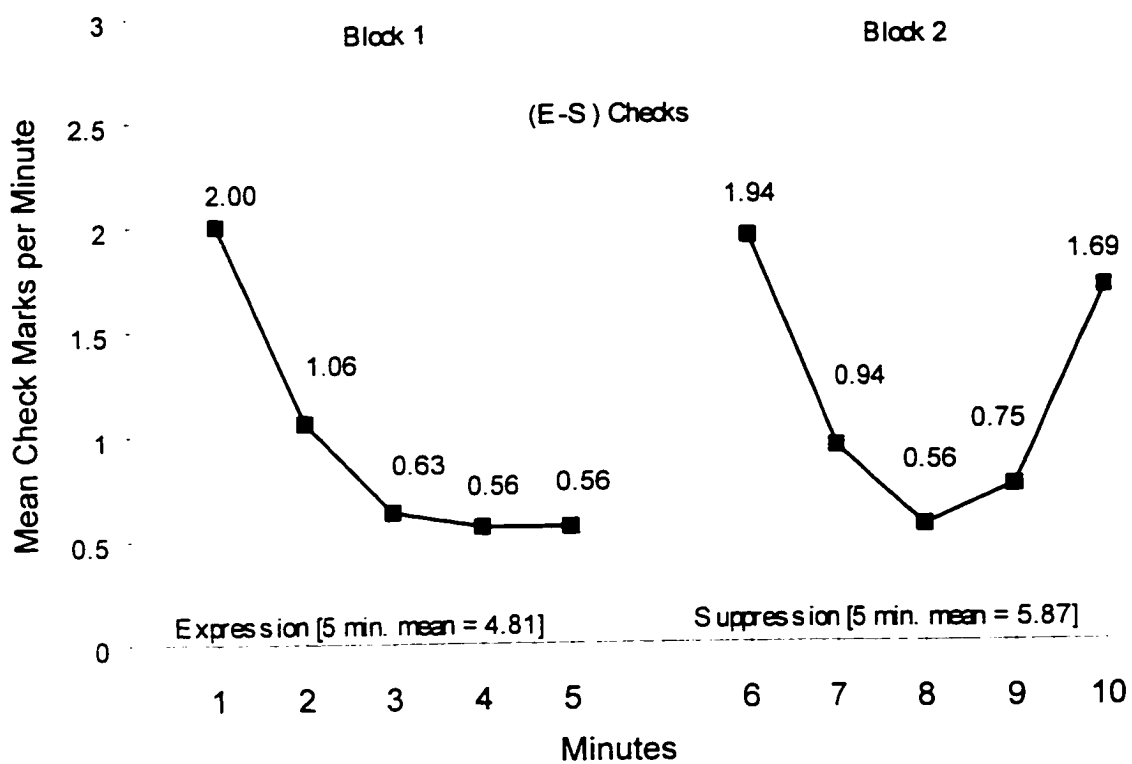


Figure 24 Checks per minute over two 5-minute periods for the expression-suppression condition (E_1 - S_2) for the dictionary stimulus.

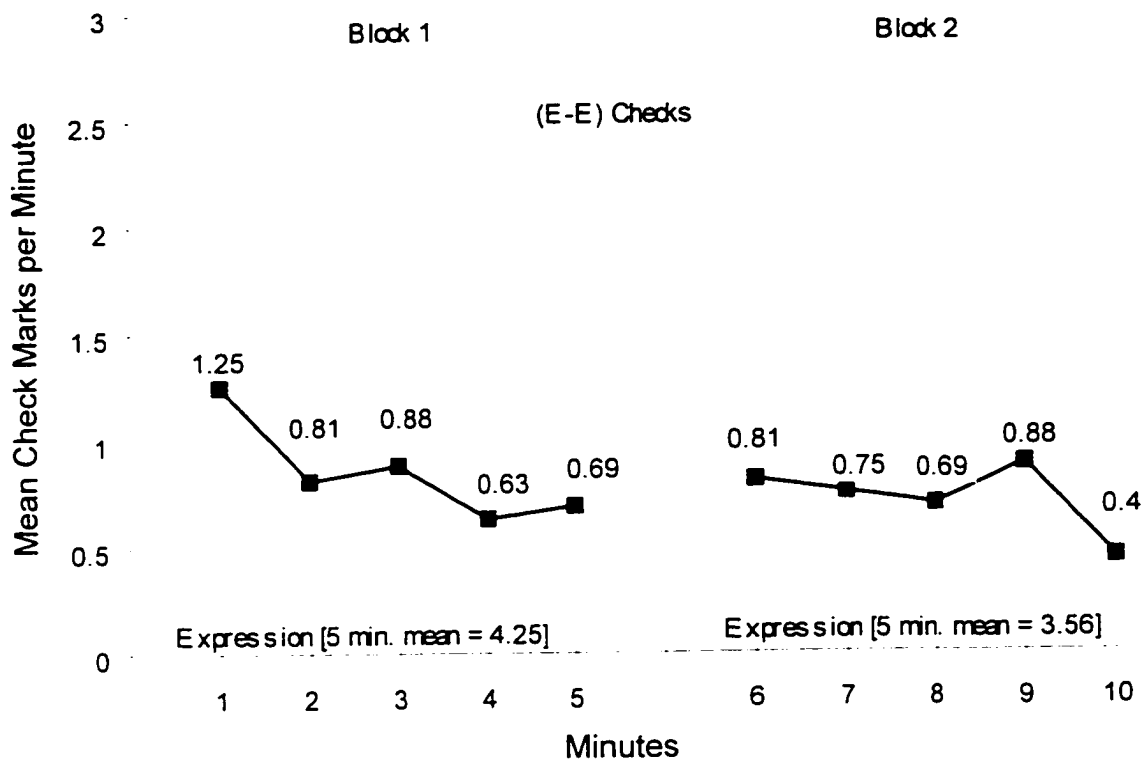


Figure 25. Checks per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for the dictionary stimulus.

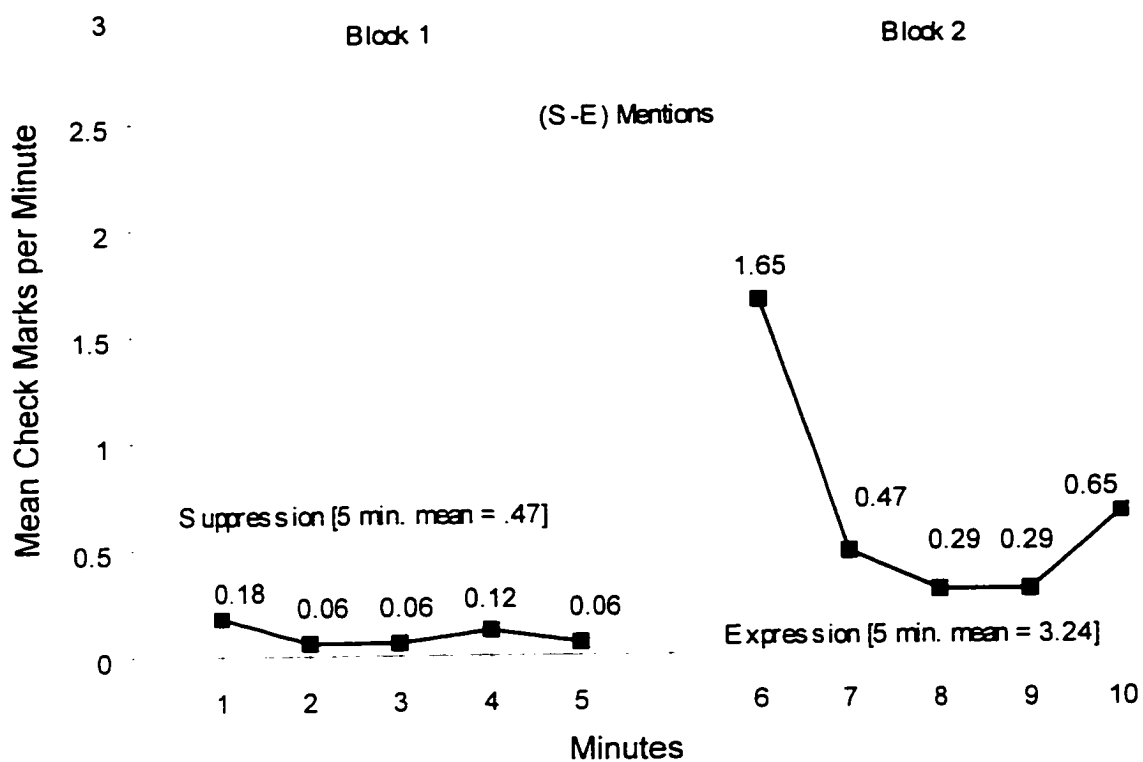


Figure 26. Mentions per minute over two 5-minute periods for the suppression-expression condition (S_1 - E_2) for the dictionary stimulus.

