

Fall 1997

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Dennis Charles Mitchell
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**REPRESSION AND RELIEF:
MOOD AND CARDIOVASCULAR CHANGES FOLLOWING
THREAT, THINKING ABOUT THREAT, AND THREAT REMOVAL
FOR REPRESSORS AND NONREPRESSORS**

BY

DENNIS CHARLES MITCHELL

**B.A., Case Western Reserve University, 1990
M.A., Case Western Reserve University, 1991**

DISSERTATION

**Submitted to the University of New Hampshire
in Partial Fulfillment of the Requirements
for the Degree of**

Doctor of Philosophy

in

Psychology

September, 1997

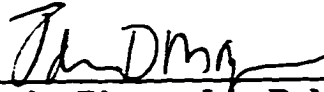
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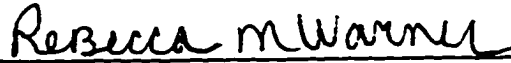
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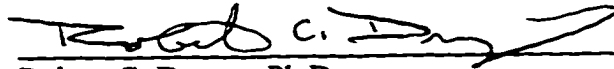
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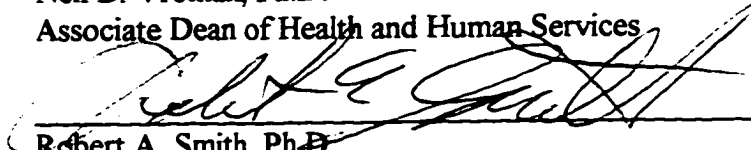
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To my wife and sunflower,

Katherine

ACKNOWLEDGMENTS

Several people have made significant contributions to the completion of this thesis and to my professional development during graduate school.

First, over the years, Jack Mayer has challenged my thinking on several projects and provided me with invaluable insights regarding writing style. Jack has supported me when the data from other projects looked discouraging, then encouraging, then discouraging again. Jack has taught me much about the politics of the profession and how to be more diplomatic. Finally, Jack has gradually adapted his mentorship role around my struggle to really understand the phenomena that I study.

Second, since my arrival at UNH, Ellen Cohn has been my maternal advisor. Having worked on several projects with Ellen, and having met with Ellen more hours than I have spent writing this thesis, she is the single most familiar person to me in the department. Without her openness, encouragement, and acceptance throughout the years, I am certain that my professional attachment to my colleagues and my work would have quickly become anxious-ambivalent.

Third, Becky Warner has provided three substantial services to me. She has facilitated my understanding of advanced statistics and my pursuit of nonconventional statistical analyses. She provided the laboratory facilities for the experiment in this thesis and spent several hours helping me to trouble-shoot the computer programming. In one very enlightening meeting last year, she mentioned the work of James Pennebaker on the benefits of confession and we collectively developed what would become the design of the

experiment. I believe that I have spent about 100 hours talking with and listening to Becky (which includes two semesters of classes) and these have been among the most informative and productive hours of my life.

Fourth, the other members of my dissertation committee have provided substantial contributions to my project and my thinking about the project. Rob Drugan has raised my level of awareness about the complexities involved in psychophysiological research, but has also helped me to envision where my dissertation research might lead. Neil Vroman has guided my thinking about the external validity and applicability of my research on repression and relief. Also, Neil has been openly enthusiastic about the research, providing me with motivational energy a couple times when I really needed it. Bob Smith has facilitated my thinking about how research on repressive coping style informs (or is informed by) classic experimental work on repression. In addition, Bob Smith has spent several hours developing an earlier version of the experiment program and advising me about the current version of the program.

During the past three semesters, several Introductory Psychology instructors have permitted me to enter their classrooms, administer the defensiveness and anxiety scales, and otherwise recruit subjects. These instructors are Josh Burk, Heather Chabot, Deb Coon, Ken Fuld, Mark Henn, Richard Kushner, Lisa Parsons, Tonya Plunkett, Christy Porter, and Phyllis Wentworth.

A few other graduate students helped me with different aspects of this project. Glenn Geher provided feedback on an earlier version of the computer program. Eric Dearing assigned and kept track of color codes for the different disposition-X-gender

groups. Finally, Katherine Black gave feedback on the credibility of the various manipulations in the study, and she provided feedback on several rehearsals of my defense presentation.

This dissertation project has been supported by funds from several sources. The Dissertation Year Fellowship and most recent Summer Fellowship that I received from the Graduate School enabled me to devote considerable time to learning the Visual Basic programming language, developing a sophisticated computer program to run the experiment, and to collect data from a large group of subjects. Ellen Cohn and Kathy McCartney provided additional summer support prior to my dissertation year. Dennis Meadows at the Institute for Policy and Social Science Research provided money for scanning the data received during prescreening. (Thank goodness, I didn't have to manually enter data from 1300+ subjects!) Finally, Victor Benassi loaned me the computer which was supposed to be used for the experiment but ended up being used as the main word processor for this document.

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ABSTRACT

REPRESSION AND RELIEF: MOOD AND CARDIOVASCULAR CHANGES FOLLOWING THREAT, THINKING ABOUT THREAT, AND THREAT REMOVAL FOR REPRESSORS AND NONREPRESSORS

by

Dennis Charles Mitchell
University of New Hampshire, September, 1997

Advisor: John D. Mayer, Associate Professor

Do persons who typically deny their feelings of anxiety also deny relief when a threatening situation ends? Can such persons create relief in themselves by reconsidering the threat and their resources to cope with the threat? The present study sought to answer these questions and to explore more generally the experiential and cardiovascular nature of emotional relief that emerges from coping with the presence of a threat and then realizing that a threat is no longer present. Preselected in terms of whether or not they typically deny feelings of anxiety ("repressive coping style"), 141 college students participated in two series of manipulations designed to be threatening and then non-threatening. In one series of manipulations, students took a bogus "Psychological Sensitivity Test," received computerized feedback that they failed the test, participated in a writing task in which they either wrote about their test performance (experimental condition) or wrote about a typical day in their lives (control condition), and then received feedback that their first test evaluation was incorrect and they had actually passed the test. In the second series of manipulations, students were informed that they had been randomly selected for a (bogus) security check, in which their research credits would be revoked if they did not properly

identify themselves on an ambiguous identification task -- a task which all subjects did, in fact, pass. During both series of manipulations, heart rate and blood pressure were recorded, and after each manipulation, self-reported mood was assessed. I predicted that, compared to nonrepressors, repressors would exhibit less cardiovascular relaxation while writing about their failure and they would report less relief after success on the bogus test and after passing the security check. As it turned out, repressors' and nonrepressors' cardiovascular responses during the experimental writing task were not significantly different from each other or from cardiovascular activity during the control task. In contrast to nonrepressors, repressors reported more relief following success and (nonsignificantly) less relief after passing the security check. These and other findings suggest that the security check may have been more effective than the test evaluations at eliciting anxiety and relief.

*Canst thou not minister to a mind diseas'd,
Pluck from the memory a rooted sorrow,
Raze out the written troubles of the brain,
And with some sweet oblivious antidote
Cleanse the stuff'd bosom of that perilous stuff
Which weighs upon the heart?*

Shakespeare, Macbeth, (V, iii: 40-45)

GENERAL INTRODUCTION

Two of the most important and yet complex questions in psychology are why do people sometimes deceive themselves and how can people experience relief from psychological pain. These two questions are related to one another in that self-deception may prevent a person from acknowledging the need for “real” relief from pain and that self-deception may itself be an alternative form of psychological relief. Although there is some evidence that a modest amount of self-deception is psychologically healthy (e.g., Taylor & Brown, 1988), most clinicians — whether Freudian, Rogerian, or otherwise — would agree that substantial use of self-deception to cope with threats to one’s well-being actually makes matters worse by supporting unwarranted expectations about the self and the world and by making the truth an intrapsychic hurdle. Furthermore, there is considerable evidence that psychological relief is dependent upon the acknowledgement and complete understanding of a threat which has passed — a process that seems quite unlikely for a person who has initially deceived him/herself about that threat.

Are people who typically repress feelings of anxiety able to experience emotional relief? The present study examines cardiovascular changes and self-reported mood in college students who are made to feel anxious and then relieved about their performance on a bogus test. The major comparison in this study is between persons who are identified as “repressors” (those who report having low anxiety in everyday life, but who also engage in considerable self-deception) and “nonrepressors” (those who do not engage in much self-deception or who report higher everyday anxiety). Based upon the separate

research literatures on the nature of repression and emotional relief, I develop and test a model of the relationship between repression and relief.

SECTION I.

REPRESSION

The concept of repression has undergone considerable change since its reformulation by Sigmund Freud (1900/1965; 1915/1957) at the turn of the century. While theory and research within the psychodynamic tradition developed from a universal model of the mind, more recent research on repression has examined correlates of individual differences in the tendency to repress anxiety. Whereas psychodynamic theorists were concerned with people's selective lack of awareness of ego-threatening information and the influence of such unconscious information on people's behavior, contemporary researchers have been concerned with people's tendencies to deny anxiety and to perceive less emotion in things.

Foreground: Repressive Coping Style

Interest in individual differences in repression began with research on personality moderators (e.g., "ego strength") of presumably normal repressive behavior, such as selective forgetting of failure experiences (e.g., Alper, 1948; Rosenzweig & Mason, 1934). This work was followed by studies which examined cross-situational consistency of repression -- whether persons who exhibited repressive behavior on one task would also exhibit repressive behavior in another task (e.g., Erikson & Lazarus, 1952; Lazarus & Longo, 1953). Finally, Byrne (1961) and later Weinberger, Schwartz, and Davidson (1979) developed paper-and-pencil measures of dispositional repression, or the tendency to repress negative experiences or feelings, which were validated against other repressive behaviors. The following sections focus on research using the Weinberger et al (1979)

measure of dispositional repression because this work is more recent and the measure has exhibited greater reliability and discriminant validity than other measures (Weinberger, 1990).

Repressors: Anxious Self-Deceivers

In early work, Weinberger et al. (1979) identified a group of persons who exhibited a “repressive coping style,” persons who reported feeling little anxiety in everyday life, but who appeared to be “self-deceivers” on another questionnaire¹. As mentioned above, this method of identifying repressors represented a substantial psychometric improvement over previous classification systems, which included single-behavior measures, such as recall latency of failure-associated stimuli (e.g. Erikson & Lazarus, 1952), as well as Byrne’s (1961) paper-and-pencil measure of repression-sensitization, which was accidentally highly correlated with chronic anxiety. When Weinberger’s “repressors” completed sentences, some of which had sexual or aggressive themes, they a) exhibited the same physiological indices of anxiety² that admittedly high-anxious people exhibited, b) completed sentences in such a way as to discount the sexual or aggressive themes³, and yet c) claimed to feel little anxiety about the task (Weinberger et al., 1979). Apparently, repressors are truly anxious self-deceivers, who regulate their moods through denial and/or dissociation.

¹ answering negatively to questions such as “There have been times when I was quite jealous of the good fortune of others.”

² marked increases in blood pressure, heart rate, and skin conductance (palmar sweating).

³ For instance, the phrase “Bob thought his mother was attractive _____” might be completed with “or at least she seemed to be attractive to men her age.”

A selective memory. A considerable body of research suggests that repressors have difficulty remembering unpleasant personal experiences. In an early study, Lazarus & Longo (1953) examined the learning and memory of persons who had previously demonstrated a recall bias for tasks on which they failed (“sensitizers”) vs. persons who had demonstrated a recall bias for success tasks (“repressors”). In their study, subjects from each group were asked to learn nonsense syllables, in which each nonsense syllable’s presentation was either followed or not followed by an electric shock (according to a random schedule). These researchers found no reliable difference between the two groups in terms of how long it took the subjects to learn the nonsense syllables; however, an unanticipated recall test 24 hours after the learning trials did differentiate the two groups. As predicted, subjects with a success recall bias recalled more nonsense syllables that were not followed by an electric shock, while subjects with a failure recall bias recalled more nonsense syllables that preceded an electric shock. Significant here is the fact that subjects were well aware that the shocks did not depend upon their performance on the learning task. Thus, it seems that whether or not repressors have control over the pleasantness/unpleasantness of a situation, they have difficulty remembering unpleasant situations.

Differentiating repressors from non-repressors using the Weinberger et al (1979) method, Davis (1987) and Davis & Schwartz (1987) investigated the recall of personal memories for these two populations. Between the two sets of studies, these investigators found that repressors recalled fewer unpleasant and pleasant personal experiences, except when the recall task was directed toward more specific experiences (e.g., “an anger

experience associated with being treated unfairly”), in which case repressors only recalled fewer unpleasant memories (there was no difference for pleasant or neutral memories). In the more recent article, Davis (1987) found that the apparently weaker accessibility of negative memories for repressors only holds for memories which focus on the self, as opposed to memories about others. Based upon her findings, Davis (1987) concluded that repressors exhibit a selective, motivated inhibition of memories of experiences that are self-evaluative or otherwise threatening to the self.

Repressive discreteness. Hansen & Hansen (1988) asked Weinbergian-defined repressors and nonrepressors to recall experiences in which they felt angry, sad, fearful or embarrassed and to rate how much they had felt each of ten basic emotions during the experience. Although repressors and nonrepressors reported similar amounts of dominant emotions during the experiences (e.g., feeling of shame and embarrassment during the embarrassing experience), repressors reported much lower amounts of “nondominant emotions” (e.g., fear, sadness, and anger during the embarrassing experience). Hansen & Hansen argued that their results support Davis’ understanding (Davis, 1987; Davis & Schwartz, 1987) that repressors’ encoding of emotional information is much less complex and thus reduces the likelihood of recall via spreading activation. According to Hansen and Hansen (1988), the memory structure of repressor’s experiences is more emotionally discrete — reflecting only the dominant emotions of remembered scenes.

A second series of studies conducted by Hansen, Hansen, & Shantz (1992) provided additional support for what they term the “repressive discreteness hypothesis.” In study one, repressors and nonrepressors viewed slides of 5 persons posed with one of

four dominant emotional expressions (happy, sad, fearful, and angry) and rated how happy, sad, fearful, and angry each face appeared. Although repressors and nonrepressors did not differ in ratings of the dominant emotion, repressors rated many of the nondominant emotions as less intensely portrayed. In the second study⁴, repressors and nonrepressors were presented with a series of photos of a large number of faces, each portraying one of three emotions (happiness, anger, or fear), for 30 sec; their task was to estimate the number of persons in each scene depicting each of the emotions. Hansen et al. found that repressors and nonrepressors were equally accurate in estimating the number of people displaying the dominant emotion in each scene, but repressors estimated less persons portraying the nondominant emotions in each scene. As a control procedure, each person was also asked to estimate the number of circles, squares, and triangles in several arrays. Interestingly, repressors and nonrepressors did not differ in their estimations of the number of dominant or nondominant shapes. Hansen et al. concluded that repressive discreteness is a reliable phenomenon, which only occurs with emotionally laden stimuli.

At this point, I believe that it is important to consider an alternative explanation for repressive discreteness that will later have bearing on the results of the present study. Recall that repressors are categorized on the dual basis of reporting little anxiety in everyday life and denying socially inappropriate (but normative) behavior, such as being jealous of others' good fortunes. In many circumstances, repressing negative information about the self does not conflict with winning approval from others and may, in fact, prevent embarrassment, promote empathy, and otherwise facilitate impression

⁴Employing more rigorous controls. Study 3 replicated the findings of Study 2.

management (see Wegner, 1990). On the other hand, I can think of at least one instance in which repression of ego-threatening information would compromise one's approval from others -- namely, when one blatantly denies, omits or forgets ego-threatening information to which others are privy. In such a case, one may come across as a liar, rather than a saint.

Consider the experimental context in which the phenomenon of repressive discreteness emerges. In the original study, subjects are expected to describe instances of unpleasant personal experiences, and then to describe their emotions during these experiences. Now suppose that a repressor really wants to downplay the emotion in these experiences. Would this repressor rate his/her embarrassing memory as less embarrassing? Perhaps not, for such a rating might suggest that the repressor did not do a very good job of coming up with an embarrassing memory and may, in fact, be withholding a better, more ego-threatening example of embarrassment. In such a case, the repressor might only be able to downplay those ambiguous emotional aspects of the memory that have no bearing on the appropriateness of the memory for the experimental task.

Now consider the second set of studies on repressive discreteness, in which the amount of pleasant and unpleasant emotion in complex stimuli is judged by repressors and nonrepressors. Here, greater social approval (from the experimenter) and ego-enhancement is associated with better performance on the task and hence less repression of emotion. One can imagine that the repressor wants to perform well on the test but also wants to ignore or downplay the emotion in the stimuli. The result of this conflict is greater attention to the dominant emotional aspects of the stimuli and lesser attention to

nondominant emotional aspects.

The main point behind this short discussion is that repression may be a highly selective form of ego-management, operating only on certain ego-threatening information in particular situations in which the apparent benefits of denying, ignoring or downplaying the emotional information outweigh the costs or risks to the ego. In circumstances in which repression represents a cost or risk to the ego, repressive behavior may be complex or even non-existent.

Approval motive Because many researchers have defined repressors in part by high scores on the Marlowe-Crowne (Crowne & Marlowe, 1960) measure of approval motive (also called “social desirability”), it is not surprising that some critics have attributed the behavior of so-called repressors to their greater need to present themselves in a socially desirable light. For instance, Tomaka, Blaskovich, and Kelsey (1992) recorded skin conductance and heart rate for repressors and nonrepressors while they performed a difficult serial subtraction task as quickly as possible. Although repressors were significantly more reactive to the task than nonrepressors, none of the variance in reactivity was attributable to self-reported stress (they substituted a Perceived Stress Scale for the TMAS); simply, those who scored high on social desirability experienced greater increases in skin conductance and heart rate during the task. Perhaps, those who were more concerned about social approval were also more anxious when a potentially embarrassing situation (difficult subtraction) confronted them. The Tomaka et al. (1992) study raised the question that the repressive coping style might be a self-presentational strategy.

Roy Baumeister, one of the leading authorities on self-presentational strategies (e.g., Baumeister, 1982), provided some evidence against the notion that repressive coping is merely self-presentational. Specifically, Baumeister & Cairns (1992) asked repressors and nonrepressors to answer a series of questions on a computer screen and then view a personality profile of themselves that was based upon their answers. Two aspects of the subject's experience was manipulated: a) either the computer asked the subject for identifying information and then the experimenter informed the subject that his/her personality profile would be shown to another subject (the "public condition") or the experimenter indicated that the subject would remain completely anonymous ("private condition"); and b) either the subject was presented with a favorable profile (using Anderson's, 1968, list of trait terms) or an unfavorable profile (using Anderson's, 1968, list of trait terms). Two dependent measures were assessed: a) how long the subject spent reading the profile and b) how many trait adjectives from the profile the subject recalled following an initial debriefing of the study. The results indicated that anonymous repressors who received unfavorable profiles spent less time reading these profiles than did nonanonymous repressors who received unfavorable profiles⁵. If repressive coping is merely social desirability, then why did repressive coping occur more strongly in the private condition?

A study by Weinberger & Davidson (1994) also argued against the self-presentation explanation. Repressors and nonrepressors participated in a sentence-

⁵ Furthermore, all repressors who received favorable profiles showed superior recall for the few negative traits on this profile than did nonrepressors; however, repressors showed inferior recall for negative and neutral items on the unfavorable profiles.

completion task, after being instructed to either be emotionally expressive or emotionally restrained. Because many of the phrases dealt with ego-threatening topics (e.g., “In my worst moments, I . . .”), the investigators predicted that repressors would engage in distancing strategies (e.g., not being able to remember an instance or think of an acceptable answer) to avoid the threat of the phrases. Consistent with their predictions, repressors did employ more distancing strategies, and this effect was apparent across instruction (expressive, restrained) condition. In addition, repressors exhibited greater heart rate activity prior to and during the task than nonrepressors. As a more direct test of the self-presentation hypothesis, Weinberger & Davidson compared the behavior and reactivity of repressors with a group of “impression managers” — persons who score high on Snyder’s (1974) Self-Monitoring Scale and who are thus highly invested in maintaining favorable social impressions. Interestingly, while repressors were just as physiologically aroused when they employed distancing strategies as when they were honest, impression managers, on the other hand, were less physiologically aroused when they employed distancing strategies.

Collectively, the research does support some differentiation between the two constructs of approval motive and repressive coping style. On average, repressors probably are quite concerned with approval from others to the extent that the lack of such approval is damaging to the ego; however, they are also concerned with their private perceptions of themselves as worthwhile beings. Supposedly, it is the latter concern, rather than the former, which motivates defensive self-deception.

Attention regulation. Two studies have directly examined the information-

processing styles of repressors. Bonanno et al. (1991) had repressors and nonrepressors (defensive, high anxious; nondefensive, low-anxious; and nondefensive, high-anxious) shadow (repeat aloud) unpleasant or neutral words presented in a dichotic listening task, in which unpleasant or neutral words were presented in the unattended ear. The results indicated that repressors made fewer errors in shadowing (for both negative and neutral words) than did any other group of subjects in the study. Interestingly, however, repressors reported the greatest frequency of distracting thoughts during the dichotic listening task. Ostensibly, then, repressors performed better on the task not because they had greater focus on the task but because they were better able to distract themselves from the interference. An alternative explanation that I believe is equally viable is that repressors sought distraction as a means of investing themselves less in the task (e.g., “this is no big deal”) and as a ready-made excuse (a self-handicapping strategy, Berglas & Jones, 1978) for possibly poor performance. Whatever the explanation, it seems plausible that repressors have histories of being reinforced for distracting themselves: repressors create a kind of “white noise” against irrelevant emotional information. A recent study by Medolia, Moore, and Tesser (1996) qualifies such an interpretation. In their set of studies, repressors and nonrepressors a) took part in an analogies test, b) received either failure or success feedback, c) completed a word-familiarity rating task that was either billed as a completely distinct task or as a means of explaining performance on the analogies test, and finally d) took part in either a free-recall task or recognition task of the words in the familiarity rating task. The words in the word-familiarity rating task were either pleasant, unpleasant, or neutral. Repressors recalled fewer emotion words (regardless of valence)

than nonrepressors after receiving failure feedback or when they believed that the word-frequency task was informative about performance on the analogy task; however, repressors recalled many more emotion words after receiving success feedback or when the word-frequency task was supposedly unrelated to the analogy task. Overall, repressors reported being less distracted during the free recall task than did nonrepressors. The researchers conclude from these and similar results that repressors are naturally hyperattentive to emotionally charged information; however, when an ego-threatening situation arises they will distract themselves from the emotionally charged information⁶.

Threat dismissal. Weinberger reviewed evidence supporting the idea that repressors trivialize threats to the self. For instance, while involved in highly stressful experimental tasks, repressors tend to report lower levels of anxiety than truly less anxious subjects (Asendorpf & Scherer, 1983; Kiecolt-Glaser & Greenberg, 1983). Repressors also rate hypothetical threat scenarios (e.g., "Your girlfriend leaves you for another) as significantly less upsetting than do low anxious subjects (Weinberger & Schwartz, 1982). Finally, repressors spend a little more time examining feedback about their personality assets than liabilities, even after failing at an ego-involving task (intelligence), while sensitizers (persons who readily are highly aware of their anxiety and anxiety-provoking situations) spend more time evaluating liabilities after failing at the same task (Mischel, Ebbesen, & Zeiss, 1973). These and other related findings led Weinberger (1990) to speculate that repressors escape awareness of anxiety by reinterpreting threats as unimportant or irrelevant. Sometimes, this reinterpretation comes in the form of mere

⁶Mendolia et al. (1996) did not report an interaction between feedback condition (success vs. failure) and disposition (repressor vs. nonrepressor) on reported distraction, which would have been predicted.

denial or distancing, but sometimes the reinterpretation follows a more indirect route, such as intellectualization. Importantly, although threat reinterpretation may fool the mind, this form of threat dismissal does not “fool” the body, which instead remains prepared (cardiovascularly) to do something about the threat long after the threat is initially perceived; accordingly, repressors exhibit chronically high levels of cardiovascular arousal (e.g., King et al., 1986).

Related Personality Patterns

While repressive coping style appears to represent a distinct pattern of coping with threats, it is conceptually related to several other personality patterns, the more popular of which I describe below.

Internalization. Jones (1935) introduced the distinction between internalizers and externalizers by noting that children who tend to respond with the greatest skin conductance to a loud stimulus nevertheless display little emotion on their faces; likewise, children who show the less skin conductance to a loud stimulus are facially expressive. Jones called these two groups of children internalizers and externalizers respectively. Jones' findings are consistent the “emotional discharge theory.” According to this theory (see Cacioppo et al., 1992, for a review), sympathetic activation and emotional expressiveness are alternative avenues of tension release; emotional intensity is a drive state, compelling one to “do something, anything” about some emotionally relevant event. Two responses that are themselves sufficient for reducing emotional intensity are a) changing the anticipated consequences of the event (for instance, studying extra hours for an upcoming difficult examination) and b) communicating to others one's feelings about

the event (for instance, talking to others in the class about how anxious one is about an upcoming examination). Thus, according to the emotional discharge theory, emotional expressiveness and sympathetic activation should be negatively correlated: the more one allows one's emotionality to be expressed, the more tension is released and the less tension there is for other avenues of emotional release. In contrast to the emotional discharge theory is the "arousal theory," (again, see Cacioppo et al., 1992, for a review) which regards emotional reactions as coordinated, multiple-system responses to apparently important events, in which sympathetic activation and postural changes prepare the mammal for some sort of action (e.g., Cannon's, 1929, fight or flight response). In this light, in which emotional intensity is considered a unitary phenomenon, one would expect emotional expressiveness to be positively correlated with one's degree of physiological activation.

Many years after Jones' landmark study, Ross Buck and colleagues (Buck et al., 1972; Buck, Miller & Caul, 1974) examined the relationship between facial expressiveness and skin conductance while adult men and women viewed slides of other adult faces posed with emotional expressions. Interestingly, while between-subject analyses revealed a negative correlation between expressiveness and skin conductance, supporting the discharge theory, within-subject analyses revealed a significant positive correlation, supporting the arousal theory. Cacioppo et al. (1992) suggested that the complexity of results on internalization-externalization can be explained by a model of the interactions between various emotional systems that is more complex than either the emotional discharge theory or the arousal theory. I believe that seemingly complex results of Buck's

studies are consistent with the existence of a simple dynamic relationship between sympathetic activation and expressiveness: as sympathetic activity increases, the tension becomes greater, which demands a greater behavioral response (hence a positive relationship); however, once this behavioral response is initiated, the greater the response, the greater the sympathetic deactivation (hence a negative relationship). Such a view is consistent with the work by James Pennebaker and colleagues (Pennebaker, Hughes, & O'Heeron, 1987) who have found a negative correlation between whether one talks about a traumatic event and how physiologically aroused the person is after the disclosure.

The relationship between internalization and repressive coping is not quite clear. If one interprets self-reported anxiety as an expression of anxiety, then repressors might be regarded as internalizers. However, there are two lines of evidence that suggest otherwise. Most notably, Buck et al. (1974) found that although internalizers do not display overt facial or postural expressions of anxiety, they do report on questionnaires greater trait anxiety, as well as lower extraversion and lower self-esteem, than do externalizers. Furthermore, although repressors deny their anxiety, they do display as much facial anxiety (as measured by EMG) as admittedly high anxious subjects (Asendorpf & Scherer, 1983; Weinberger et al., 1979). Although these findings argue against the idea that repressors are internalizers, they do not preclude the possibility that repression and internalization are in some sense both processes that moderate the influence of emotion on behavior. While internalization regulates the expression and nonverbal communication of emotion, repression regulates the awareness and verbal acknowledgment of emotion. Also, even though repressors display facial anxiety through

highly sensitive EMG measures, their more overt facial expressions are probably not representative of anxiety. Indeed, one might imagine that in a crisis situation, both repressors and internalizers might be apparently “unmoved” --- repressors trying very much to “keep their cool” and internalizers simply “paralyzed by their fear.”

Alexithymia. While repressors seem to have turned off (or down) their awareness of anxiety and self-threatening information, another group of persons — alexithymics — appear to have turned off (or down) their awareness of all types of emotional feelings. As first developed by Sifneos (1973), the term alexithymia refers to an apparent clinical syndrome characterized by, among other things, extreme difficulty in describing one’s own feelings and recognizing feelings in others. When alexithymics encounter a threat, they may notice their heart rate and blood pressure have increased or perhaps that they seem jittery, but they have difficulty determining whether they feel angry or anxious or otherwise stressed. When alexithymics receive praise or other rewards, they may notice a decrease in heart rate and blood pressure, but they apparently can not truly experience pride or joy. Thus, alexithymics focus on the somatic and behavioral manifestations of emotion rather than the subjective feeling states associated with emotion.

Several researchers have examined personality and behavioral correlates of alexithymia (see Taylor, 1994, for a review). For instance, persons identified as high in alexithymia give self-reports of subjective stress that are relatively constant across different emotional stimuli and which are uncorrelated with psychophysiological measures of stress (Martin & Pihl, 1986; Papciak, Feuerstein & Spiegel, 1985). Alexithymics score higher in neuroticism (Parker, Bagby & Taylor, 1989), lower in positive emotional

experience (Bagby, Taylor & Parker, 1993, cited in Taylor, 1994), lower in openness to experience (Bagby, Taylor & Parker, 1993, cited in Taylor, 1994) and lower in extraversion (Wise, Mann, & Shay, 1992). Alexithymics take longer to recognize emotionally charged words in a stroop-type task (Parker, Taylor, & Bagby, 1993), have difficulty identifying emotions in slides of persons posed with emotional expressions (Mann et al., 1994; cf, Mayer, DiPaolo, & Salovey, 1990), demonstrate a hemispatial bias (a chimeric⁷ face task) in perception indicative of a left hemisphere bias (Berenbaum & Prince, 1994), and report a childhood family life that was less emotionally safe and less emotionally expressive (Berenbaum & James, 1994).

As with internalization, the theoretical relationship between alexithymia and repressive coping style is unclear. Alexithymia is a syndrome in which labelling of emotional feelings is difficult, while awareness of somatic responses is not impaired. In repressive coping style, awareness of emotional feelings and somatic responses are impaired. Perhaps, alexithymia may develop from repressive coping style as autonomic responses to threats become too intense to ignore, in which case the dissociation with the experiential component of anxiety must be changed from mere denial of bodily responses to intellectualization of these responses.