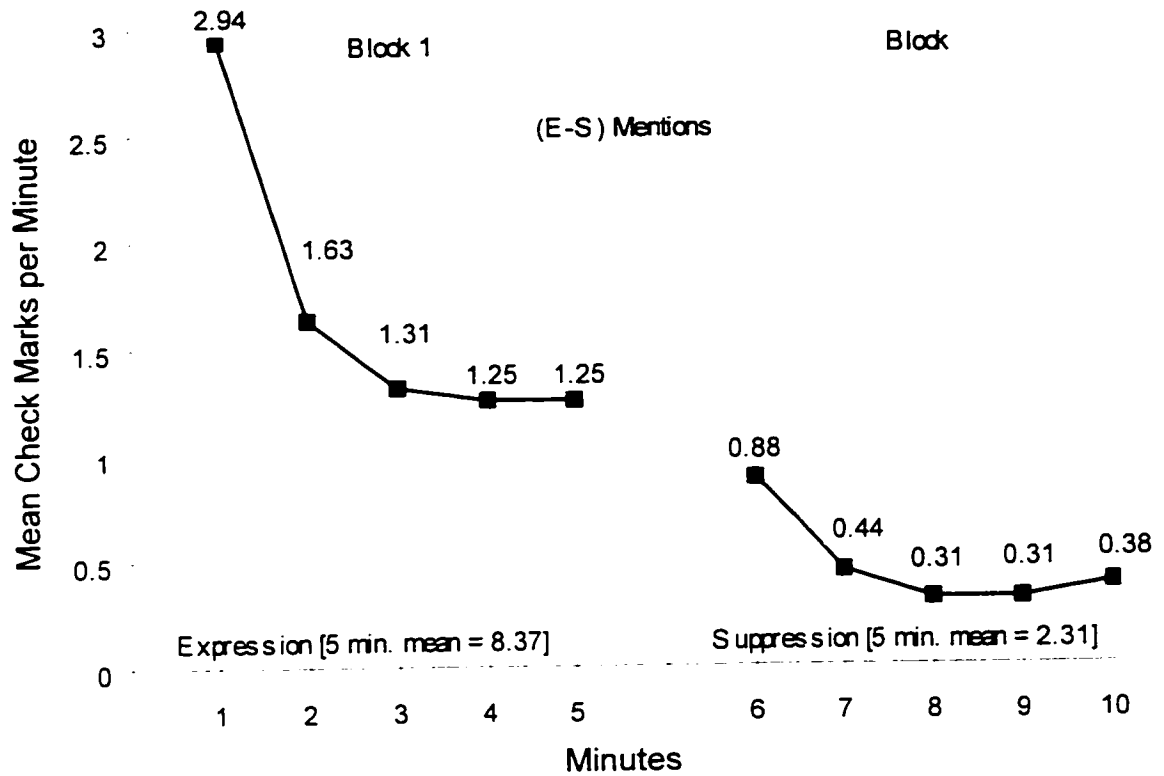


Figure 27. Mentions per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for the dictionary stimulus.

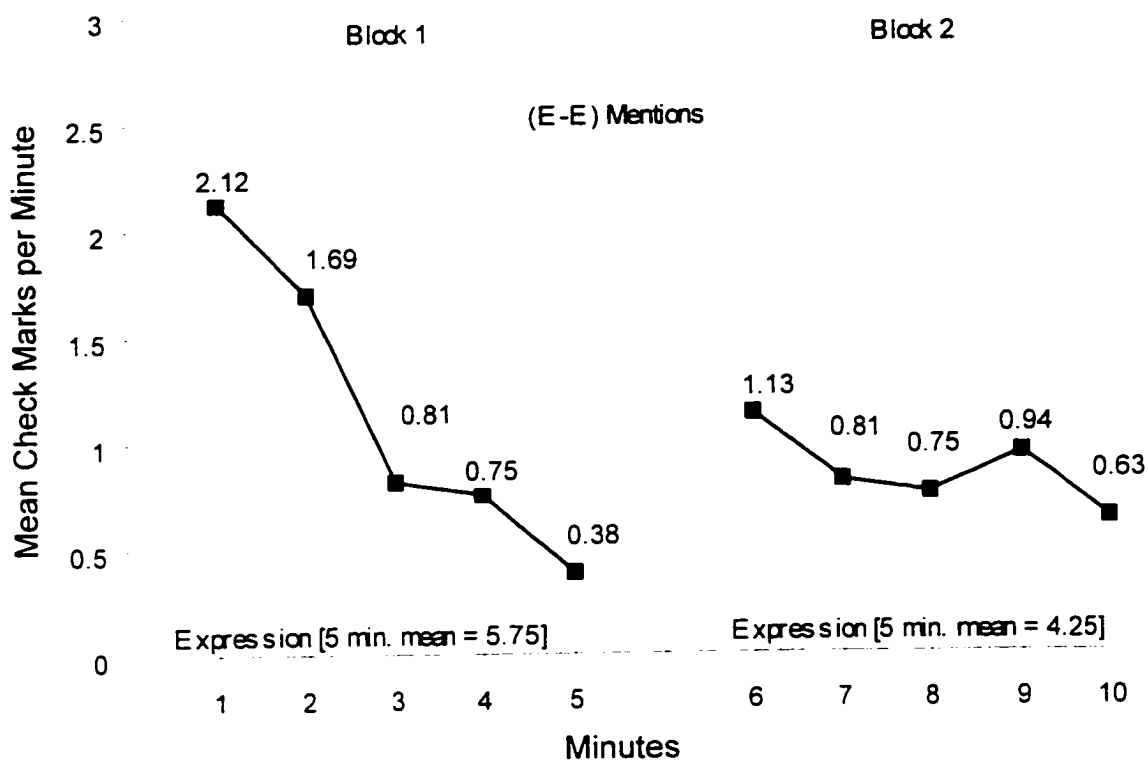


Figure 28. Mentions per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for the dictionary stimulus.

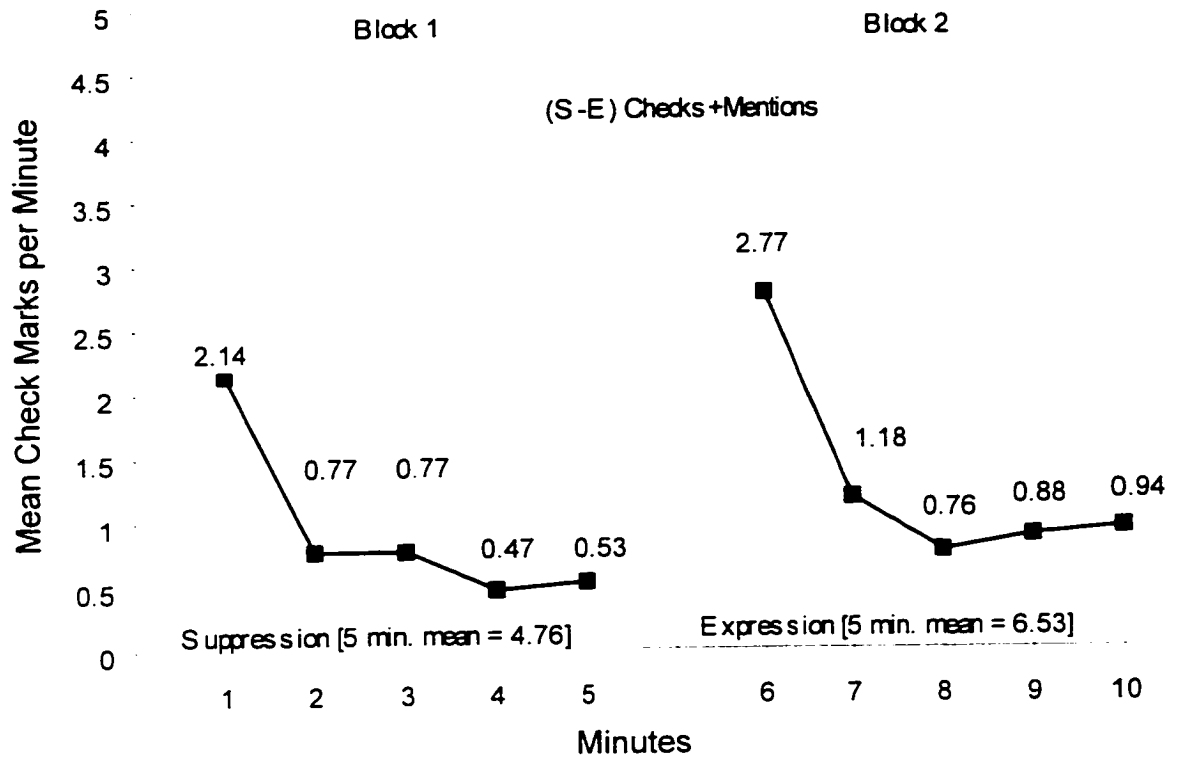


Figure 29. Checks and mentions combined per minute over two 5-minute periods for the suppression-expression condition (S₁-E₂) for the dictionary stimulus.