Schizoid personality disorder. A more widely accepted clinical syndrome (than alexithymia) that is only tangentially related to repressive coping style is schizoid personality disorder (APA, 1994). SPD is characterized by a pervasive indifference to

⁷ Chimeric faces are artificial images constructed by dividing a target face image along the midline into left and right sides, creating mirror images of these left- and right-side images, and producing left and right pseudo faces through the juxtaposition of each half face with its mirror image counterpart.

emotional situations and social relationships. Schizoids are often unable to express their anger or hostility toward others. Schizoids generally prefer to remain alone in their lives: schizoids often appear aloof, detached, and humorless; they may have no close friends and they often remain unmarried; and, in the extreme, schizoids may become reclusive. They are generally indifferent to criticism or praise by others, and they are often asexual and hypoactive (no spontaneity).

According to Millon (1984), schizoids have a complacent self-image, demonstrating very little awareness about the self and how their actions and situational circumstances affect them. They have very few internalizations of their experiences (after all their experiences do not matter to them). Their intrapsychic organization is undifferentiated: they are indifferent about fulfilling needs or resolving inner conflicts. They often resort to using intellectualization as a defense mechanism: they describe interpersonal and emotional experiences in a matter-of-fact, abstract manner. Despite this reliance on intellectualization, they remain cognitively impoverished: their arguments are often illogical, circular, obscure, and vague--and their communication is easily de-railed.

Clearly, a person suffering from schizoid personality disorder has a much more impaired social existence than a person suffering from alexithymia. To my knowledge, there is no research investigating the sympathetic reactivity of persons with SPD. One wonders whether SPD describes a condition in which the body does not react emotionally to self-relevant or otherwise important events or a condition in which awareness and emotional expressiveness are so well-dissociated from autonomic reactivity that the person feels and seems to feel almost nothing at all, ever. It would be interesting to determine

whether persons with repressive coping style exhibit special difficulty in clarity and coherence of communication under normal or threatening circumstances. As with alexithymia, schizoid personality disorder might represent a clinically advanced form of repressive coping style, in which no event is allowed to affect the self — good or bad.

Avoidant attachment style. Based upon the conceptualization of human attachment made by John Bowlby (e.g., Bowlby, 1969), Ainsworth and colleagues (Ainsworth et al., 1978) identified three distinct patterns of human attachment: a) a secure pattern characterized by apparent trust in the availability of the primary caregiver, which facilitates a balance between exploration of the world beyond the caregiver and proximity-seeking toward the caregiver for reassurance or protection; b) an anxious-resistant pattern characterized by an apparently ambivalent attitude toward the primary caregiver — clinging to her at times, rejecting her at other times; and c) an avoidant attachment pattern characterized by an apparent indifference toward the primary caregiver. Ainsworth et al. have suggested that these patterns of attachment are stable coping strategies of infants whose mothers are consistently responsive to them, inconsistently responsive, or nonresponsive, respectively. According to Bowlby (1969), early interactions with the mother form the basis of an “internal working model” — an unconscious (or semi-conscious) schema for understanding and relating to others, which includes rules for guiding behavior, one’s perceived interpersonal capacities, and expectations about how people will respond to the person. For instance, the schema for the avoidant child probably represents the world of people as uncaring and untrustworthy and the self as unfit or unneeded of love or support. With such a schema, the avoidant child learns to

detach him/herself from the facade of emotional relationships, to become “emotionally self-sufficient,” (Bowlby, 1988, p. 124) and to fully invest him/herself in other activities that involve no emotional risks. Consistent with this conceptualization, Sroufe (1983, cited in Bretherton & Waters, 1985) found that avoidant children are less likely than other children to seek the aid of teachers when they are physically injured or emotionally upset.

Assuming the development of internal working models, one would expect that patterns of attachment in infancy would influence how people understand and relate to others later in life. Consistent with this idea, a wealth of research has recently investigated romantic attachment styles (Hazan & Shaver, 1987) which parallel the patterns of attachment developed in infancy. Persons characterized by an avoidant style of romantic attachment report difficulty in getting emotionally close to romantic others and trusting them. Furthermore, romantically avoidant persons self-disclose significantly less information than do romantically anxious or romantically secure persons (Mikulincer & Nachshon, 1991).

Two recent studies have demonstrated an association between romantic avoidance and repressive defensiveness. In one study, Mikulincer et al. (1993) asked Israeli adults to describe how they attempted to cope with Iraqi Scud missile attacks. While both romantically avoidant and romantically anxious adults reported higher levels of stress than romantically secure adults, the romantically avoidant adults were more likely to distance themselves from the threats, shut off their emotions, and instead experience somatic problems. In the other study, Mikulincer & Orbach (1995) asked romantically avoidant, anxious, and secure persons to recall and evaluate personal experiences that were

associated with anger, happiness, sadness, and anxiety. As expected, romantically avoidant persons rated anger, sadness, and anxiety experiences as less intense than did romantically anxious and secure persons. In addition to the recall task, Mikulincer & Orbach (1995) also measured repressive coping style, using the Marlowe-Crowne Social Desirability Scale and the Taylor Manifest Anxiety Scale (see above). Using a canonical discriminant analysis, Mikulincer & Orbach were able to reliably classify the romantic attachment styles based upon social desirability (defensiveness) and reported anxiety. As expected, romantically avoidant persons were more defensive than romantically anxious persons and more anxious than romantically secure persons. Thus, persons who have learned to trust and rely only upon themselves and to remain emotionally distant from romantic partners deal with highly threatening situations by dismissing them.

Background: The Psychodynamics of Repression

Theoretical Perspectives

Freud: Divestment of ideas. Freud (1915/1957b) argued that repression is a form of intentional forgetting, motivated by a desire to keep anxiety-provoking thoughts and urges out of one's awareness. Quite regularly in life, a person is confronted with "evidence" (such as the presence of sexual feelings toward the mother, the presence of an abusive father, or the presence of some insurmountable obstacle to one's career goals) that threatens certain assumptions that the person has made about the self or the world (such as "I am a moral person," "My life is safe," or "I will be a physician"). When such a threat arises, the person's natural response is to deeply bury this evidence into the unconscious mind, where years of preverbal impulses and experiences have been stored. Although

repression helps one to “feel” less anxious, it also leads to a maintenance of unwarranted assumptions about the self and/or world. For instance, a teacher who represses certain negative nonverbal feedback that he/she receives from students might persist in his/her belief that certain teaching methods are effective, when, in fact, they are not.

A popular misconception of Freud’s repression construct is that it only refers to the intentional forgetting of entire experiences. In contrast to this misconception, Freud actually maintained that repression can operate on selected psychological aspects of experiences (Erdelyi, 1995). Specifically, Freud (1915/1957b) argued that persons can repress the content of a threatening experience and/or one’s feelings about the experience, and it is this latter aspect of the experience (which Freud called the “quantitative factor,” p. 109) with which the ego is most concerned. For instance, a person may remember a traumatic experience in vivid detail; however, the person’s feelings of guilt, helplessness, and anger concerning the trauma might be repressed. In place of the complex emotional understanding of the experience might be a highly intellectualized analysis of the events, antecedents and consequences — or a conspicuously simple emotional labelling of the event as “awful” or “depressing.” Freud believed that repression is really only “successful” if the threatening thought is divested of its emotional value (i.e., an “anticathexis” is achieved).

According to Freud (1915/1957a), all repression has its basis in the emergent ego’s desire to control unconscious sexual and aggressive impulses. On the surface, Freud appears to have excluded from the range of repression all of those anxiety-eliciting thoughts that are not related to sexual or aggressive impulses; however, the crux of

Freudian psychoanalysis is that all behavior, thoughts and feelings are in some way energized by these basic impulses. Thus, in repressing the fear that my dissertation results may not conform to my hopes, I am repressing the influence of sexual and/or aggressive (or life and death) energy motivating thoughts about my dissertation research. Exactly how these impulses energize such seemingly far-removed experiences as dissertation research activity can at present only be speculated.

In addition to distorting reality, repression has some behavioral and psychosomatic side-effects as well, which Freud (1915/1957b) collectively called “the return of the repressed” (pp. 111-112). Freud (1926/1963b) argued that repressed impulses seek physical expression, and these impulses make use of multiple avenues of escape. Unconscious feelings of anger toward one’s child might surface in the form of undue criticism of the child’s behavior or unfair treatment, physical abuse, “innocent” teases, lashing out at other people, being late for meetings, self-deprecation, . . . etc. Occasionally, if the unconscious feelings are intense enough, they may surface in the form of physical symptoms—such as insomnia, nervous twitches, localized pain, high blood pressure, illness—or severe mental problems—such as thought intrusions, delusions, panic attacks, . . . etc.

Accordingly, Freud would have viewed repressive coping style as a propensity to “successfully” repress one’s true feelings about anxiety-provoking events. Repressors devalue threatened aspects of their experiences or downplay the threats themselves by siphoning mental energy from their emotional attachments to these things. The repressed mental energy does emerge as physical symptoms indicative of anxiety (e.g., slightly

elevated resting blood pressure and normal or slightly elevated cardiovascular reactivity to threatening situations) but not as emotional experience. Living most of his life in the Victorian era, Freud may have regarded repressive coping style as somewhat normative and indicative of the neurosis of civilization (Freud, 1930/1961).

Dollard & Miller: Conditioned thought avoidance. In an attempt to translate classic psychodynamic principles into principles of behavior, Dollard and Miller (1950) proposed that repression merely represents a conditioned “thought-stopping” behavior. According to Dollard and Miller, repression results when a person has been thinking about an anxiety-provoking idea, stops thinking about this idea (a natural response in any anxiety-provoking situation is to simply suspend activity), and then experiences a decline in anxiety (due to the removal of the anxiety-provoking stimulus), which negatively reinforces the act of “stopping thinking.” Eventually, verbal or nonverbal cues in the mind that anticipate the anxiety-provoking idea serve as signals (conditioned stimuli) which produce the anxiety before the thought, which in turn prompts the person to stop thinking. In this way, repression is a type of avoidance learning in which the person is classically conditioned to anticipate the anxiety-provoking thought and instrumentally conditioned to avoid the thought by stopping thinking.

Dollard and Miller’s understanding of repression is entirely compatible with Freud’s understanding. Just as the act of stopping thinking can be conditioned, so can the act of intellectualizing an experience or projecting certain feelings. On a trivial level, one can claim that any mental activity can and is conditioned by reinforcers and occasioned by certain mental and environmental cues. It only makes sense that people use certain

strategies (healthy or defensive) under circumstances in which, in the past, they have produced some apparent good or reduced some apparent bad. On a less trivial level is Dollard and Miller's implication for the central role of avoidance learning in repression. In contrast with positive reinforcement and escape learning, avoidance learning is highly resistant to extinction (meaning that it does not require reliable reinforcement). Just three years before the Dollard and Miller's publication, O. H. Mowrer (1947) proposed a two-process theory of avoidance learning which parallels Dollard and Miller's explanation of repression. According to Mowrer, avoidance learning is the combined effect of classical conditioning and instrumental conditioning. An animal learns to avoid an aversive stimulus (e.g., a shock) which follows some environmental signal (e.g., a bell). The successful avoidance of the shock reduces the fear that has been anticipating the shock. Being a negative experience in its own right, fear, when eliminated, serves to negatively reinforce the avoidance behavior. Once the animal learns to avoid the shock, it will continue to avoid the shock, without "knowing" whether the shock would still occur without avoidance. As applied to repression, the person who learns to avoid negative thoughts will continue to avoid them, even though circumstances might arise that reduce the actual negativity of these thoughts. For instance, the child who has repressed feelings of fear about an abusive parent may continue to harbor these feelings even after the parent has passed away.

Other perspectives. Repression or some related form of self-deception has been a popular topic within many different personality theories. For instance, according to George Kelly (1955), repression is the consequence of either not being able to

satisfactorily or completely understand certain threatening experiences, such as social rejection by a respected person. Consider the instance in which a person states, "Everyone has been good to me." (Kelly, 1955, p. 468). This statement strongly suggests that the person making the statement is repressing some negative experiences. Kelly argued that the person may understand the statement by virtue of an implied ("repressed") contrasting statement or implied qualification of the original statement. For instance, the person could mean "Everyone has been good to me, *but I don't know how they will treat me in the future*" or "*I like to think that everyone has been good to me, but I don't like to consider when they have been bad to me*" or "*I am the type of person to say 'Everyone has been good to me,' while some other people complain about their treatment.*" These implicit qualifiers are said to be "submerged" in that the person has not verbalized them. The qualifiers have been submerged because their verbalization would permit the comprehension of certain anxiety-producing experiences. Because these qualifiers are submerged, the person simply does not remember experiences that do not conform to the blanket statement "Everyone has been good to me" because these experiences are not currently comprehensible. For Kelly, the emergence of repressed experiences comes from either verbalizing the submerged qualifiers or adopting a new way of understanding one's experiences that make the repressed experiences less threatening.

According to Carl Rogers (1959), repression represents a denial or distortion of experiences such that all or most conscious experiences conform to the person's understanding of the self. The average individual has learned that self-worth is contingent upon the demonstration of certain capacities and socially acceptable behaviors, which are

often inconsistent with a person's natural tendencies. For instance, a person may have learned that self-worth is contingent upon romantic/sexual feelings for a person of the opposite sex and nevertheless have sexual feelings for a same-sex person. According to Rogers, such self-incongruent feelings are "subceived" (processed in the mind without awareness) and distorted or denied before they reach awareness. For Rogers, the emergence of self-incongruent feelings may only take place when the person comes to understand the self in a different way, mainly as a person whose worth is not contingent upon what other people value and what other people think -- whose worth is unquestionable.

Clearly, Kelly's and Rogers' understanding of repression is quite similar. For both of these theorists, repression is a means of ignoring evidence that is inconsistent with one's current, desired understanding of personal experiences. Motivated by a need to avoid considerable anxiety, persons may simply exclude from their understanding threatening, but useful information about the self. For both theorists, the maintenance of a consistent, unilaterally desirable view of the self and world snowballs as a person develops an increasingly distorted understanding of the self and world. This, in turn, leads to unfulfillable expectations about the world and the self, which elicits more distortion and denial of experiences. Repression constrains (sometimes, severely) the kind of information available to the mind and thus prevents the person from truly understanding the world and the self.

Psychodynamic Research

Perceptual defense. Bruner and Postman (1947b) introduced the term perceptual

defense to refer to the raising of recognition thresholds for emotionally laden stimuli. In a very crude, but intuitively “appealing” procedure, Bruner and Postman (1949) placed typed words, one at a time, under several layers of onion skin, and then removed these skins, one layer at a time, until a naive subject recognized the word. Bruner and Postman found that more onion skin layers had to be removed for the recognition of emotionally charged words (e.g., sex). Other crude methods for manipulating recognition thresholds (e.g., separating the subject and target word by a great distance, Berger, 1956; reducing the ambient illumination, McClelland & Liberman, 1949) produced similar findings. A much more experimentally rigorous technique for examining perceptual defence involved the use of a tachistoscope — a device that manipulates either the illumination or exposure duration of a stimulus, while holding the other variable constant. To determine the recognition threshold of a word, the experimenter may gradually increase the illumination or exposure time until the subject responds with the appropriate word, or he/she may present nonemotional and emotional words each at a different level of illumination or exposure time and then require subjects to choose the target word from a normal list of words (the “forced-choice” technique). Using the tachistoscope procedure, several experimenters found higher thresholds for emotional words than nonemotional words (see Brown, 1961, for an extensive review of this literature). Unfortunately, several other experimenters (also reviewed in Brown, 1961) found evidence for lower recognition thresholds for emotional words, providing support for a “perceptual vigilance” hypothesis (Bruner & Postman, 1947a).

Many researchers have sought to debunk the perceptual defense hypothesis,

arguing for more mundane explanations for higher recognition thresholds. The premier counterargument to the perceptual defense hypothesis was the word frequency explanation. Howes and Solomon (1950) argued that higher thresholds for taboo words would be expected due to their relative infrequency of use in normal, daily conversation: taboo words are harder to recognize because they are simply less familiar. McGinnies (1950) replied to Howes and Solomon's (1950) criticism by noting that a) the taboo words were probably more frequently experienced than was indicated by the standard word frequency reference ("Thorndike-Lorge" word counts, which, as noted by Erdelyi, 1995, was actually developed to inform teachers when to teach certain words to children) and b) that the different frequencies of non-taboo words were not reliable predictors of recognition threshold. Another counterexplanation of perceptual defense is the expectancy-set explanation (e.g., Postman et al., 1953), which holds that subjects don't expect such taboo words to be presented to them and therefore fail to recognize these words at lower thresholds. Indeed, other studies have shown higher thresholds for words that were unexpected by subjects (for instance, a non-color word embedded in a sequence of color words, Postman & Bruner (1949). Despite the evidence in favor of the expectancy set explanation, Erdelyi (1995) argues that the use of "set" to explain anything is highly suspect. As he maintains, "set. . . [has] signified practically everything [from response biases to mental rigidity to anxiety]—and therefore nothing." (p. 7) Furthermore, Erdelyi argues that although expectancy set can account for perceptual defense, it can not account for the findings of perceptual vigilance, in which emotional words are more easily recognized. The most difficult counterexplanation for perceptual

defense is the response-bias explanation, also levelled at McGinnies by Howes and Solomon. According to one form of this argument, subjects are more hesitant to indicate recognition of taboo words; therefore, they require greater confidence about their identifications of taboo words and thus greater exposure duration or illumination of these words. The only tenable criticism against the response bias explanation is that it does not account for the findings of perceptual vigilance.

A convenience of the perceptual defense hypothesis is that any counter-explanation for it must also account for the findings of perceptual vigilance — which, at least on the face of it, is a logical impossibility. In order for the criticism of not accounting for perceptual vigilance to be a valid one, the findings of perceptual vigilance must be reconciled with the findings of perceptual defense. Under what circumstances do researchers find increased sensitivity to emotional stimuli and under what circumstances do researchers find decreased sensitivity? Drawing upon the results of several studies on recognition thresholds (e.g., Bruner & Postman, 1947a; DeLucia & Stagner, 1953; Levy, 1958; Neel, 1954), Brown (1961) hypothesized that a curvilinear relationship exists between recognition thresholds and stimulus emotionality: while people have greater difficulty recognizing moderately emotional stimuli, they have less difficulty with either nonemotional or highly emotional stimuli (Bruner & Postman, 1947a). Brown argued that a curvilinear relationship is expected if one assumes that recognition of emotional stimuli represents an approach-avoidance conflict, in which approach (recognition) prevails (over nonrecognition) for nonemotional stimuli (no threat; thus, no conflict) and for highly emotional stimuli (threatening stimuli demand recognition). This argument echoed an

earlier suggestion made by Bruner & Postman (1947a) that people selectively ignore emotional information, unless this information is beyond a “critical degree of emotionality,” in which a person selectively attends to the important/threatening information. Thus, the complex findings of the perceptual defense research may be attributable to a conflict between recognizing the importance of threatening information and avoiding the unpleasant awareness of this information.

Subliminal psychodynamic activation. A line of research related to perceptual defense was first carried out by Otto Poetzl (1917/1960). Poetzl presented subjects with pictorial stimuli that was too dim to be consciously recognized. The next day, he asked these subjects to report about the content of their dreams the previous day. Poetzl found that subjects dreams often reflected the content of the pictorial images presented subliminally the day before. Assuming that dreams are the arena of the psychodynamic unconscious (Freud, 1900), one may conclude from Poetzl’s findings that subliminal images may have a priming effect upon the unconscious mind. Over half a century later, Silverman and colleagues (e.g., Silverman et al., 1978; Silverman & Weinberger, 1985) examined the extent to which unconscious psychodynamic conflicts could be intensified or alleviated through subliminally presented messages. For instance, in one study (Silverman et al., 1978) college men in a dart-throwing competition were first presented with passages and pictures portraying Oedipal themes and then presented with one of the following subliminal messages: “BEATING DAD IS WRONG,” “BEATING DAD IS OK,” OR “PEOPLE ARE WALKING.” Silverman and colleagues theorized that the first message would intensify the Oedipal anxiety elicited by the passages and pictures, the

second message would weaken the anxiety, and the third message would have no effect. The researchers predicted greater deficits in performance when Oedipal anxiety was subliminally augmented, and this is just what they found; also, however, those men who were exposed to the second message, where Oedipal anxiety should be partially alleviated, performed better in dart-throwing than those who saw the control message.

Despite the intrigue of the SPA paradigm, the research has been highly controversial. Although some studies have replicated the findings, other studies have not. Also, Balay & Shevrin (1988) noted that it is far from obvious why rational (i.e., “secondary process”) statements like “Mommy and I are one” should activate an irrational (i.e., “primary process”) system like the unconscious mind. In defense of the reliability of SPA, but not its validity, Weinberger (1989) and D. Silverman (1989) cited a meta-analysis (Hardaway, 1985), which produced an average effect size of $d = .45$ for the statement “Mommy and I are one” vs. other statements. The evidence seems to indicate that people differentially respond to emotionally charged messages that are not consciously registered, and that these responses are consistent with a profile of bolstered or relaxed psychic defenses.

From this brief discussion of the research on perceptual defense and subliminal psychodynamic activation, it should be clear that cognitive processes may not always be influenced in a straight-forward way by ego defenses. Rather, repression may be highly dependent upon the situational context and the benefits vs. costs to the ego of restricting one’s emotional awareness.

Summary

Collectively, the research on repressive coping style is consistent with Freud’s

(1915/1957b) view that repression represents a devaluation of a threatening idea, even though the repressed idea continually exerts pressure on the person's mind to be valued and to influence behavior. Unconscious repressive defenses protect the mind from awareness of threatening aspects of experiences, except when the threat is so important that it demands the attention of the person. Repressors — persons who are more prone to deny feelings of anxiety — deny the importance of personally threatening events or information, which in turn minimizes the likelihood that these things will be remembered. Repressors adopt a stereotypical analysis of the emotionality of events probably for the sake of isolating unpleasant memories from other memories and thereby reducing the likelihood of encountering unpleasant memories. Indeed, the repressors acknowledgment of dominant emotional tone in stimuli and personal memories may reflect a need for social approval; however, in the absence of such approval motive, repressors dismiss or downplay all emotional information. Repressors appear to be masters of attention regulation — highly sensitive to important, self-relevant information yet able to distract themselves from such information to attend to other matters. Repression is a highly persistent avoidance of anxious thoughts or aspects of these thoughts — one which severely constricts the mental “arena” (see Mayer & Mitchell, in press) in which information processing occurs. While the admittedly anxious person is preoccupied with his/her problems, the repressor is semi-consciously preoccupied with not feeling anxious. Collectively, the regulation of attention, the dismissal of threats, and the oversimplified processing of emotional stimuli suggest that repressors use multiple methods in order to devalue potentially threatening stimuli — in short, to not care so much.

SECTION II.

RELIEF

Whereas the research on the nature of repression and repressive coping style is abundant and fairly well-defined, the research on the nature of relief is relatively sparse and eclectic. In the following section, I describe research regarding the subjective nature of relief and its relation to the experience of the preceding threat, the psychoanalytic notion of relief as tension-reduction, theories of emotion change that describe possible mechanisms behind emotional relief, and theories of drive satisfaction following frustration, theories of laughter, and the relief experience following personal disclosures. Collectively, the following research and theories will converge on an understanding of relief as freedom from pain, but a freedom that depends upon a re-evaluation of threatened experiences.

Foreground Phenomenology of Relief

Relief as Appraisal Process

Very little empirical research has examined the subjective experience of relief. Roseman, Spindel, and Jose (1990) asked college students to write down personal experiences involving emotional relief (including their feelings and thoughts) and several other emotions and to rate these experiences in terms of a number of dimensions, including how powerful the person felt in the situation, who or what brought about the circumstance that occasioned the emotional state, and whether the circumstance enabled one to approach a reward or avoid punishment. Consistent with their predictions, Roseman, Spindel and Jose found that relief was similar to the experience of joy along all

dimensions, except that the motivational underpinning of relief was the avoidance of punishment rather than the pursuit of reward. These researchers noted one other unique aspect of the relief experience: students could not talk about their relief without making reference to the negative circumstances that preceded the relief: "Apparently, subjects had difficulty focussing on the appraisals that caused relief, to the exclusion of appraisals that caused other emotions but were part of the same experience." (p. 910) Relief, then, appears to be a cognitively complex emotion — somehow interweaving past threats with present freedom from these threats.

Ortony, Clore & Collins (1988) proposed that the experience of relief is one of being "pleased about the disconfirmation of the prospect of an undesirable event" (p. 110). Within their cognitive structure theory of the emotions, the intensity of the relief experience depends upon two general things -- the intensity of the fear associated with the once-possible undesirable event and the degree to which the undesirable event is avoided. For example, a woman who, while caught in heavy traffic, greatly fears missing an important job interview, will later be greatly relieved if she reaches the interview on time; however, she will be less relieved if she is only a minute late. The intensity of prior fear about a prospective undesirable event depends upon many things, most notably the perceived undesirability of the prospective event, the likelihood of the event, the degree to which the event is imbued with a sense of reality and importance, and the psychological proximity of the event. Because of relief's connection to fear, these variables that affect the intensity of fear should also affect the intensity of relief.

Near-Negative Outcomes

In his Psychology of interpersonal relations, Fritz Heider (1958, p. 144) discussed the phenomenology of near-misses, such as escaping an accident “by the skin of one’s teeth.” According to Heider, a near-miss is an intensely moving event that provokes one of two attributions: either the person regards the near-miss as a warning to the self to be more careful in the future or as a sign of being blessed. If Heider is correct, the quality and intensity of relief following the same near-negative circumstance (e.g., nearly missing the interview) may be quite different for those who blame themselves for the near-negative circumstances and those who blame others or who can find no-one to blame, with non-blaming persons feeling the most relief.⁸

The only empirical support for relief following near-negative outcomes was provided by Johnson (1986). Johnson asked college students to judge the emotions of story characters who had been involved in moderately negative circumstances that could have been much worse. Johnson found that students rated the characters to be happy and satisfied if the characters were aware of even-worse outcomes that were apparently more probable (due to external circumstances). Accordingly, he concluded that not-so-bad outcomes produce satisfaction and happiness when these outcomes are conspicuously compared to nearly worse outcomes. Johnson’s study supports Heider’s model of “blessed” relief in that judged relief depended upon the probability of the near-worse outcome, about which the character could do nothing.

⁸ Heider’s conceptualization suggests that in near-negative circumstances where the blame is quite difficult to assign, persons having a greater external locus of control (Rotter, 1966) might feel greater relief.

In their discussion of the simulation heuristic, Kahneman & Tversky (1982) have suggested that an anticipated pleasant or unpleasant event that doesn't happen will augment the intensity of a certain emotion (e.g., frustration, regret, relief) to the extent that the near-event is more imaginable. Supposedly, the closer that a near-event was in time or space, or the more the actual happenings resemble the near-event, the more imaginable the near-event is; and the more imaginable the near-event is, the more heuristic influence its absence has on judgment. In evaluating the likelihood of near-events, people run mental simulations of the event occurring. The easier this mental simulation is to conduct, the more probable this event seems and the more emotion it stirs up. Thus, conceptualized as an emergent aspect of the mental simulation of near-negative outcomes, the intensity of relief may greatly depend upon the imaginability of the these avoided outcomes.

Negative-State Relief

There is other, indirect evidence that the experience of emotional relief is specifically linked to the negative emotion that precedes it. For instance, according to the negative-state relief hypothesis (e.g., Cialdini, Darby, and Vincent, 1973), altruistic behavior is motivated by a drive to reduce negative feelings. Helping makes one feel less bad about oneself, and this motivates prosocial behavior. Carlson and Miller (1987), however, found that while helping behavior alleviated student's feelings of guilt regarding unrelated things, helping did not reduce their feelings of sadness. This finding suggests that emotional relief may be specific to the removal of a particular kind of threat. One may regard guilt as the consequence of self-serving behavior at another's expense, which

undermines one's view of oneself as a good person. Accordingly, altruistic behavior may relieve feelings of guilt by helping one restore a sense of the self as good. Feelings of sadness, which are a consequence of loss, would not be relieved through helping behavior — unless somehow the helping behavior enabled a person to recover or replace what was lost (for instance, if the helping person had lost a friend, and the helping lead to a new friendship). Carlson & Miller's (1987) research also suggests that there may be many forms of relief that are particular to the negative emotion that precedes it: an anger relief, an embarrassment relief, a fear relief, . . . etc.

Importance of Threatened Experience

Together, the evidence suggests that the experience of relief is cognitively inseparable from the negative experience that precedes the relief. Based in part on the research on excitation-transfer, opponent-process theory and Freud's understanding of tension-release (see below), I became very interested in trying to quantify the relationship between emotional relief and the negative emotion that precedes it. In my master thesis research, I brought students into a laboratory setting and asked them to complete a "Social Sensitivity Test." The test consisted of trying to identify which person among sets of four photos was "psychologically abnormal in some way"; this task was chosen because pilot research had shown it to be involving for the subjects, yet it was sufficiently ambiguous that failure and success feedback were both highly convincing. Half of the subjects, who were preassigned to the control group, rated their moods before the test and after receiving their grades of 16/25 (designated as average). Experimental subjects, on the other hand, rated their mood a) before the test, b) after receiving an average grade of

8/25 (designated as the worst grade the experimenter has seen at the University), and c) after the experimenter returned to the laboratory, with an embarrassed look on his face, apologizing that he had used the wrong answer key to grade his/her exam, and indicating that he/she had actually received a 16/25 (an average score). As predicted, the results of the experiment revealed a strong negative correlation between how disappointed subjects felt prior to the “corrected” information and how relieved they felt after the corrected information.⁹

In addition to the failure-no-failure manipulation, half of the subjects were given a description of the test as being a highly important predictor of intelligence and success in social and professional settings, while the other half of subjects were given a description of the test as a highly specific test of social sensitivity and nothing else. I predicted that subjects who read a description of the test as highly important would feel both more disappointment and more relief following failure and corrected feedback. The results were marginally significant, in the predicted direction. As a manipulation check, following the corrected feedback, I asked all participants to rate how important they thought the test was. Dividing the group into high vs. low perceived importance based upon the subjects ratings, I found that persons who perceived (in retrospect) the test as more important experienced more disappointment and more relief.