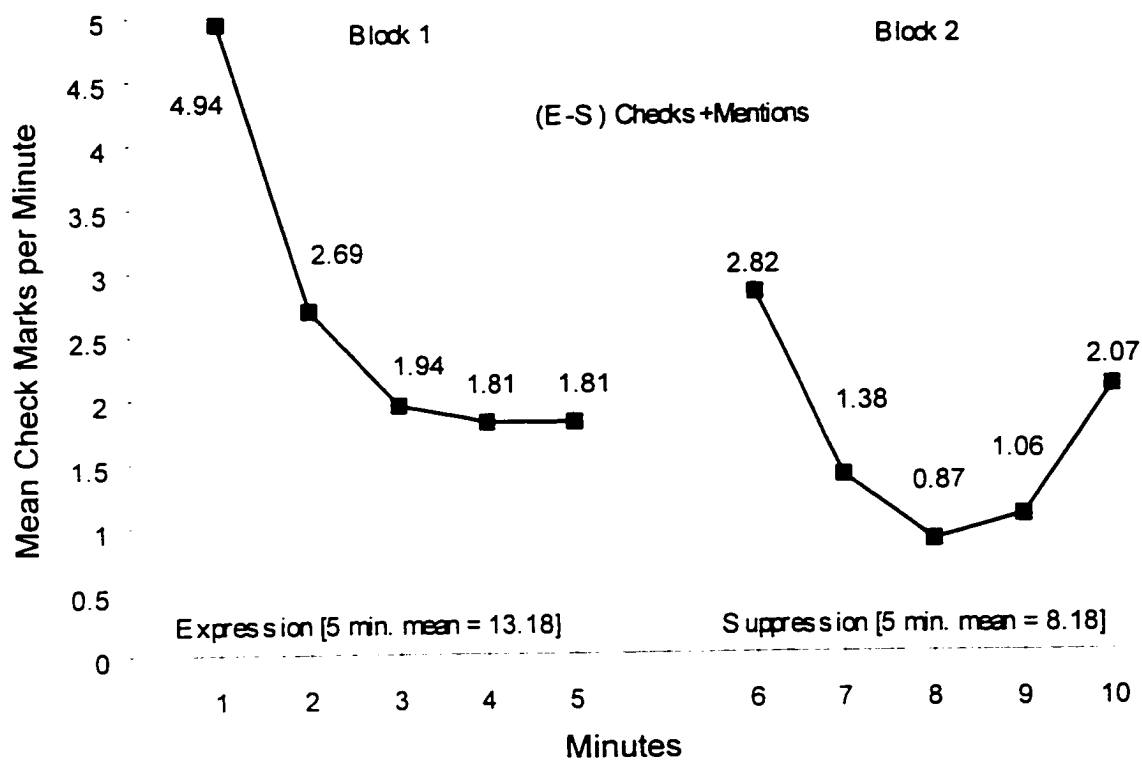


Figure 30. Checks and mentions combined per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for the dictionary stimulus.

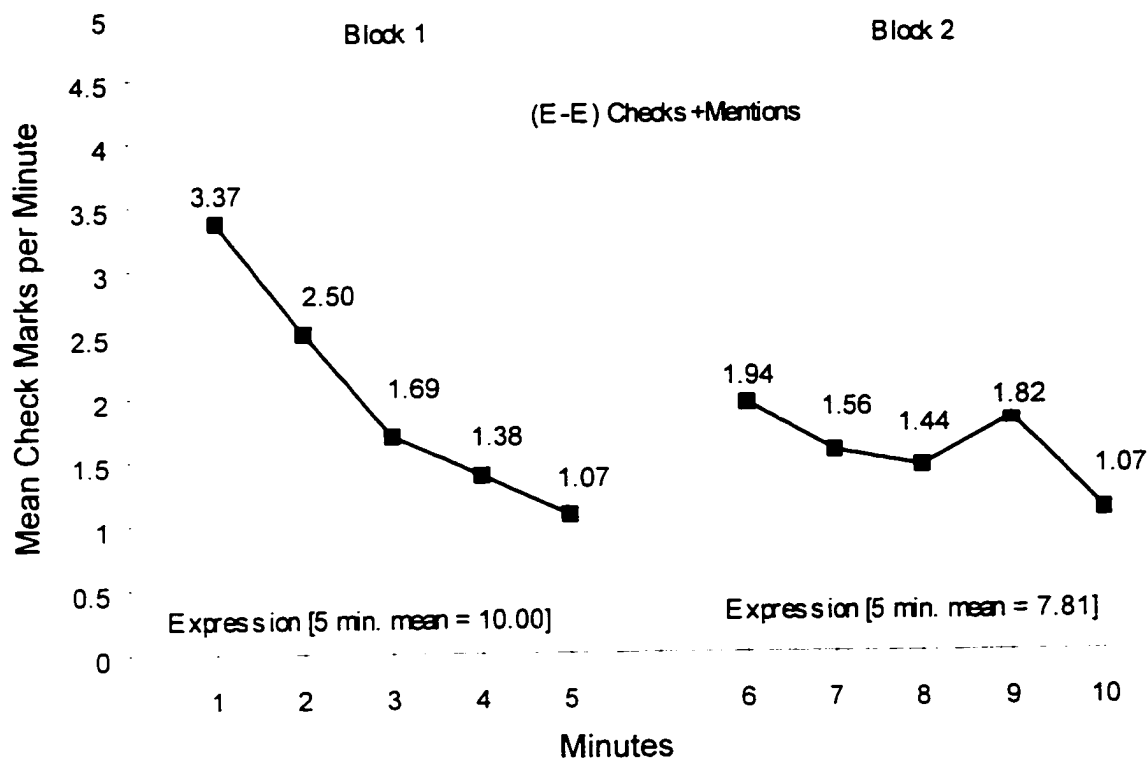


Figure 31. Checks and mentions combined per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for the dictionary stimulus.

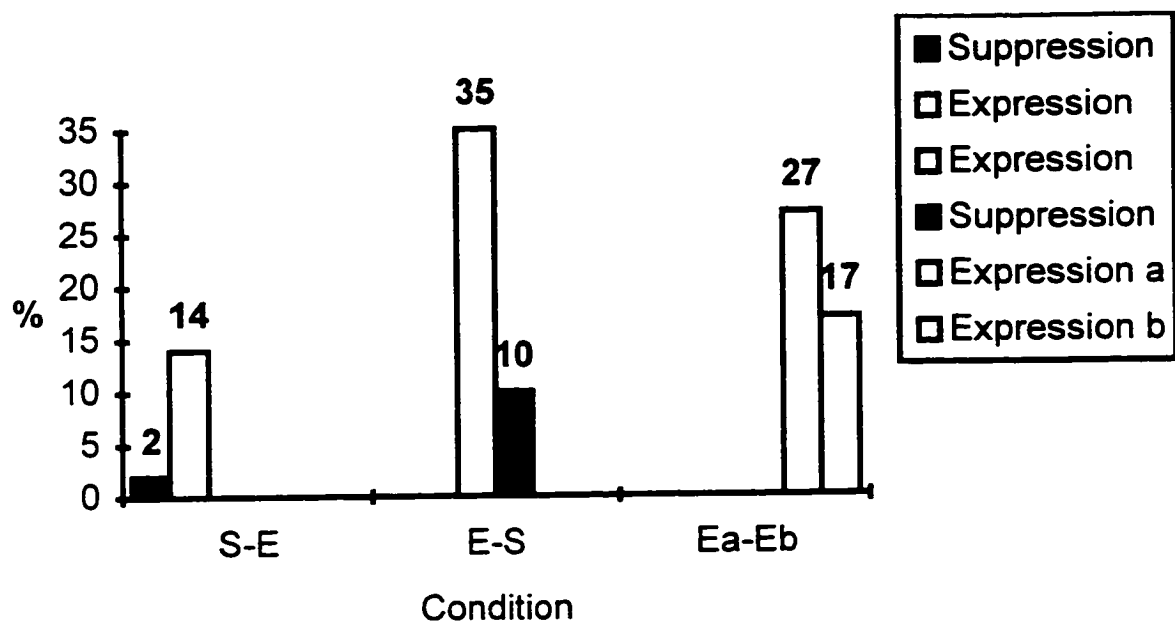


Figure 32 Percent of mentions for the dictionary stimulus.

Judges blind to experimental condition counted the number of times subjects mentioned the dictionary selection or something related to it. The correlation between a pair of evaluators within each time block averaged .96 with a range of .93 to 1.00. Table 3 shows the means for each measure by condition.