Antonio Damasio (1994) has suggested that emotions are an essential aspect of decision making in that one’s emotional responses to different response options provide a

⁹ The modified instructions for the mood inventory required that subjects indicate how their moods had changed since they entered the laboratory. Some subjects may have compared their moods following the test correction to their moods following the “incorrect” test results rather than their moods at the beginning of the experiment.

kind of bias to the decision-making process. Emotions infuse these response options and anticipated consequences with real value, which enables a person to make everyday decisions (such as what to have for dinner a particular night) under uncertainty. Assuming that Damasio is correct, one can see why anxiety and anxiety relief are mutually related to the perceived importance of the threatened aspect of experience: both anxiety and anxiety relief represent evaluations of the threatened experience — anxiety is evaluation in terms of potential loss and anxiety relief is evaluation in terms of near-loss.

Background: Relief as Anxiety Reduction, Transformation, or Integration?

Tension Reduction

Consistent with the idea that the experience of emotional relief is intimately tied to the negative emotion that precedes it, emotional relief may simply be the physical and psychological reduction in a negative emotion. According to such a view, people feel relief as the reduction of some interpsychic and/or physical stress.

Pain and pleasure in psychoanalysis. From a psychoanalytic point of view, emotional relief represents a release of bound up, unconscious mental energy. Freud (1911/1963; 1920/1955) argued that the foremost (and most primitive) operating principle of the mind is the pleasure principle. The pleasure principle is a strategy in which the reduction of tension and maximization of pleasure is accomplished as quickly as possible. People experience “unpleasant tensions” associated with bodily needs, sexual or aggressive drives, and the presence of uncomfortable situations. These tensions, in turn, prompt a person to act or think in a way that meets the needs or reduces the drive or anxiety, and thereby reduces the psychic tension. Whereas an increase in psychic tension

produces feelings of “unpleasure,” a reduction in tension produces feelings of pleasure. For instance, infants experience feelings of unpleasurable tension prior to a bowel movement, and feelings of pleasurable tension-release following a bowel movement. Analogously, all aspects of a person’s behavior are driven by a dynamic negative (tension) and positive (tension-release) reinforcement system.

Freud (1920/1955) hypothesized that feelings of pleasure and unpleasure should be governed by certain psychophysical laws, such as those espoused by Fechner — particularly the relations between stability and instability. In light of this relation (no pun intended), Freud offered an alternative description of the pleasure principle: that “the mental apparatus endeavors to keep the quantity of excitation as low as possible or at least to keep it constant.” This endeavor or tendency is not always realized, however, because of certain opposing factors—most notably the conflict between survival and tension-reduction. Because of these opposing factors, the mind developed the ego and the reality principle, so that it could coordinate tension-reduction within the constraints of reality. Unfortunately, the development of the ego, and later the superego, set the stage for a dynamic conflict among various motives (tension-reduction vs. safety vs. social-and-self-acceptance). When this conflict among motives becomes too great for the person to deal with through normal behavioral channels, psychopathology develops. Thus, the mind’s work of relief-seeking is an all-important, but difficult task.

Laughter. Several psychological theorists regard the humor response — most notably laughter — as a relief experience. According to the arousal-safety theory of laughter (Berlyne, 1969; Tomkins, 1962), laughter occurs after an apparently threatening

stimulus is reinterpreted as harmless or trivial. Laughter may be regarded as an innate response of tension-release (Sroufe & Wunsch, 1972) in which arousal associated with confusion, anxiety, or other tensions is discharged. Although Sroufe & Wunsch did not regard the pre-laughter tension as necessarily unpleasant in valence, other theorists who have adopted the arousal-safety theory (e.g., Rothbart, 1973) posit a distinct emotional rebound from negative (distress or fear) to positive (happiness) emotional feelings (Rothbart, 1973). Anyone who has ever watched a suspense film, in which the main character is about to confront a killer in the bushes, but then realizes that the killer is merely the neighbor's blow-up doll or some other ridiculous object, may understand the natural link between laughter and relief. As with other forms of relief, laughter occurs as a re-evaluation of some situation, event, person or thing in light of information that undermines its formidability or importance.

Hobbes (1994/1650) regarded laughter as the recognition of superiority or triumph in the self: "the passion of laughter is nothing else but a sudden glory arising from sudden conception of some eminency in ourselves, by comparison with the infirmities of others, or with our own formerly" (p. 54-55). Other theorists, including Alexander Bain, Harald Höffding, and Freud (see Piddington, 1963, for a review) expanded upon Hobbes' conception of laughter to include with a feeling of superiority, respectively: a sense of freedom from restraint, a realization of self-preservation, and the satisfaction of aggressive impulses. The superiority theory of humor response is not incompatible with the arousal-safety theory of laughter. If one believes as Festinger (1955) that people are ever-engaged in social comparison, then each encounter with another person (or even personifiable

thing) represents a potential threat to one's self-esteem. The recognition of superiority over another provides a feeling of relief from such a threat. In this light, laughter is a reduction in tension regarding a misjudged threat to the self-concept.

That laughter is a manifestation of relief is supported by several additional observations made by philosophers and psychologists (all cited in Piddington, 1963). For instance, Plato regarded laughter as an experience of simultaneous pain and pleasure. Descartes, too, described laughter a mixture of pleasant and unpleasant feelings. Katherine Wilson observed that laughter enables a person to reconsider painful experiences in a way that produces delight rather than stress. In all of these observations, the experience of laughter is linked experientially to the tension that precedes the laughter, much as the experience of relief was intimately connected to the negative emotion that preceded it. Other philosophers have noted that laughter is the expression of liberty from constraint (Penjon), "strained expectation" (Kant), or bodily preparation for activity (Crile). More directly, J. C. Gregory argued that the pleasantness of laughter is completely due to emotional relief (from tension). Thus, as with relief, laughter represents both a re-evaluation of unpleasant experiences and a simultaneous sense of freedom from these experiences.

Rebound and Residual Relief

While the tension-reduction model of relief suggests that relief is a period of relaxation following the removal of some stressor, other theories regard relief as a revitalization of the organism — a change from being controlled or inhibited by negative circumstances to being once again in control of one's rewards and punishments.

Conditioned emotional response. According to some behaviorists, relief is defined as increased appetitive behavior following a reduction in the frequency or intensity of an aversive event (Hammond, 1970). When a mammal is threatened by an aversive stimulus, it is prevented from reducing other innate drives (e.g., hunger or thirst); the presence of the aversive stimulus serves as an obstacle that increases the mammal's frustration (amplifies its drive state). Once the aversive stimulus is removed, the mammal's behavior becomes more highly directed toward procuring the long-awaited reward (Mowrer, 1960). In this light, relief is manifested by compensatory goal-directed activity following frustration. Relief is a rebound in motivation from "can't do" to "can do."

Opponent-process theory. The opponent-process theory of motivation (Solomon, 1980) provides an explanation for why mammals seem to experience a natural emotional rebound when experiences that are unpleasant or pleasant are removed. For example, Solomon describes the behavior of baby ducklings as they first notice their mothers as highly excited stumbling in the direction of the mother; if the mothers are then immediately removed, the ducklings characteristically emit high-pitched distress calls. If, however, the ducklings never see their mothers in the first place, these distress calls are not emitted. Similarly, when Solomon inserted and then removed a nursing nipple in the mouths of sleeping 12-hour old babies (who were still digesting amniotic fluid and therefore not hungry), the babies began to cry. Again, if the nursing nipple had not been presented, the baby would not have become upset at its removal. Solomon cites Epstein's (1967) observation of military parachutists, who often experience extreme anxiety or terror during their first experience free-falling, but who experience a "stunned and stony-faced

expression for a few minutes, and then they usually smile, chatter, gesticulate, being very socially active and appearing to be elated.” (Solomon’s description, p. 693).

According to Solomon’s (1980) opponent process theory, emotional afterreactions such as relief are by-products of the mammalian motivational system that regulates approach and avoidance behavior (and conditioning). The motivational system is composed of two opposing processes: an ‘a process,’ which governs the main affective reaction to the stimulus, and a ‘b process,’ which governs the organism’s habituation to the stimulus. Loosely speaking, while the a process affectively “pulls” the organism either toward the stimulus or away from it, the b process simultaneously, but with less force, “pulls” in the opposite direction. The resultant “force” of the a and b processes is the felt (and displayed) emotional intensity (either pleasant or unpleasant) toward the stimulus. Habituation occurs because with repeated exposures to the same (or similar) stimulus, the b process pulls with greater and greater force, while the a process pulls with the same force. According to opponent-process theory, the emotional afterreactions experienced during relief occur because of another idiosyncratic feature of the b process -- it tends to keep pulling after the eliciting stimulus is removed and the a process has quit pulling. The euphoria that a parachutist feels upon landing is the preservation of the b process in the absence of the a process.

As mentioned above, the b process strengthens with repeated exposures to the same (or similar) stimulus. Accordingly, with repeated presentations and removals of the stimulus, the affective/motivational afterreaction is supposedly stronger and lasts longer. For example, when the pleasure of heroin intoxication wears off, the first-time user feels

some discomfort, but the long-time heroin addict experiences highly unpleasant withdrawal symptoms. At this point, I should mention that this last aspect of the opponent-process theory makes predictions about the nature of relief that seem a bit counterintuitive. Here is some anecdotal evidence. When I first practiced driving an automobile, I was very anxious behind the wheel and very relieved when the experience was over. Now, however, as I have habituated to the feel of driving, my experience of relief after driving is not nearly as intense as those first couple of months driving. In general, I find it hard to believe that relief should ever be greater than the anxiety that precedes it.¹⁰

Although the strengthening of relief with repeated exposure to a threat does not seem intuitively plausible, the transformation of motivation predicted by opponent-process theory does make sense. Once a mammal has had a pleasant experience (e.g., mating), it is an adaptive advantage for the b process to gradually emerge as an internal negative reinforcement system. Because of the strength of this motivational system, mammals develop strong attachments to their homes, and they form strong bonds with members of their species -- bonds maintained by the fear of separation. A transformation from negative reinforcement to positive reinforcement over time can also be adaptive. On a daily basis, mammals must risk their lives and possessions in order to live. When a risk continually pays off (e.g., scavenging when predators are nearby), the risk-taking behavior should be reinforced, and gradually, the mammal should come to be motivated by the reward

¹⁰ One possible exception to the dependence of relief upon felt anxiety is the phenomenon of retrospective relief. When a person becomes aware that he/she just unwittingly avoided a negative situation, the person may feel relief to the extent that he/she would have felt anxiety had he/she been able to anticipate the possible negative circumstance.

that the risk-taking promises, rather than the anxiety that the risk produces.

Opponent-process theory could explain relief as a perseveration of the b process following cessation of a threatening situation. The theory explicitly predicts a greater rebound in emotion state following more experiences with the threatening stimulus and its cessation. A direct test of an opponent-process model of relief would therefore require several presentations and removals of threatening stimuli over time, a test which is at the present time impractical.¹¹ Furthermore, I think that it is likely that the enhanced effect of the b-process with repeated exposure to a threatening stimulus has more to do with bolstered confidence that similar stressful situations (e.g., jumping from an airplane) will be positively resolved (by the parachute opening) than with augmented relief that the present situation has been resolved.¹² In sum, although the opponent-process theory has been used as an explanation for relief-like experiences, the long-term dynamics of the theory do not seem compatible with an intuitive understanding of relief experiences.

Excitation-transfer theory. In one of the classic studies in social psychology, Schachter & Singer (1962) proposed that emotion is a composite of undifferentiated physiological arousal that is labeled by the person in light of certain salient stimuli (i.e., what has happened to the person). Arousal supplies the intensity of the emotion and the cognitive label supplies the quality of the emotion. Their classic demonstration of the two-

¹¹ However, one could examine anxiety/relief cycles across time in persons viewing basketball games or playing video games or encountering other such situations in which several near-equal-intensity manipulations are possible across time.

¹² A slightly different conceptualization of the b-process is that pleasant b states represent a feeling of increased long-term security about an aspect of one's experiences, while unpleasant b states represent a feeling of increased long-term insecurity about an aspect of one's experiences. According to this view, relief may be distinguished from a pleasant b process to the extent that relief is a feeling of unanticipated short-term security.

factor model involved manipulating physiological arousal via injection of epinephrine vs. placebo and manipulating the cognitive label of the arousal by a) either informing or not informing the person about the true physiological effects of the injection or misinforming the person that the drug produced an itching sensation, and b) creating a social situation that would elicit either annoyance or happiness from the confederate. Schachter and Singer predicted that participants who were injected with epinephrine, but were uninformed or misinformed about the effects of the drugs would attribute their arousal to the salient stimulus (a confederate's behavior) in their environment; accordingly, uninformed arousal would augment happiness in the happiness condition and anger/annoyance in the anger/annoyance condition. The results seemed to support Schachter and Singer's predictions: Of those Ss who were injected with epinephrine, those who were ignorant of the effects reported more happiness in the happy condition and more annoyance in the anger condition relative to Ss who were informed about the drug.

There were many notable problems with Schachter and Singer's study, including the fact that all subjects in all conditions reported feeling moderately happy (between .98 and 1.91 on a scale of -4 to +4). Also, the self-report measure was a combined happiness-minus-irritation measure. The authors should have kept these two factors (which are not bipolar dimensions of affect) separate; my hunch is that they did keep these scales separate at first, but combined them when their data produced nothing. Also, several Ss at different stages were dismissed for suspicion and other reasons. Interestingly, if one examines the tables of self-reported emotions, one can see that Ss reported being the most happy in the angry condition when they were informed about the epinephrine, and Ss

reported being the most angry in the happy condition when they were informed about the epinephrine. This is a puzzling finding that is not explainable by the two-factor theory.

Reisenzein (1983) reviewed Schachter and Singer's theory and subsequent research generated by their theory. He noted that emotion, cognition, and arousal were not well-defined in Schachter and Singer's model. Furthermore, he reviewed three lines of research generated by the model (the so-called "misattribution-of-arousal studies," arousal inhibition studies, and excitation transfer studies) and concluded that the only line of research that has received adequate support is the excitation transfer research. For instance, subsequent attempts to replicate Schachter and Singer's results produced mixed results. Marshall & Zimbardo (1979) replicated Schachter and Singer's results for the happiness condition when they administered the same dose of epinephrine to Ss; but when Ss were given a greater dose of epinephrine, they reported feeling negatively. Similarly, Christina Maslach (1979) found that unexplained arousal due to post-hypnotic suggestion lead to decidedly negative emotion. Schachter and Singer (1979) noted some methodological problems with these replications, including the poor timing of arousal in Maslach's study and the existence of embedded information in Marshall and Zimbardo's misinformation condition; however, I think that these demonstrations support the idea that arousal may not be affectively neutral. Indeed, several researchers (e.g., Ax, 1953; Ekman, Levensen, & Freisen, 1983; Schwartz et al., 1981; Sinha et al., 1992; Uchiyama, 1992; Uchiyama et al., 1990; see Cacioppo et al., 1993, for a review) provided evidence that cardiovascular indices (most notably DBP) differentiate the imagined feelings of joy, sadness, anger and fear.

The excitation-transfer paradigm has generated consistent empirical support over the years. According to this paradigm, arousal produced by some earlier emotional experience or by physical activity will — if enough time has elapsed — be assimilated into a subsequent emotional experience, making that emotional experience more intense. Zillman & Bryant (1974) found that prior physical exercise (e.g., running in place for a few minutes) leads to greater aggressiveness in a later situation. Similarly, White et al. (1982) found that prior physical exercise increased males' romantic attraction to attractive females and decreased their romantic attraction to unattractive females. Additional research has demonstrated increased romantic attraction after persons are startled (Dienstbier, 1979) and increased aggressiveness after persons are exposed to a loud noise (Donnerstein & Wilson, 1976), erotic stimuli (e.g., Cantor, Zillman & Einsiedel, 1978), or aggressive films (Donnerstein, Donnerstein, & Barrett, 1976). Interestingly, these excitation-transfer effects do not take place unless there is about a ten-minute lag between the first stimulus situation and the second stimulus situation (e.g., Cantor & Zillman, 1973; Zillman, Johnson & Day, 1974). Zillman (1978) argues that such a recovery period is expected if one is to really misattribute residual arousal to another stimulus.

According to excitation transfer theory, relief represents a relabeling of residual arousal that was usurped from an antecedent anxiety experience. Although the excitation transfer explanation is quite appealing, in order to explain emotional relief it must make an exception to the ten-minute lag rule. Emotional relief often occurs immediately after a negative stimulus ceases; thus, the arousal brought upon by the negative stimulus is not simply misattributed, but perhaps re-attributed to the removal of the stimulus. In any

event, one would expect that when persons feel relief, they are at least dimly aware of such a re-attribution process.

Disclosure

The talking cure. One of the greatest influences on the development of psychoanalysis by Freud was a remarkable treatment approach taken by a colleague of Freud's, Joseph Breuer. In the now-famous case of "Anna O," Breuer (see Breuer & Freud, 1895) treated a young woman suffering from hysterical symptoms, which included a dual personality, limb paralysis, hallucinations and other perceptual disturbances. Breuer's technique was simple: Anna O merely talked at length about her hallucinations and other somatic problems. Breuer believed that the simple act of talking about the symptoms released some of the built-up tension associated with the symptoms. Even though the therapy ended with an unfortunate controversy (Anna O claimed to be pregnant with Breuer's child), the therapy demonstrated some remarkable short-term gains in the reduction of Anna O's symptoms.

The success that Breuer had with Anna O prompted Freud to try out this "talking cure" on his own client, "Frau Emmy von N." Freud believed that the talking cure was an excellent approach to psychotherapy because it made the client become aware of certain unconscious thoughts and feelings (e.g., sexual or aggressive urges, conflicts between desires and reality, anxiety about certain aspects of one's childhood or present experiences), which were producing an abundance of tension merely because these thoughts and feelings had been repressed. By talking about one's thoughts and feelings, one is apt to stumble upon, and perhaps set free, certain bound-up feelings and thoughts,

which have been demanding expression. In order to facilitate the work of the talking cure, Freud hypnotized his client and then instructed her to explore the meaning of her particular psychosomatic symptoms (which included facial ticks and speech disturbances). Although Freud's client eventually got worse, she did experience some short-term reduction in her symptoms.

The whole story. Although Freud believed that the talking cure was beneficial for its ability to bring repressed feelings and thoughts to consciousness, more recent research suggests that the talking cure might benefit the individual by helping one to organize and better understand one's experiences. James Pennebaker (e.g., Pennebaker, Barger, & Tiebout, 1989; Pennebaker & Susman, 1988; see also, Pennebaker, 1990) has conducted research on the mental health effects of talking or writing about a personal trauma. For instance, Pennebaker & O'Heeron (1984) asked persons who had lost their spouses in automobile accidents about the frequency with which they spoke to family and friends about the death. Pennebaker and O'Heeron found that those persons who had spoken more frequently about the death reported fewer mental intrusions related to the accident and less problems with physical health the following year. Similarly, Pennebaker & Beall (1986) asked college students to write about their most upsetting or traumatic experiences for four consecutive days. Each student was instructed to concentrate on either a) the facts of the experience, b) their feelings about the experience, or c) both the facts and their feelings. The investigators measured the number of health care visits for physical illness 2.5 months prior to and 5.5 months after the study. Pennebaker & Beall's results were striking: while writing about the facts or their feelings alone actually apparently increased

the number of health care visits, writing about facts and feelings apparently decreased the number of health care visits. Pennebaker & Beall suggest that the person must be able to construct the entire story about their traumatic experiences in order for them to be stress-reducing (and thus health-improving). Pennebaker (1992) elaborated upon this general formulation by suggesting that healthy personal narratives must be coherent, integrative stories, which connect feeling to fact and thus the self to the event.

Coherence and security. Some theoretical support for the notion that coherent reconstruction is healthy comes from the developers of the Adult Attachment Interview (Main & Goldwyn 1992; see also Main, Kaplan, & Cassidy, 1985). According to the coding scheme of the AAI, adult persons are categorized as either secure, dismissing, preoccupied or unresolved with respect to experiences with their parents. Paralleling the infant attachment patterns (see Ainsworth et al., 1978), the adult classifications represent how well persons have learned to understand and accept their complex relationships with their parents. Persons who are dismissing of the importance of certain experiences with their parents or who are preoccupied with their feelings about the experiences tend to give relatively incoherent accounts of their experiences. Persons who have had a traumatic experience that is unresolved give coherent accounts, but which are at times bizarre and implausible. In contrast, secure persons give plausible coherent, complex (having both positive and negative connotations) accounts of their experiences with and feelings about their parents. If one assumes that the adult attachment classifications are true parallels to the infant classifications, then the non-secure classifications harbor considerable anxiety and resentment, “expect” (perhaps semi-consciously) relationships with others to have

problematic themes that echo experiences with one's parents, and thus behave toward others with some degree of defensive mistrust — all of which undoubtedly adversely affects their mental well-being.

Summary

So what do we know about the nature of emotional relief? First, there seems to be a direct analogue to emotional relief in physical tension reduction. Such an analogue is consistent with Antonio Damasio's (1994) belief that emotional feeling states are neurally associated with somatic processing centers in the brain. Second, both the emotional and cognitive components of emotional relief appear to be intimately connected to the anxiety-inducing situation which is antecedent to the relief. Consistent with this idea, the experience of laughter, which has been regarded as the manifestation of relief, unites past incongruities, misperceptions, or infirmities with present clarifications, resolutions, or glories. Third, the experiential connection between relief and prior anxiety may be largely due to the role of perceived importance of threatened experiences: those experiences that are deemed more important will elicit more anxiety when they are threatened and more relief when they are re-secured. Fourth, the exact mechanism by which the antecedent thoughts and feelings are transformed into, or simply give way to, the relief experience is unknown: relief may occur through the "relabelling" of residual arousal from preceding anxiety, an opponent-process "rebound" from an unpleasant feeling state to a pleasant feeling state, a better understanding of negative circumstances and/or threatened experiences, or some combination of these processes. Regardless of the mechanism behind emotional relief, the relief experience undoubtedly involves a re-evaluation of

negative circumstances and a subsequent freedom from the psychical tension produced by these circumstances.

SECTION III.

A MODEL FOR REPRESSION AND RELIEF

Common Themes of Repression and Relief

As is generally the case with emotional phenomena, an understanding of the antecedents and manifestations of repression and relief is somewhat complex and seemingly contradictory at times. Nevertheless, the research and theoretical insights about repression and relief do converge upon a few themes.

First, people are often confronted by situations that to some extent threaten desired expectations about themselves or the world. For instance, a researcher discovers that a year's worth of research is worthless because the p values are greater than .05. Occasionally, these threats dissolve on their own accord and the person is able to reaffirm that all is well with the world. For instance, the researcher may find significant p values when a few outliers have been removed. More often, however, the person must deal with these threats to the self by changing his/her expectations about the self and/or the world. For instance, the researcher must realize that the null hypothesis might be a better representation of the truth and that his/her efforts are better spent elsewhere.

Second, emotional pain and pleasure are mutually dependent upon one another. From Freud's (1911/1963a) understanding of tension reduction to Solomon's (1980) opponent-process theory, emotional pleasure has been viewed as a consequence of prior feelings of pain. Indeed, the research on excitation transfer suggests that the intensity of feelings about some event partly determines the intensity of feelings toward a subsequent, but unrelated event. The research on the phenomenology of relief suggests that the

cognitive component of the relief experience is organized around thoughts about the prior threat. Also, research on the intensity of relief and prior anxiety suggests that they both depend upon the perceived importance of the threatened aspect of one's experience. The research on internalizers and externalizers suggests that relief is in part a consequence of the behavioral expression of negative emotion. Finally, the research on disclosure of threats suggests that the experience of relief depends upon a full understanding of the threat and one's reaction to the threat.

Third, repression and relief are evaluative processes. Although the popular conception of repression is a forgetting of whole memories, neither Freud's writings nor contemporary research supports such a simplistic view. While there is some evidence that people tend to selectively forget negative self-evaluative information, it appears as though self-deception often works to distort the intensity and complexity of one's feelings about an event rather than simply the existence of these feelings or the memory of the event. Rather than denying that the null hypothesis might be true, the researcher may deny just how much he/she cares about the line of research. The research on perceptual defense and vigilance suggests that although people tend to filter out of awareness information that is moderately emotional and self-irrelevant, people are sharply tuned to information that is highly emotional or self-relevant. Perhaps, the repressive filter can not ignore what is obvious, but can only distort what is already ambiguous. As with repression, relief probably occasions an adjustment of one's evaluations about some aspect of one's experience that was threatened. A mother who loses and then finds her child at an amusement park is apt to re-evaluate the importance of paying attention to her child's

location at such places and to re-affirm the importance of her child. Research on the phenomenology of relief suggests that the relief experience is imbued with thoughts such as “what if the threat had remained or been worse?” and “boy, will I be careful next time!” James Pennebaker’s research on disclosure suggests that people need to make sense of past traumas in order to experience psychological relief. In all, although relief may represent a liberation of the mind from the awareness of some threat, relief is probably not simply a letting go, but an active restoration or revision of assumptions about the self and world.

In the following sections, I summarize research and observations that expand upon the above-mentioned unifying themes of repression and relief. In particular, I address the following questions: What happens when a repressor encounters a threat, which is subsequently removed? Why does perceived importance have a pivot role in repression and the relief experience? What physiological and motivational systems could underly both repression and relief?

“The Return of the Repressed”

Beyond the work conducted on rats within the paradigm of conditioned emotional response, very few researchers have sought to manipulate emotional relief in the laboratory. The early work on the “return of the repressed” is an exception. Zeller (1950a) proposed and tested (Zeller, 1950b) a model for testing the effects of ego-threatening failure and subsequent success on the recall of nonsense syllables. Two-to-three days after learning a list of nonsense syllables to a specific criterion, subjects

engaged in a seemingly simple task similar to the electronic game "Simon."¹³ In the control group, all subjects were given an easy level of the task and then told that they "did all right" on the task. In the experimental group, all subjects were given a more difficult level of the task and told that they performed so poorly that the experimenter doubted their mental fitness for college. After this first manipulation, subjects were asked to recall the list of non-sense syllables. Two-to-three days later, each subject was again summoned to the laboratory for additional testing. For the control group, the procedure was identical to the procedure two days prior (success with the Simon-like game followed by a recall test for the nonsense syllables). The experimental group, however, was re-introduced to the Simon-like game at a much easier level, in which success was guaranteed. After a number of successes and convincing the subject that his/her score was actually quite good, the experimenter again tested the subject on his/her recall of the nonsense syllables. In two separate studies, Zeller obtained the same findings: after subjects failed at the Simon-like task, they recalled less syllables; however, when they subsequently succeeded at the task, the subjects recalled some syllables that they had not been able to recall previously — in other words, their memories had apparently improved with their self-efficacy.

A few years later, Flavell (1955) conducted a near replication of Zeller's study, with one major revision -- rather than letting subjects eventually succeed at the Simon-like game, Flavell merely informed subjects of the fact that the experimental task was designed to be unusually difficult and that no-one was expected to perform very well on it. As with

¹³ Simon is a game in which a series of different colored lights flash in random order, and the player's task is to exactly reproduce the sequence of colored flashes. Zeller (1950b) placed five black blocks in a straight line in front of the subject and tapped different blocks with a sixth block in his hand. The subject had to reproduce the order of blocks tapped.

Zeller, Flavell found a rebound in words recalled after the relief manipulation; however, Flavell's relief effect was not selective for unpleasant words.

One of the most interesting aspects of Zeller and Flavell's studies was their qualitative remarks regarding the behavior of subjects in the experimental group just prior to the final recall task. For Zeller's (1950b) subjects, the gradual success with the easy task brought about an extraordinary change in the subjects:

It was amazing to see the change in the attitude on the part of the subject. . . The entire tone of the relationship [between experimenter and subject] was altered. The subject was cooperative, happy, and in some cases almost euphoric. (p. 413)

For Flavell's subjects, who perhaps were made to focus on their being deceived in the experiment, the change was less dramatic, but notable:

About half of the Ss frankly stated that the interpretations [about their poor performance on the Simon-like task] had been very disturbing to them. The professed lack of anxiety on the part of the remaining Ss was in most cases belied by the presence of observable tenseness, facial grimaces, etc., and by the obvious relief most Ss showed when told they had been victims of an experimental hoax.

Thus, in contrast to Zeller's "reborn" subjects, Flavell's subjects appeared to benefit less motivationally than did Zeller's subjects, despite their similar improvement in recall. Thus, the degree of emotional relief one feels seems to depend upon whether or not the relief concerns a personally important aspect of one's experience or self. When the relief means that an important aspect of the self has been recovered (e.g., when Zeller's subjects succeeded with the block task; or when subjects in my master's thesis study had succeeded at a test that was perceived as important), the relief is strong; however, when the relief means that an unimportant aspect of the self has been recovered, or that a supposedly important aspect is found to be really unimportant (e.g., Flavell's experiment), the relief is not so strong.

Repression and Relief as Evaluative Processes

Acknowledgment of Importance

One additional theme in the research of repression and relief is the central role that perceived importance takes. Repression occurs when a person perceives a threat to one or more assumptions that the person wants desperately to protect, and this person subsequently denies the importance of this threat, even though his/her sympathetic nervous system still acts as if the threat is important. Relief occurs when a threat to one's assumptions is removed or disconfirmed, and the importance of these assumptions has, in the meantime, become particularly clear (e.g., Dorothy's "There's no place like home!"). The function of repression is the continued protection of desired, but unwarranted assumptions about the self and world. The function of the relief experience is the reaffirmation of the importance of certain assumptions in one's life, through a glimpse at life without these assumptions. According to this model, although repressors may exhibit the physiological signs of relief after a threat is removed or disconfirmed, they cannot consciously experience relief because they cannot acknowledge the importance of the threat. Furthermore, and perhaps most importantly, because repressors don't acknowledge the importance of evidence against their assumptions, they can not see the importance in changing these assumptions to reflect their experiences; as a consequence, unless the threat merely disappears, repressors can never resolve the physiological tension within themselves that continually prepares them to do something about the threat.

Individual Differences in Repression and Relief

My master's thesis was concerned with establishing some generalizations about the

experience of emotional relief for the average person. As with any emotional experience, there are undoubtedly significant individual differences in one's tendency (and perhaps capacity) to experience emotional relief. Larsen & Diener (1987) describe their theory of affect intensity, in which people who tend to experience negative emotions (e.g., anger, fear, and sadness) intensely, also tend to experience positive emotions (e.g., joy and love) intensely. According to the affect intensity model, some people feel great anxiety and great relief simply because they are more emotional; likewise, some persons feel little anxiety and relief because they are less emotional in general.