Table 3

Measure of Thought by Group and Time-block for Experiment 3 (Stimulus: Dictionary)

Group	Time-block		
	Sup.	Exp.	Exp. B
Initial suppression ¹			
(S ₁ -E ₂)			
checks only	S ₁ = 4.29	E ₂ = 3.29	
mentions only	S ₁ = .47	E ₂ = 3.24	
checks and men- tions combined	S ₁ = 4.76	E ₂ = 6.53	
Initial expression ²			
(E ₁ -S ₂)			
checks only	S ₂ = 5.87	E ₁ = 4.81	
mentions only	S ₂ = 2.31	E ₁ = 8.37	
checks and men- tions combined	S ₂ = 8.18	E ₁ = 13.18	
Expression expression ³			
(E ₁ - E ₂)			
checks only		E ₁ = 4.25	E ₂ = 3.56
mentions only		E ₁ = 5.75	E ₂ = 4.25
checks and men- tions combined		E ₁ = 10.00	E ₂ = 7.81

1. N = 17

2. N = 16

3. N = 16

This third experiment, it will be recalled, was conducted to determine how a dry, informative treatise on the criteria and procedures for the inclusion of words into the International Science Vocabulary (ISV) would fare as a stimulus within the same experimental paradigm as the stimuli in the first two experiments. As queried for the stimulus "white bear" and the story of the War of the Ghosts, would Ebbinghausian forgetting over time or the Wegnerian rebound effect obtain?

Rebound analysis. Again it must be asked whether there were differences in numbers of thought tokens within expression (E) periods depending upon which order came first, to express or suppress. Three significant results were found. Mentions alone were found significantly more often in the expression period of the initial expression condition (E_1-S_2 : mean = 8.37) than in the initial suppression condition (S_1-E_2 : mean = 3.24, $MSE=1.36$, $F(1,31) = 8.96$, $p<.01$). The same held true for checks and mentions combined, for which the mean of 13.18 in the initial expression group (E_1-S_2) was significantly greater than the mean of 6.53 in the initial suppression group (S_1-E_2). $MSE=1.19$, $F(1,31)=10.70$, $p<.0$, and for percent of mentions (35% vs. 14%), $MSE=.05$, $F(1, 31)=7.24$, $p<.05$. All three findings run counter to what you would expect if a rebound effect obtained. Comparing the expression (E) periods of the control group with the experimental groups, once again no significant differences were found for either the initial (E_1) or second (E_2) expression periods.

Concerning consistency within subjects from period to period, findings similar to those of WOG were obtained. The total number of checks alone had significant positive correlations within subjects between time-blocks for the initial expression group (E_1-S_2 : $r(16)=.73$, $p<.001$), whereas both checks alone ($r(16)=.72$, $p<.01$) and mentions alone (r

(16)=.52, $p < .05$) had significant correlations for the control group (E_1-E_2). No significant correlations were found in the initial suppression group (S_1-E_2). One may offer the same alternate hypothesis as for WOG to explain these findings.

Time-line analysis. Next we must examine the data to determine what were the minute to minute variations within subjects from time-block to time-block and ask if the pattern and (or) the direction of that variation (if any) is important in drawing conclusions about the rebound effect.

A main effect for minutes was significant for all three thought measures for both experimental groups combined: checks alone, $MSE=.30$, $F(4,124)=13.01$, $p < .001$ (see Figures 23,24); mentions alone, $MSE=.45$, $F(4,124)=3.17$, $p < .05$ (see Figures 26,27); checks and mentions combined, $MSE=.48$, $F(4,124)=10.16$, $p < .001$ (see Figures 29,30), indicating that over a five-minute block of time, significant changes occurred in subjects' response rates.

In the control group (E_1-E_2) as well, a significant main effect for minutes for all thought measures was found, showing that significant changes occurred in subjects' response rates over time: checks alone, $MSE=.23$, $F(4,60)=2.90$, $p < .05$ (see Figure 25); mentions alone, $MSE=.28$, $F(4,60)=8.18$, $p < .001$ (see Figure 28); checks and mentions combined, $MSE=.29$, $F(4,60)=9.05$, $p < .001$ (see Figure 31).

A trend analysis resulted in the finding that, for the initial suppression group (S_1-E_2), checks alone decreased significantly over time in the suppression period (S_1 : first five minutes), $MSE=.52$, $F(1,16)=8.57$, $p < .01$ (see Figure 23), whereas mentions alone decreased significantly over time in the expression period (E_2), $MSE=.57$, $F(1,16)=5.38$, $p < .05$ (see Figure 26) When checks and mentions were combined, there was a significant

decrease over time for both periods: Block 1: $MSE=.49$, $F(1,16)=10.76$, $p<.01$; Block 2: $MSE=.77$, $F(1,16)=8.53$, $p<.01$ (see Figure 29). For the initial expression group (E_1-S_2), checks alone decreased significantly over time in the expression period, $MSE=.24$, $F(1,15)=27.25$, $p<.001$ (see Figure 24), as did mentions alone, $MSE=.61$, $F(1,15)=7.78$, $p<.05$ (see Figure 27), and checks and mentions combined, $MSE=1.40$, $F(1,15)=16.00$, $p<.01$ (see Figure 30).

In the control group (E_1-E_2) there was a significant decrease for all thought measures (except for the second five minute period for mentions alone which was only marginally significant, $MSE=.27$, $F(1,15)=4.08$, $p=.06$) (see Figure 28): checks only, Block 1: $MSE=.35$, $F(1,15)=4.75$, $p<.05$; Block 2: $MSE=.14$, $F(1,15)=5.24$, $p<.05$ (see Figure 25); mentions only. Block 1: $MSE=.55$, $F(1,15)=17.50$, $p<.001$ (see Figure 28); checks and mentions combined; Block 1: $MSE=.99$, $F(1,15)=19.45$, $p<.001$; Block 2: $MSE=.47$, $F(1,15)=7.78$, $p<.05$. (see Figure 31)

Thus, on the whole, within most of the time periods, subjects thought less and less about the dictionary selection over time whether they were instructed to think about it or not. Furthermore, no period--including the expression (E_2) period following a period of suppression (S_1) in the initial suppression group (S_1-E_2)-- evidenced a significant linear increase in thought tokens. Hence no rebound effect could be derived from the trend analysis.

Suppression analysis. Finally, it can be queried as to how well subjects exposed to the dictionary stimulus were able to suppress. Here, too, the results were positive for subjects' abilities to follow such a directive. A main effect was found for condition, which indicated that the initial expression group (E_1-S_2) (mean=5.34) had significantly

more total responses than the initial suppression group (S_1-E_2) (mean=2.82), $MSE=1.53$, $F(1,31)=9.23$, $p<.01$. There was a significant main effect for instruction (checks and mentions combined) as well, which indicated that the expression (E) period (mean=4.93) elicited significantly more total responses than the suppression (S) period (mean=3.25), $MSE=1.08$, $F(1,31)=12.28$, $p<.001$.

Turning to simple comparisons, for mentions alone, the overall mean in the expression periods of 5.81 was significantly greater than the suppression time block mean of 1.39, $F(1,31)=30.53$, $p<.001$. For checks and mentions combined, the overall means were also significantly different in the same direction, with the expression groups having a mean of 9.86 and the suppression groups a mean of 6.47, $F(1,31)=12.28$, $p<.001$. For checks alone, however there were no significant differences, $F>1$.

Looking at the simple comparisons in the ANOVA between suppression and expression time blocks for each of the thought measures individually in each of the groups, about half the comparisons are significant. There were significantly more mentions alone in the expression period (E_2) of the initial suppression group (S_1-E_2 : mean=3.24) than in the suppression period (S_1 : mean=.47, $F(1,32)=7.50$, $p<.01$). The same was true for mentions alone in the expression period (E_1) of the initial expression group (E_1-S_2 : mean =8.37), which was also significantly greater than the number of mentions alone in the suppression period (S_2 : mean=2.31, $F(1,32)=10.40$, $p<.01$). Combined checks and mentions in the expression period of the initial expression group (E_1-S_2 : mean=13.18) were also significantly greater than combined checks and mentions in the suppression period (mean=8.18, $F(1,32)=10.40$, $p<.01$).

Percent of mentions showed that there was a significant main effect for instruction too, $MSE=.03$, $F(1,31)=18.17$, $p<.001$ (see Figure 32), indicating that there were significantly more responses in the expression (E) period than in the suppression (S) period (25% vs. 6%)

Once more the results confirm that most subjects were able to suppress thoughts fairly well and some could even suppress them completely: for checks alone and also for checks and mentions combined, 12% of the participants suppressed completely, and for mentions alone that figure rose to 67%. Obviously, no evidence of an initial enhancement effect could be found.

Conclusions. Similar conclusions can be drawn for Experiment 3 as for Experiments 1 and 2. No rebound or initial enhancement effect was measured; subjects think less and less about a stimulus over time whether asked to suppress or express it; most subjects are able to suppress thoughts when directed to do so (See Figures 33 through 41 for composite data on the three experiments.)

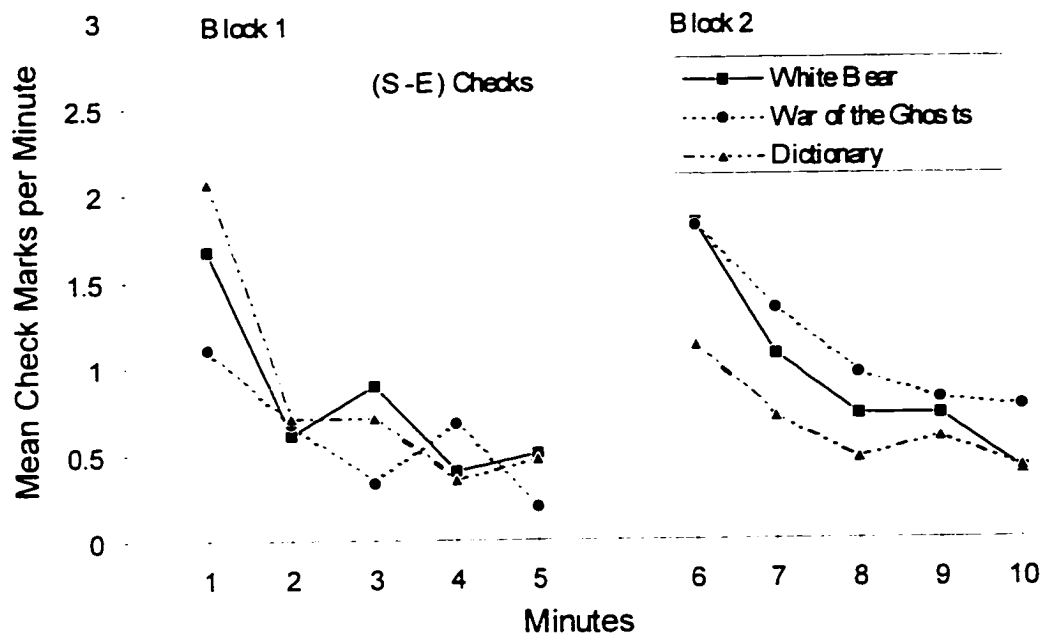


Figure 33. Checks per minute over two 5-minute periods for the suppression-expression condition (S₁-E₂) for three experiments.

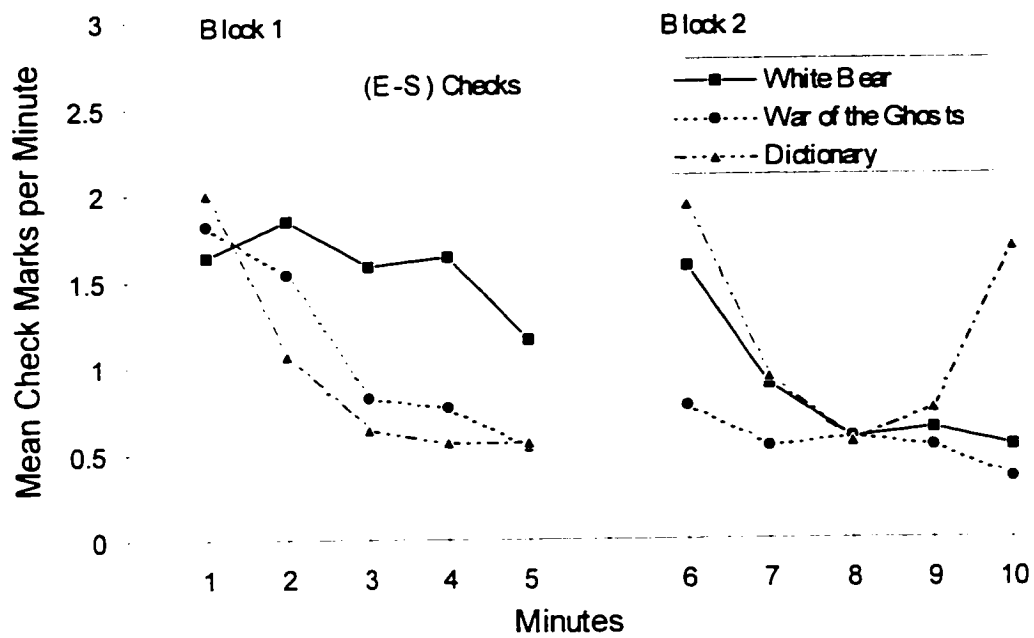


Figure 34. Checks per minute over two 5-minute periods for the expression-suppression condition (E_1 - S_2) for three experiments.

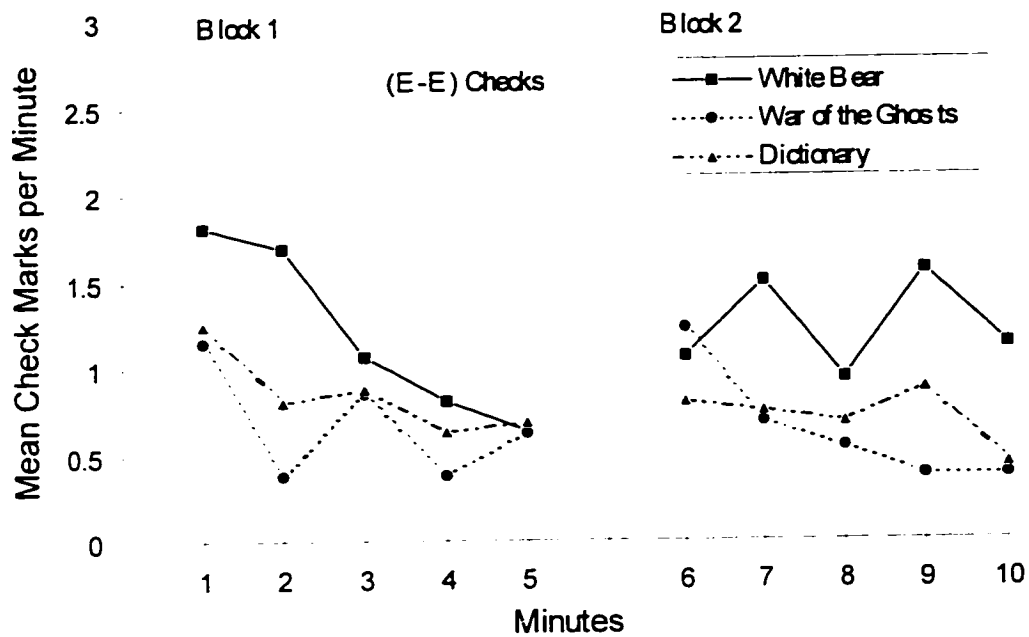


Figure 35. Checks per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for three experiments.

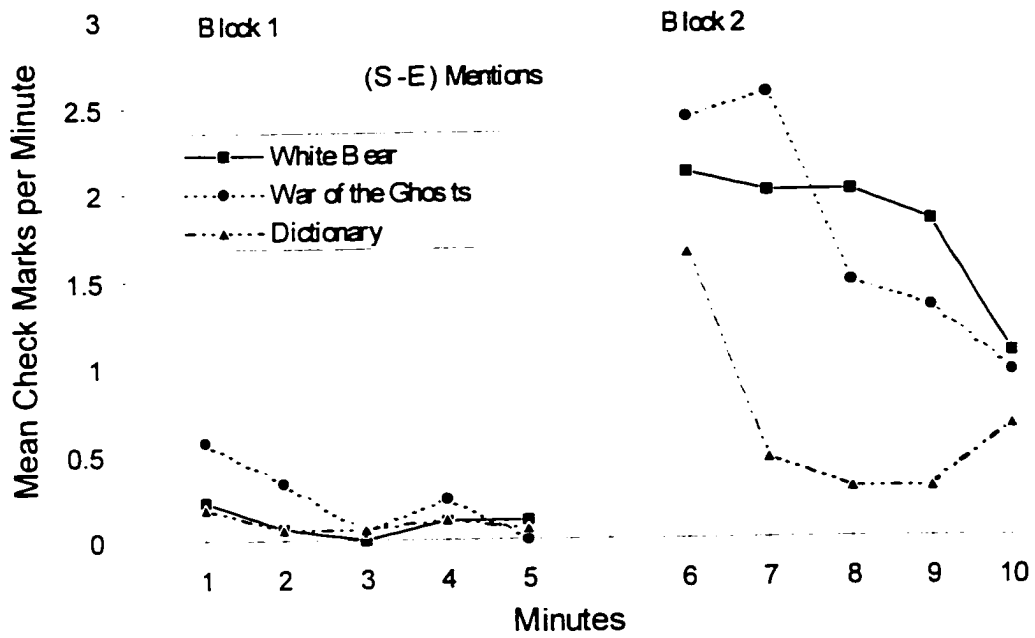


Figure 36. Mentions per minute over two 5-minute periods for the suppression-expression condition (S_1-E_2) for three experiments.