Another way of conceptualizing affect intensity is in terms of how important people regard different situations. Some people are concerned about very many things, while some people are less concerned. Some people are highly invested in the outcomes of sporting events, the stock market, first dates with a potential romantic partner, and other matters; while other people are apparently less invested (the *c'est la vie* attitude) or more "cool" about things. Such a re-conceptualization of affect intensity makes it perfectly compatible with the results of my masters thesis research. *Emotional intensity is a function of perceived importance of a situation, and some people are more emotional simply because they tend to see situations as more important.*

Psychotherapy and Relief

One can regard psychotherapy as the process by which a client either learns to behave in a socially appropriate or productive way or discovers some degree of relief from psychological pain. Psychological relief may follow insights about one's irrational beliefs (as with cognitive and rational-emotive therapy), transference and realization of

unconscious conflicts (as with psychodynamic therapy), the restoration of congruence between what a person thinks of him/herself and what his/her experiences say about the self (as in client-centered therapy), acceptance of death, existential freedom, existential isolation, and meaninglessness in life (as in existential therapy), becoming sharply aware of one's dynamic bodily sensations and what they communicate to the self (as in gestalt therapy), and so forth. One theme that underlies all nonbehavioral therapies is the assumption that psychological disturbance involves an allocation of attention or mental energy toward or away from some problem: the mind has less working memory for productive thought and behavior. After confronting and partially resolving the problem in therapy, some of the mental energy or attention devoted to the avoidance of, or preoccupation with, the problem is liberated. I believe that this attentional/motivational liberation is at the heart of the relief experience.

Autonomic Systems of Repression and Relief

Physiology of Repression

The peripheral physiological activation accompanying repression has been well-documented. For instance, McGinnies (1949) measured electrodermal activity while presenting taboo words, such as penis and vagina, to subjects, and he found increases in electrodermal activity for these taboo words, even when the words were below recognition threshold (see "subliminal psychodynamic activation" above). Weinberger, Schwartz & Davidson (1979) observed higher increases in systolic blood pressure, heart rate, and electrodermal activity for repressors (as opposed to nonrepressors) when they were given an ego-threatening sentence-completion task. Also as mentioned above,

repressors generally evidence higher chronic basal (nonreactive) arousal than nonrepressors. Between-subject research on internalizers shows similarly augmented cardiovascular reactivity. More recently, Brown et al. (1996) demonstrated that the basal salivary cortisol levels of repressors were higher for repressors than low-anxious persons. This increase in repressors' cortisol levels may represent either an increased preparedness for an uncertain or insecure future and/or an increase defensiveness toward threatening information¹⁴.

One of the most interesting lines of research on emotional physiology has only very recently been related to repression. Research by Richard Davidson and Nathan Fox (e.g., Davidson et al., 1990; Davidson & Fox, 1982; Davidson & Fox, 1989; Fox & Davidson, 1986) on the cerebral lateralization of emotion suggests that left prefrontal cortex might be slightly specialized toward producing (or regulating) approach-related emotions (for instance, anger and joy), while the right prefrontal cortex might be slightly specialized for avoidance-related emotions (for instance, sadness and fear). Interestingly, Tomarken & Davidson (1994) found that baseline EEG readings of alpha wave activity in the left midfrontal and lateral frontal cortex (relative to right-side counterparts) were substantially greater for repressors than EEG readings from highly anxious, non-anxious, and highly depressed women. Tomarken & Davidson review additional evidence and theoretical statements that collectively suggest that the left prefrontal cortex is specialized for inhibiting negative affect and promoting approach-related behavior. According to this perspective, repression may consist of the overshadowing of negative affect by goal-

¹⁴ Because Brown et al. (1996) omitted a group in their research design, they could not differentially test the two explanations.

related activity (for instance, burying oneself in one's work).

Physiology of Relief

To date, no investigator has mapped the peripheral physiology of emotional relief, however, several studies and theoretical perspectives provide clues regarding how relief might be manifested autonomically.

First, the autonomic profile of emotional relief might be similar to that of happiness, relaxation, or laughter. Cacioppo et al. (1993) reviewed studies that attempted to determine the autonomic profiles of various discrete emotions, such as fear, anger, and happiness. Relative to subjects receiving no emotion manipulation, subjects receiving happiness manipulations in various studies did not display any significant changes in heart rate, systolic blood pressure or diastolic blood pressure. In contrast, subjects receiving relaxation manipulations, exhibited decreased heart rate, SBP, and DBP. Ruch (1993) reviewed research on the autonomic profile of laughter. Consistent with the body tremors and unique pattern of respiration that follow define laughing behavior, laughter is accompanied by marked increases in heart rate, systolic blood pressure, and diastolic blood pressure (Fry & Savin, 1988), as well as electrodermal activity (Averill, 1969). Generally, this elevated autonomic activity returns to baseline (or perhaps overshoots it) immediately following the cessation of laughter (Fry & Savin, 1988). Consistent with these findings, laughter may represent a transformation of tonic, anxious "potential energy" (i.e., bodily preparation for flight/fight response) into phasic, pleasant "kinetic energy," which may be released in brief, intense motor activity.

Second, the autonomic profile of relief might be opposite that of fear. In Cacioppo

et al.'s (1993) review, fear manipulations (relative to controls) were generally accompanied by increased heart rate and systolic blood pressure. If emotional relief represents an unravelling of the fear response, then perhaps relief will manifest a cardiovascular profile that is opposite to fear, namely decreased heart rate and systolic blood pressure. Such a pattern of "autonomic reversal" would be manifest as a decrease in heart rate and SBP to either baseline (pre-fear) levels or sub-baseline levels. Sub-baseline levels would be expected if the relief response exterminates fear through a relaxation response, à la reciprocal inhibition (Wolpe, 1961).

Third, the autonomic profile of relief might conform to one of several models of arousal, each broadly defined by an approach-withdrawal theme. For instance, the idea that relief represents revitalization and restoration following some crisis suggests that relief might be a parasympathetic process, while fear and other precursors to relief are sympathetic processes. In contrast to the energy mobilizing sympathetic nervous system (SNS), the parasympathetic nervous system (PNS) is designed to moderate activity and repair damaged or undernourished tissue. Whereas the primary manifestation of SNS activity is vascular dilation or constriction (which is very roughly measured by blood pressure), the primary manifestation of PNS activity is in suppression of heart rate by the vagus nerve (Blascovich & Kelsey, 1990). If relief is truly a PNS process, then relief should be accompanied by significant decreases in heart rate.¹⁵

Another popular model of arousal within which relief seems to have a place is the

¹⁵ Because heart rate is also (secondarily) affected by SNS activity, significant changes in the SNS, relative to changes in the PNS, might mask the effect of the PNS on heart rate. Blascovich & Kelsey (1990) suggest measuring vagal tone (which is a measure of the effect of respiration on heart rate) as a more accurate index of PNS activity.

activation-inhibition model. According to Jeffrey Gray's (1987a; 1987b) version of this model, there are two motivational systems in mammals that collectively govern their conditioned emotional and behavioral responses to stimuli. The behavioral approach system (BAS) is activated by a cue in the environment that informs the mammal of the current appropriateness of a conditioned behavior (e.g., teasing a friend) for producing pleasant circumstances -- either a reward (e.g., friend laughs) or safety from punishment (e.g., teasing prevents serious conversation with friend). In contrast, the behavioral inhibition system (BIS) is activated by a cue that informs the mammal of the current inappropriateness of a behavior (whether conditioned or unconditioned), which would lead to unpleasant circumstances -- either punishment (e.g., friend snaps at you) or nonreward (friend discontinues pleasant conversation).¹⁶ Importantly, Gray (1987a) argued that the BIS underlies feelings of anxiety, for the BIS merely delays (perhaps indefinitely) the emission of an unsafe behavior. Therefore, assuming that relief represents a decrease in anxiety, perhaps relief is the deactivation of the BIS (but not necessarily a corresponding activation of the BAS). How would such a deactivation be represented physiologically? Fowles (1980) argued that the activity of the BIS is manifested in electrodermal activity; therefore, a BIS relief should be manifested in decreased skin conductance. Also, BIS strength has been associated with greater relative activation of the right prefrontal cortex, which exerts an inhibitory influence on several neural systems that are involved in the production of behavior (Sutton & Davidson, 1997); accordingly, BIS relief might be

¹⁶ In the absence of significant behavior-guiding cues, a third system -- the fight-flight system (FFS) -- will prompt the mammal to emit an unshaped behavior (such as attacking or leaving a friend) that prevents or terminates punishment or removes an obstacle that has prevented reward.

manifested as a decrease in activity of the right prefrontal cortex. In terms of cardiovascular activity, if BIS activity is manifested as anxiety, then BIS relief should be accompanied by decreases in heart rate and systolic blood pressure (Cacioppo et al., 1993).

In general, the reviewed research and theoretical perspectives suggest that repressive coping and emotional relief (except in the case of persistent laughter or exhilaration) will be manifested as increased autonomic arousal and decreased autonomic arousal, respectively. The extent to which these patterns conform to a PNS/SNS model of arousal or a BIS model of arousal is unclear at present. Furthermore, because autonomic arousal is influenced by diverse aspects of the stimulus-response context (e.g., whether the stimulus is novel or unexpected; Brener, 1987), as well as an individual's response stereotypy¹⁷ (Lacey & Lacey, 1958) and other extraneous variables such as drug use and physical exertion, a laboratory researcher might expect to uncover only a rough approximation of the true pattern of the autonomic activity involved in the experience of emotional relief.

Different Types of Relief

So far in this section, I have been referring to emotional relief as a unitary phenomenon, which is experientially and autonomically opposite to repression. Actually, one might conceive of several qualitatively different kinds of relief. For instance, relief that follows removal of a feared stimulus might be experientially and autonomically distinct from relief that follows removal of an obstacle to some reward or goal. Similarly,

¹⁷ For instance, some people appear to manifest their anxiety more strongly in electrodermal activity, while other manifest their anxiety in elevated systolic blood pressure.

relief that results from one's own actions may be different from an incidental relief. Relief that results from reconceptualizing a threat or recognizing one's resources to deal effectively with a threat may be different from relief that results from the mere termination of the threat. Finally, relief that results from terminating a threat to one's self-esteem might be different from relief that results from terminating a threat to one's well-being or other valued experiences. What is common to all of these relief experiences is that a valued aspect of one's experiences (whether an expected goal, another person, a characteristic of the self) that once was threatened is no longer so threatened. To the extent that repression distorts one's view of the nature of a threat, it could interfere with all types of relief, but most especially that type of relief which is created by actively reconsidering the threat and one's resources to deal with it.

In the foregoing discussion, I have asserted that repression and relief are evaluative processes that represent vastly different ways of dealing with anxiety. In the wake of a threat, repression operates by devaluing and distancing, while relief operates through re-valuing and re-connecting. Anxiety represents a mobilization of the body and mind to deal with threat to one's experiences or self-view; and while repression places this mobilization "on hold" until something can be done to eliminate the threat, relief frees this pent-up energy as one either realizes that the threat is no longer present or recognizes one's resources for adequately dealing with the threat.

A Test of the Model

According to the model developed above, repression and relief are very nearly opposite processes. One should therefore expect that persons who are predisposed to use

repression to cope with ego-threats would have difficulty feeling emotional relief. Such persons are predisposed to distort their feelings, rather than to come to terms with them. Thus, the examination of repressors' experience of relief provides an excellent test of the model of repression and relief as devaluative and re-evaluative processes.

Approach of the Present Study

In order to examine whether, and under what conditions, repressors and nonrepressors experience emotional relief, I placed repressors and nonrepressors in a series of computerized mood manipulations, two of which were designed to create threats and associated anxiety and three of which were designed to moderate or remove the threat and produce relief. In one series of manipulations, subjects completed a bogus "Psychological Sensitivity Test," received feedback that they failed the test, received an opportunity for catharsis by writing about their failure (as a control, half of the subjects underwent a distraction task), and then received feedback that a scoring error had been made and they, in fact, had done well on the test. Self-reported mood, blood pressure, and heart rate were assessed at critical times during these manipulations. Furthermore, the subject indicated his/her perception of the test following failure feedback, by rating such things as how important psychological sensitivity is. In general, it was expected that repressors would report less relief following the writing task and following the success feedback and they would rate the Psychological Sensitivity Test as less important. Most subjects experienced a second anxiety and relief manipulation, in which they underwent a bogus security check, which everyone passed. Again, it was expected that repressors would report less relief than nonrepressors when they learned that they passed the security

check. In terms of cardiovascular response, it was expected that persons would become more aroused in the presence of a threat (i.e., test failure or the security check) and less aroused following the removal of the threat (i.e., test success or passing the security check) and that these observations would be equally true of repressors and nonrepressors.

Hypotheses

The present study examined a number of research concerns, including the construct validity of repressive coping style and the normative pattern of self-reported mood and cardiovascular activity underlying relief. For parsimony, I formally tested seven hypotheses, which focused on the test evaluation manipulations.

Hypothesis I: In comparison to nonrepressors, repressors will exhibit equal or greater decreases in cardiovascular activity following failure removal. In previous studies, the blood pressure and heart rate of repressors increase as much as or more than nonrepressors as these persons perform ego-threatening tasks such as mental arithmetic (see Weinberger et al., 1990). Just as their physiological reaction to the anxiety-eliciting situation is substantial, I expected that repressors' physiological reactivity following the cessation of the anxiety-eliciting situation would also be substantial -- equal to or greater than the physiological relief of nonrepressors.

Hypothesis II: Compared to nonrepressors, repressors will report less improvement in mood (i.e., less emotional relief) following failure removal. Because repressors underreport feelings of anxiety, it stands to reason that they should also underreport feelings of emotional relief. This hypothesis follows from several lines of thinking. First, Ortony et al. (1988) argue that the perceived intensity of relief depends

upon the perceived intensity of prior fear; therefore, repressors should report less anxiety after failure and less subsequent relief after failure removal. Second, if repressors cope with an ego-threatening situation by downplaying the importance of whatever is being threatened or the importance of the threat, then they may report less relief because they simply see themselves less concerned about their “psychological sensitivity.” Third, if repressors are aware of the intuitive relationship between amount of anxiety felt during a threat and amount of relief felt after threat removal, then they may underreport their relief in order to appear consistent.

Hypothesis II: Rated importance of psychological sensitivity will moderate the influence of failure and success evaluations on mood and mediate¹⁸ the influence of repressive coping style on relief (mood at success controlling for failure). In my master’s thesis research (Mitchell, 1991), I found a positive correlation between how important students believed social sensitivity was and how relieved they were by their “corrected” test grade. In the present study, I predicted that the more important psychological sensitivity is perceived to be, the worse the subject will feel after failing the Psychological Sensitivity Test and the more relieved he/she will feel after succeeding on the test. Consistent with the model that I present above, I expected to find that that repressors regulated their anxiety following failure by adjusting their perceived importance of the psychological sensitivity. To the extent that repressors protected their egos from failure on

¹⁸ Baron and Kenny (1986) have clarified the distinction between “moderators” and “mediators.” Both terms refers to a necessary, but not sufficient, condition for an IV’s influence on a DV; however, whereas a moderator is a second independent variable that operates prior to or collaterally with the main IV, a mediator is a second dependent variable that is influenced by the IV and then operates upon the main DV. Statistically, a moderator is evident in a reliable interaction between two IVs, whereas a mediator is evident in a significant overlap in variance shared among all three variables.

the test by downplaying its importance, repressors' moods following failure and relief should have been a function of such devaluation tendencies.