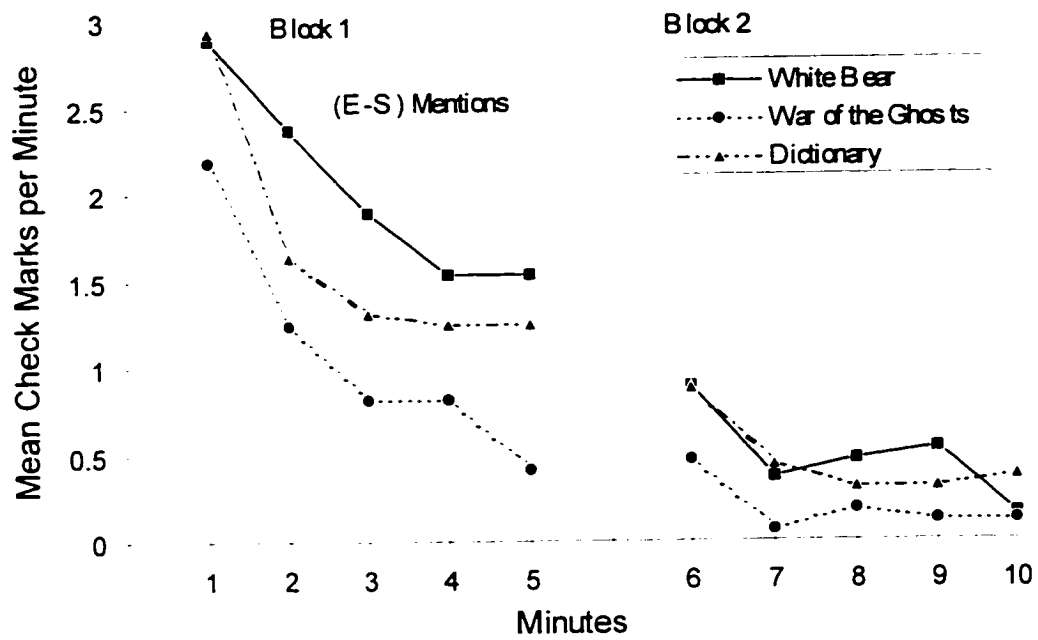


Figure 37. Mentions per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for three experiments.

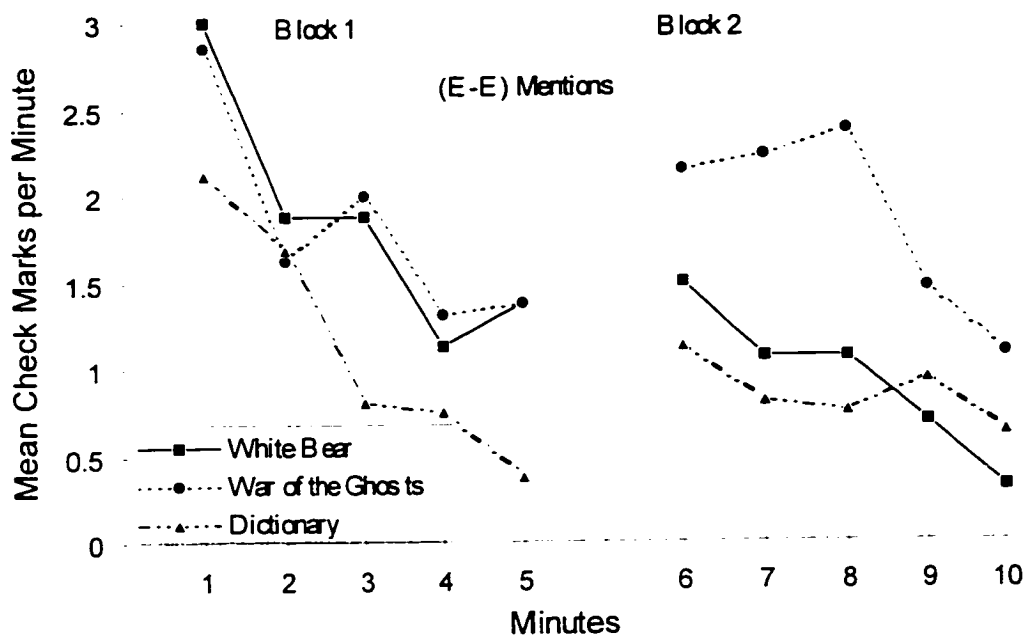


Figure 38. Mentions per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for three experiments.

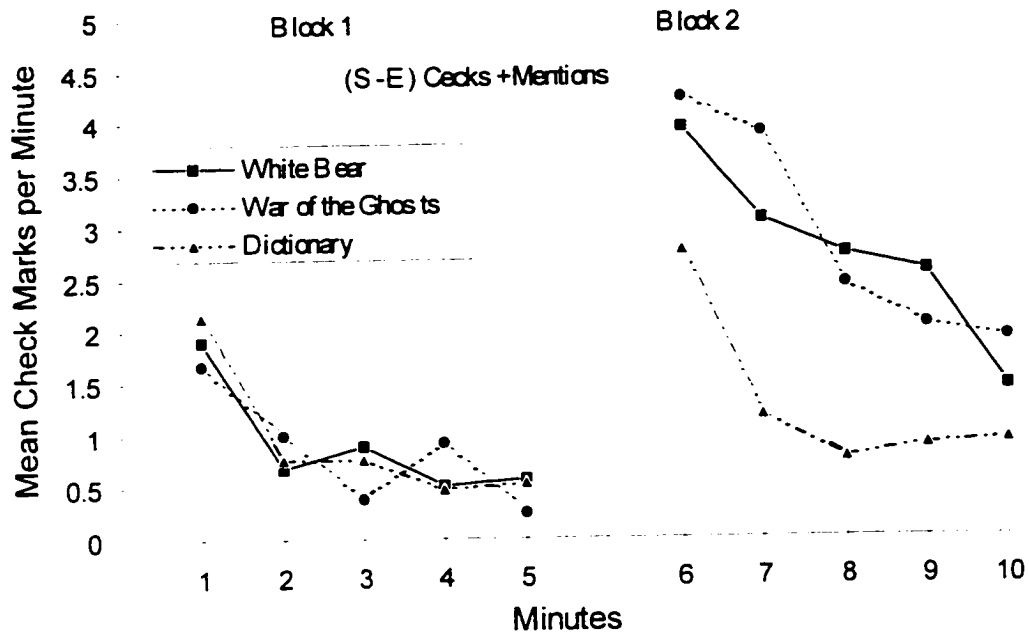


Figure 39. Checks and mentions combined per minute over two 5-minute periods for the suppression-expression condition (S_1-E_2) for three experiments.

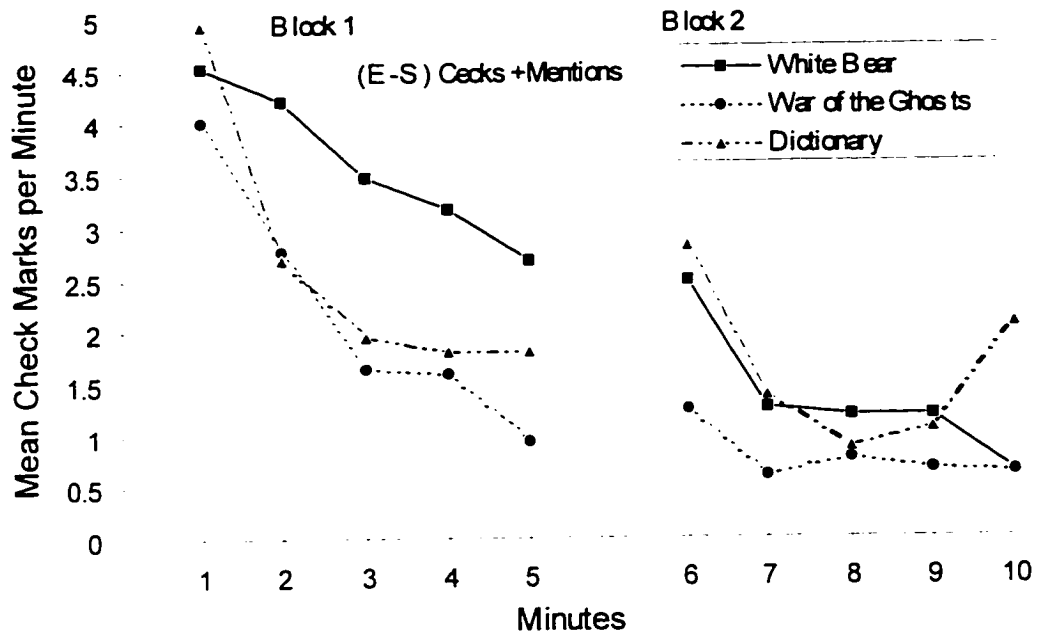


Figure 40. Checks and mentions combined per minute over two 5-minute periods for the expression-suppression condition (E_1-S_2) for three experiments.

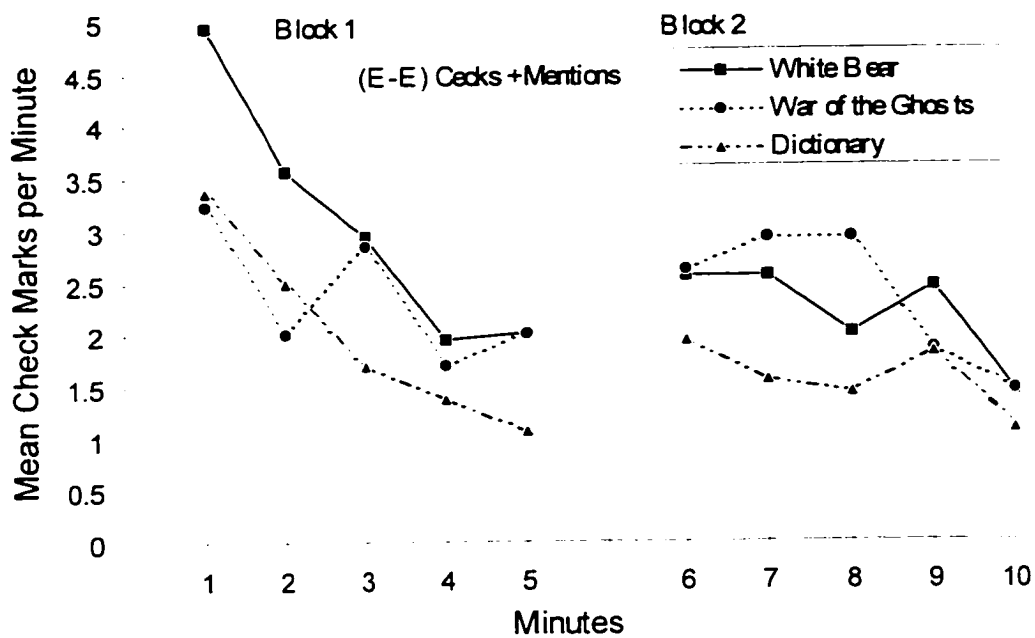


Figure 41. Checks and mentions combined per minute over two 5-minute periods for the expression-expression condition (E_1 - E_2) for three experiments.

General Discussion

The overall question asked earlier will now be addressed. What explanations can be offered for the non-replication in these three experiments of the key finding by Wegner et al. (1987, Experiment 1) which supported the rebound effect? Several hypotheses may be set forth.

First, it is possible that the urban, multi-cultural population from which samples were drawn for these experiments was sufficiently different to account for the results. Yet some subject groups (Wegner et al., 1987, Experiment 2; 1991) drawn from the very same university population as the original study (Wegner et al., 1987, Experiment 1) did not demonstrate the previously observed rebound effect during the five minutes of expression immediately following suppression.

Second, perhaps many of the subjects in these experiments were more preoccupied with personal problems than were the subjects in Wegner et al.'s (1987) original study, which problems served as focused distractors as well as or better than the proffered distractor "red Volkswagon" in the second experiment reported in the Wegner et al. (1987) article wherein the rebound effect was erased. But, as suggested earlier, Wegner et al.'s (1987) latter finding may be interpreted as evidence for the lack of generalizability of the rebound effect (if it exists) rather than as support for the negative cueing construct adopted by Wegner et al. (1987) to explain the rebound effect.

Third, perhaps it takes longer than five minutes for subjects to experience the rebound effect. Such was the case for Wegner et al.'s (1991) subjects in their study of the bonding of thought and mood. But again, recall that the study had a second manipulated variable, the showing of slides. Hence the significant results in that study are not

comparable to the results of the present study, nor are they comparable to the results obtained in Wegner et al.'s (1987) original study. The stimuli in the aforementioned study attempted to be much more personal and meaningful than is the singular image of a white bear, a strange story about the War of the Ghosts, or a dry, informational account on the International Science Vocabulary (ISV). Furthermore, the time intervals measured in the previously addressed study, as explained earlier, were separated by an even larger time-block filled with distracting activities

Finally, one must consider the possibility that the results of the original Wegner et al. (1987, Experiment 1) study are simply not reliable--that is, for normal subjects there is no rebound effect. For these subjects, Ebbinghaus' observations appear to be on the mark, at least as far as the participants in these three experiments are concerned. Thus the significant results obtained by Wegner and colleagues for normal subjects could turn out to be exceptions rather than the rule. These exceptions may well relate to individual differences. Certain subpopulations, such as the depressed or chronically anxious, could be vulnerable to the rebound effect and (or) the initial enhancement effect. Research on thought suppression within these clinically disturbed groups has been sparse but could well be the focus of future studies that might replicate the rebound effect more reliably.

Appendix A

The War of the Ghosts

One night two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war-cries, and they thought: "Maybe this is a war-party." They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said:

"What do you think? We wish to take you along. We are going up the river to make war on the people."

One of the young men said: "I have no arrows."

"Arrows are in the canoe," they said.

"I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."

So one of the young men went, but the other returned home.

And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say: "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac, and the young man went ashore to his house, and made a fire. And he told everybody and said: "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.

Appendix B

Dictionary Entries for Words in the International Science Vocabulary

Much of the technical vocabulary of the sciences and other specialized studies consists of words or word parts that are currently being used in two or more languages, with only slight modifications as are necessary to adapt to the structure of the individual language in each case. Many words and word parts of this kind have become sufficiently a part of the general vocabulary of English to require entry even in an abridged dictionary of our language.

On account of the vast extent of the relevant published material in many languages and in many scientific and other specialized fields, it is not practical to find out the language of origin of every such term. Yet it would be inaccurate to make a statement about the origin of any such term in a way that could be interpreted as implying that it was coined in English.

Accordingly, whenever a term that is entered in a dictionary belongs recognizably to this class of internationally current terms, and whenever no positive evidence is at hand to show that it was coined in English, the etymology section of the entry (which shows the history of the linguistic form of the word) recognizes its international status and the possibility that it originated elsewhere than in English by use of the label ISV (for International Scientific Vocabulary).

Examples: en.do.scope...n [ISV]
 hap.loid...adj {ISV, fr. Gk haploeides single...}
 1: having the gametic number of chromosomes
 or half the number characteristic of somatic cells
 -ene...n suffix [ISV, fr. Gk -enos, adj. suffix]: unsaturated
 carbon compound

As you can see from the above entries, sometimes the label ISV is given along with the known history of the linguistic form of the term. It should also be clear from the above entries that different parts of speech, such as the noun, the adjective, and the noun-suffix in the above examples, may be part of the International Scientific Vocabulary (ISV).

Appendix C

Briefing and General Instructions

This study is concerned with what and how people think. During several 5-minute periods, under different conditions, you will simply be asked to describe your stream of consciousness, to indicate what is going through your mind.

For the first part of the experiment, when asked to report on your thought, please write down whatever information you can on your stream of consciousness from moment to moment. Your report might include (but is not limited to) descriptions of images, ideas, memories, feelings, fantasies, plans, sensations, observations, daydreams, thoughts about thinking or difficulties in thinking, objects which catch your attention, efforts to solve a problem. I think you can see, anything goes. There are no restrictions, no qualifications, no conventions and no expectations: simply report on whatever is going through your mind (whatever you are conscious of or aware of). As you write, please remember that, in this study, spelling and grammar are not important. Also, it's not important to write in complete sentences. Fragments of thoughts are just as acceptable as are more complete thoughts.

Within each 5-minute period, after each minute, you'll be asked to draw a horizontal line across the paper and then continue to write whatever comes to mind. That's to let me know how far you've gotten at the end of each minute. Please don't let that distract you. Just draw the line and continue writing.

The following ground rules apply to every aspect of the study.

Measures have been taken to insure your privacy and to guarantee confidentiality concerning your participation in this study. To be specific:

(a) You were assigned a number which will be the only identifying mark on the data-gathering items in this study.

(b) There is no "key" or master-list linking your name to your number or to any of the data-gathering materials.

I give you my word that this is so. We've set up the experiment in this way in the interest of science, hoping that, since you're guaranteed confidentiality and anonymity you'll feel comfortable being as candid as possible in what you write.

Now let's prepare for the first 5 minute period, in which there are no special conditions and you can write whatever comes to mind--whatever you are conscious of or aware of.

Ready? Begin.

Appendix D

INSTRUCTIONS FOR INITIAL SUPPRESSION GROUP (S₁-E₂): THINKWHITE BEAR (E₂)

In the next five minutes, please continue to write your thoughts as you did before, with one exception. This time try to THINK ABOUT a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. If and when you actually DO think about a white bear, if only for an instant--when you're writing about something else--put a big check mark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--this time TRY to THINK ABOUT a white bear and let us know about it if you do--even if you are writing about something else--by making those big checkmarks. Ready? Begin.

Appendix E

INSTRUCTIONS FOR INITIAL EXPRESSION GROUP (E₁-S₂): THINK (E₁)WHITE BEAR

In the next five minutes, please continue to write your thoughts as you did before, with one exception. Try to THINK ABOUT a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. If and when you actually DO think about a white bear, if only for an instant--when if you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--TRY to THINK ABOUT a white bear and let us know about it if you do--even if you are writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix F

INSTRUCTIONS FOR INITIAL EXPRESSION GROUP (E₁-S₂): NOT THINK (S₂)WHITE BEAR

In the next five minutes, please continue to write your thoughts as you did before, with one exception. This time try NOT to think about a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. If, however, you **DO** think about a white bear, even for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--this time TRY NOT to think about a white bear but let us know about it if you do--even if you are writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix G

INSTRUCTIONS FOR EXPRESSION-EXPRESSION (E₁-E₂): THINK (E₁)WHITE BEAR

In the next five minutes, please continue to write your thoughts as you did before, with one exception. Try to THINK ABOUT a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. If and when you actually DO think about a white bear, if only for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--TRY to THINK ABOUT a white bear and let us know about it if you do--even if you're writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix H

INSTRUCTIONS FOR EXPRESSION-EXPRESSION (E₁-E₂):CONTINUE TO THINK (E₂)WHITE BEAR

In the next five minutes, please continue to do exactly what you were doing before. That is, continue to try to THINK ABOUT a white bear. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about a white bear. And, as you just did previously, if and when you actually DO think about a white bear, if only for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--continue to TRY to THINK ABOUT a white bear and let us know about it if you do--even if you're writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix I

READ AND LISTEN INSTRUCTIONSThe War of the Ghosts and Dictionary

I'm going to hand you a piece of paper. Please don't turn it over until I tell you to.

When I tell you to, please turn it over and start to read what is written on it as you listen to a tape recording of the same passage you are reading. Do not write anything on that paper. It will be collected at the end of the reading. Listen carefully and read carefully.

[HAND OUT PASSAGE--EITHER STORY OR INFORMATION PASSAGE]

Turn over the paper now and begin to read as you listen.

[TURN ON THE TAPE RECORDING OF THE PASSAGE. TURN IT OFF
WHEN IT IS COMPLETED AND COLLECT THE PAPERS.]

Appendix J

INSTRUCTIONS FOR SUPPRESSION PERIODS: DON'T THINK [S₁ and S₂]PASSAGE

In the next five minutes, please continue to write your thoughts as you did before, with one exception. [Add: "This time..." for the second experimental period] Try NOT to think about the passage you just read and heard. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about that passage. If, however, you DO think about all or any part of that passage, even for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--TRY NOT to think about the passage but let us know about it if you do--even if you're writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix K

INSTRUCTIONS FOR INITIAL EXPRESSION PERIODS: THINK (E₁ and E₂)PASSAGE

In the next five minutes, please continue to write your thoughts as you did before, with one exception. [Add: "This time..." for second experimental period] Try to THINK ABOUT the passage you read and heard. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about that passage. If and when you actually DO think about all or any part of that passage, even for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--TRY to THINK ABOUT the passage and let us know about it if you do--even when you're writing about something else--by making those big checkmarks.

Ready? Begin.

Appendix L

INSTRUCTIONS FOR CONTINUING TO EXPRESS (E₁-E₂): CONTINUE TOTHINK (E₂)PASSAGE

In the next five minutes, please continue to write your thoughts as you did before. But remember also to continue trying to THINK ABOUT the passage you just read and heard. Nevertheless, continue to write down every thought that comes to mind, whether or not it's about that passage. If and when you actually DO think about all or any part of that passage, even for an instant--when you're writing about something else--put a big checkmark on the paper at the moment you have the thought. Then just continue writing as before.

Remember--continue to TRY to THINK ABOUT the passage and let us know about it if you do--even if you're writing about something else--with those big checkmarks.

Ready? Begin.

Appendix M

CRITERIA FOR WHITE BEAR MENTIONS

S: Stimulus: white bear(s); white [polar] bear(s)

NP: Nouns and Pronouns: bear(s); it; him; her; they; them; his hers; one, etc. (if referent is clear)

D: Description: description of...; facts about...; e.g., cuddly; adorable; lives at North Pole, etc.

A: Associations: reminds me of snow and Christmas; I think of my teddy when I was little, etc.

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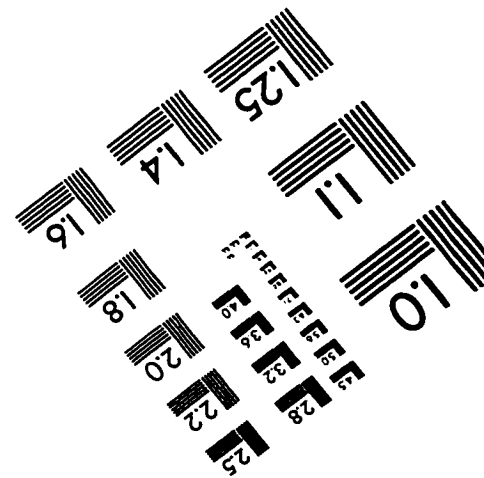
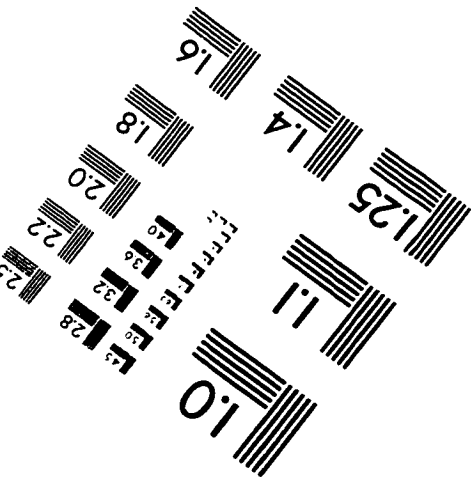
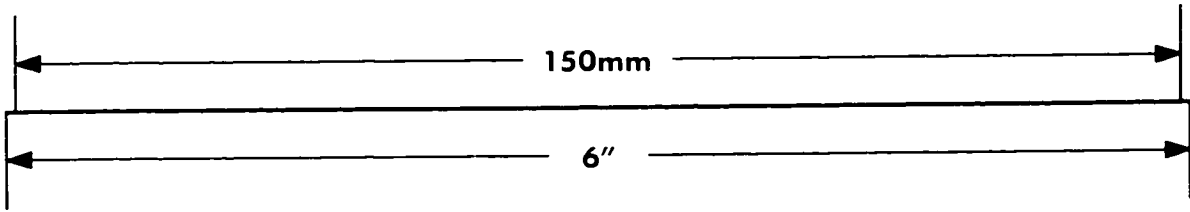
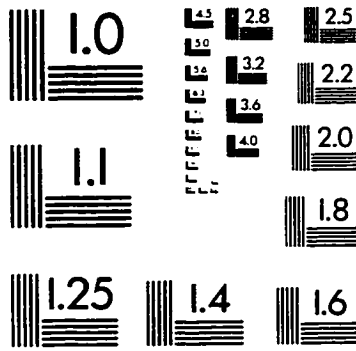
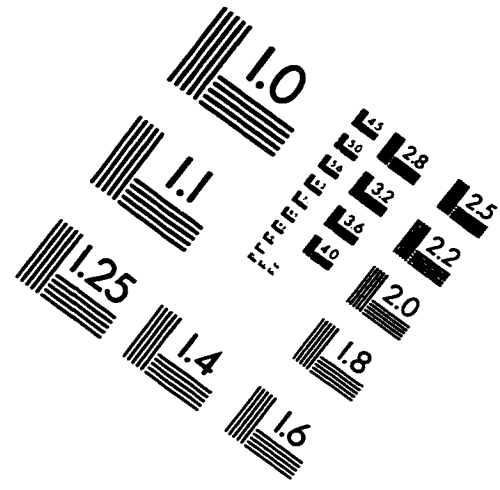
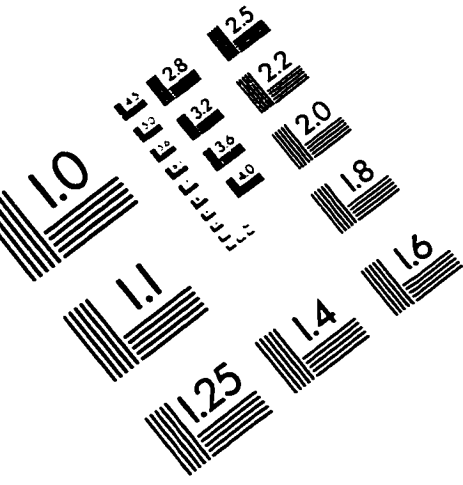
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IMAGE EVALUATION TEST TARGET (QA-3)



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