Hypothesis IV: Self-reported pleasantness following failure removal (emotional relief) will be significantly predicted by self-reported pleasantness following failure feedback, and self-reported expectations about test performance. Ortony et al (1988) suggested that the perceived intensity of relief is a function of the amount of prior anxiety felt prior to the relief and the extent to which the threatening circumstance is removed. Although in the present study, the extent to which the threatening circumstance was removed was constant (everyone received a "corrected" score of 75%-ile), because subjects undoubtedly had different expectations about test performance, these expectations should have determined the extent to which the ego-threat was removed: for subjects having high expectations, the 75%-ile may have elicited little relief; for subjects having low expectations, the 75%ile may have elicited considerable relief.

Hypothesis V: Compared to nonrepressors, repressors will exhibit less decreases in cardiovascular activity during the experimental writing task and less improvement in mood following this task. Explicit in the research of James Pennebaker (e.g., Pennebaker, 1997) on confession and the writings of Freud (e.g., Freud, 1926/1963b) is the notion that catharsis only emerges as persons confront their true feelings about things. Assuming that repressors cope with ego-threatening situations by denying their true feelings, they can not experience catharsis. To the extent that catharsis is represented in decreased cardiovascular activation and more pleasant emotion, nonrepressors, but not repressors, should have exhibited these changes when given an opportunity to come to terms with

their apparent failure on the Psychological Sensitivity Test.

Hypothesis V: Compared to nonrepressors who write about a typical day (distraction task), nonrepressors who write about their failure will rate the importance of psychological sensitivity higher and their own psychological sensitivity lower; repressors, on the other hand, will exhibit the opposite pattern. While the experimental writing task should have helped nonrepressors to acknowledge being less psychologically sensitive than they originally thought, repressors will have rigidly maintained their defensive perceptions of themselves as psychologically sensitive. Likewise, the experimental writing task should have helped nonrepressors, but not repressors, reaffirm just how important psychological sensitivity was to them.

Hypothesis VI: Rated importance and self-assessment of psychological sensitivity will mediate the influence of writing about failure on mood after writing. Generally speaking, if the writing task engendered any amount of relief in subjects it should have done so by helping them to come to terms with the implications of their failure and to acknowledge how much the failure meant to them.

Other Questions

In addition to testing the above hypotheses, I wished to examine whether the pattern of cardiovascular activity and mood reported by repressors and nonrepressors during threat and threat removal would generalize to the security check manipulations. Also, I wanted to examine whether relief conformed more to a “rebound” model, in which post-threat pleasantness exceeds pre-threat pleasantness, or a “homeostatic” model, in which post-threat pleasantness merely returns to pre-threat levels. Finally, I wanted to analyze repressors’ and nonrepressors’ moods more closely (i.e., individual mood

adjective ratings and ratings of meta-mood experiences) during threat and threat-removal conditions to determine what the relief experience is like for these two groups of persons.

SECTION IV.

METHOD

Subjects

Identification of repressors and other groups. In the present study, I adopted the most popular method for identifying repressors and nonrepressors, first described in Weinberger et al. (1979). According to Weinberger et al's scheme, repressors are persons who report little everyday anxiety, but manifest a tendency toward defensive self-deception. In their research, repressors were identified as having relatively low scores (below the median) on the Taylor Manifest Anxiety Scale (briefer version; Bendig, 1956) and relatively high scores (above the 67%-ile) on the Marlowe-Crowne measure of approval motive, which is also a measure of defensiveness (Crowne & Marlowe, 1960). Nonrepressors constitute the three remaining groups of subjects: a) those scoring above the median on the Taylor scale and above the 67%-ile on the Marlowe-Crowne ("defensive, admittedly anxious" group), b) those scoring above the median on the Taylor scale and below the 67%-ile on the Marlowe-Crowne ("nondefensive, anxious" group), and c) those scoring below the median on the Taylor scale and below the 67%-ile on the Marlowe-Crowne ("nondefensive, nonanxious" group).

On the first or second day of classes during two consecutive semesters, I entered Introductory Psychology classrooms and administered the Marlowe-Crowne and Taylor scales to students in these classes (see Appendix A). The data from the first semester was used to determine the %-ile cutoff points on the two scales (median for the Taylor and the 67%-ile for the Marlowe-Crowne). Potential participants (identified by social security

number) were classified as one of the four dispositions, and these disposition codes were entered in a data file for access by the computer during the experiment. The total number of participants in the prescreening were 909 (287 male and 622 female) and 502 (221 male and 281 female), respectively for the first and second semesters.

Recruitment procedures. Participant sign-up sheets for the present study followed a color-coded system. Each of the eight groups of subjects (4 dispositions X 2 genders) were assigned a color code by a person blind to the experimental hypotheses. All color codes were then randomly assigned to a particular experiment date such that subjects from only one group would be run on any given day (e.g., 1st day -- violet (female, repressive), 2nd day -- blue (male, anxious defensive), . . . etc.). For each of the 8 groups of subjects, a participant sign-up sheet was posted with the caption “ [COLOR] GROUP ONLY” and specific instructions about the sign-up procedure. The participant was instructed to locate a list of social security numbers (last 6 digits, in numeric order) posted on the wall next the sign-up board, find his/her social security number, note the color code next to that number, find the participant sign-up sheet with that color code as its heading (if available), and sign up under an available time slot. Throughout the course of the experiment, the experimenter carefully monitored the frequencies of the different groups of participants run in the study, adjusting the number of sign-up opportunities to encourage participants in groups whose cell frequencies were low.

Cardiovascular screening. In order to screen out participants with a known history of poor circulation, abnormal blood pressure, or current use of drugs that might affect blood pressure, participants underwent two stages of screening, the nature of which varied

slightly across successive semesters of data collection. The first stage of screening occurred during the Marlowe-Crowne/ TMAS pretesting. All pretesting participants were asked to indicate whether or not on a daily basis they consumed one or more of the following: a) medication for mood regulation, epinephrine, antihistamine, more than a pack of cigarettes each day (or equivalent nicotine), more than two beers a day (or equivalent alcohol), or other recreational drugs. They were also asked to indicate whether or not they engaged in 30 minutes of intensely aerobic exercise 3 times a week, during which their heart rate exceeded 150 beats per minute. During the second semester, subjects were asked whether or not, to their knowledge, they had abnormally high or low blood pressure or poor circulation. During the first semester, this question was asked immediately prior to the experiment. During the first semester, 109 students were excluded from the pool of potential participants because they reported regularly using one or more of the above-mentioned drugs, they indicated regular, intense aerobic training, or they indicated (immediately prior to the experiment) that they knowingly had abnormal blood pressure or poor circulation. During the second semester, 92 students were excluded from the pool of potential participants because they indicated drug use or abnormal blood pressure or poor circulation.¹⁹

The second stage of cardiovascular screening was the same for first and second semester subjects. During the experiment, the computer asked subjects several questions

¹⁹ I elected to retain subjects who reported regular, intense aerobic exercise for two reasons. First, nearly one half of the second-semester participants indicated such activity. This may have occurred because I made the item a yes/no item, where "yes" was clearly more socially desirable; therefore, the item may have not been a good measure. Second, the second semester pool of participants was too small to eliminate half of the potential participants.

about recent behavior that might affect their blood pressure during the experiment. One person indicated that he/she took anti-anxiety or anti-depressant medication within 6 hours of the experiment. This person was excluded from the study. No person indicated the use of blood-pressure medication, alcohol, or other sedatives within 6 hours prior to the study.

Balancing of cell sizes. Due to an error in the prescreening process, the number of subjects per personality category (e.g., low anxious) were substantially unequal. In at least one previous study examining the behavior of repressors and nonrepressors (Hansen & Hansen, 1988), subjects from different categories (e.g., low anxious) were randomly eliminated to bring the cell sizes into near balance (so that no one group exerts a disproportionate influence on the results). I adopted the same approach in my study, except that I eliminated those subjects from larger categories who were least representative of the category. As a rough indicator of representativeness of the category, I first re-scaled scores on the TMAS and the Marlowe-Crowne so that higher scores indicated greater agreement with the category of interest (e.g., scores on the Marlowe-Crowne were reverse-scored for the high-anxious, low defensive category), and then I calculated the product of these scores for each person.²⁰ Subjects with the smallest products were eliminated from each Personality Category X Gender X Experimental Condition cell until each cell, except the anxious-defensive cells, consisted of 10 participants. (The anxious-defensive cells began with less than 10 participants in each cell.)

²⁰ Actually, to equalize the contributions of the Marlowe-Crowne and TMAS to the composite product, the TMAS was re-scaled to have the same mean and standard deviation as the Marlowe-Crowne, before the product was formed.

Final sample characteristics. A total of 141 college students participated in the main part of the study. As indicated above, with the exception of the anxious-defensive category, all of the Personality Category X Gender X Experimental Condition cells consisted of 10 participants. The breakdown of the anxious defensive category was as follows: 4 male experimental subjects, 4 male control subjects, 6 female experimental subjects and 7 female control subjects.

Apparatus

Laboratory setting. All of the experiments were conducted in an observational room equipped with a two-way mirror. Perpendicular to the mirror (and within arm's reach of the mirror) was a cushioned, metal, fully upright chair, where the subjects were seated during the experiment. On a small, wheeled table in front of the chair was a computer monitor, keyboard, and computer mouse. Behind the monitor was a tower-style computer. Underneath the table top was the blood pressure monitor (described below), whose patient-interface cord projected out from the monitor around the subject's chair to the left or right side of the chair (depending upon the subject's handedness). On either side of the subject's chair were adjustable hospital bed tables, one of which was used as an arm rest (for the hand to which the cuff was attached) and the other of which was used as a writing table (for the writing task, described below). The room was equipped with an air conditioner, which was used to keep the room temperature at a comfortable level for participants.

Blood pressure monitor. Systolic blood pressure, diastolic blood pressure, and heart rate were recorded by a Finapres Model 2300 (Ohmeda). The 2300 Finapres

measures arterial finger pressure and heart rate at regular intervals greater or equal to 2 seconds or, as in the present study, upon demand from a serial communications device. A finger cuff is applied to the medial phalange of the third digit of the subject's non-dominant hand. Throughout the experiment, the nondominant hand rests on a table that is approximately heart-level. Arterial finger pressure has been used in a number of studies as a relatively unobtrusive measure of blood pressure. As reviewed by Wesseling, Settels, & Dewit (1986), under ideal measurement conditions (i.e., cuffed finger at exactly heart level, cuff wrapped not too tight or too loose, relatively new cuffs used) arterial finger pressure is fairly precise, underestimating upper arm DBP by an average of 3mm Hg and overestimating upper arm SBP by an average of 6 mmHg; however, in the present laboratory study, such high precision is somewhat unlikely. Because the major analyses in the present study consist of residuals of cardiovascular activity (e.g., controlling for Baseline or Failure levels), between-subject effects due to finger cuff age, tightness, height may be removed.²¹

Computer. An IBM-compatible 486-SX computer equipped with color monitor, Microsoft Windows 3.1, keyboard and mouse were used to present all of the stimuli in the experiment (except for the "Psychological Sensitivity Test" items) and record all of the dependent measures from participants. A serial cable connected the computer with the 2300 Finapres. An additional serial cable, running from the computer through a hole in the wall by the two-way mirror, was included as a bogus connection to another computer.

²¹ Controlling for cardiovascular activity at one event in the experiment would eliminate such between-subject artifacts only if these artifacts affected each subject's mean blood pressure and heart rate and not also the variance of these measures.

Miscellaneous materials. On the writing table was a laminated test form labeled “Psychological Sensitivity Test, Form b,” (described later) several sheets of paper for the writing task labeled “REFLECTIONS,” and two mechanical pencils. The experimenter carried with him a laminated booklet with a cover bearing the words “Psychological Sensitivity Test” and other graphics. Inside this booklet were experimental sign-in sheets, a list of social security numbers of eligible participants, and the experimental protocol.

Computer Program

Except for some initial instructions to subjects and the experimental debriefing, the entire experiment was governed by an event-driven, interactive computer program (see Appendix B for selected programming code) developed in Visual Basic (Version 4.0, Professional Edition). The program was developed as a Windows 3.1 application for several reasons, including the familiarity of Windows to nearly all of the participants in the study, the ease with which scale items could be presented, and the preprogrammed graphics. The program was written such that nearly all of the participant’s responses were recorded as “point-and-click” mouse events. The program was organized into 27 phases, each defined by the presentation of a form -- a screen full of instructions, scale items, graphical controls (e.g., option buttons), and/or other graphics -- and the removal of this form as a result of either a computer timer event (e.g., 30 seconds after the presentation of the test evaluation form) or a mouse-click event (e.g., the subject’s response to the last item of the mood scale). Several of these phases presented the same form (e.g., the mood scale) or nearly the same form (e.g., the test evaluation) at different times. Most of the forms were equipped with a help button, which presented a dialogue box with context-

sensitive information, and an experiment-termination button, which discontinued the experiment prematurely (after confirming the subject's intention to quit). To minimize run-time errors in the program, each form was designed such that the mouse could only activate certain events (such as recording the subject's response on a mood scale or selecting the help or quit buttons). All data from the experiment (including blood pressure, heart rate, mood reports, answers to other questions, and time stamps on some of the data) was read into a sequential file for each subject, which was later combined with all other subjects' data.

Described below are the experiment forms and tasks carried out during the form presentation.

Main Screen Form. To provide additional surface credibility to the experiment, the first screen that subject's encountered presented the words "Psychological Sensitivity Test," "A Product of the United International Testing Corporation," and "License Number: A03-110976" in graphic layout. The screen allowed the subject or experimenter to advance to the next form by a click of the mouse on a "Start" button. Along with instructions to wait for the experimenter, the Main Screen Form also served as the final screen in the experiment.

Informed Consent Form. The informed consent for the experiment was displayed on the computer screen (following an initial reading of blood pressure and heart rate; see "Computer program sequence" below), along with two buttons indicating agreement or disagreement to participate in the study. The entire informed consent is reproduced in Appendix C. The critical feature of the informed consent is the information about the

study contained in the “Purpose” and “Involvement” sections. The sections inform the subject that the study is about measuring the subject’s psychological sensitivity and his/her ability to report his/her ongoing mood accurately, as evaluated against the cardiovascular data. I anticipated that because the blood pressure and mood-assessment stimuli in the study was so salient that the subject’s suspicions would be great if the informed consent did not mention why blood pressure and mood report data were being collected.

Subject Identification and Cell Frequency Forms. The Subject Identification Form prompted the subject to enter his/her social security number, age, and gender. The program accesses two files: a file having the social security numbers and disposition codes (e.g., repressor = 1) for all eligible participants and a file containing the current cell frequencies for each of the disposition X gender X writing task combinations. The program then assigns subjects to experimental condition according to existing cell frequencies. Specifically, when an equal number of prior subjects from a particular group (e.g., male repressors or female anxious, nondefensive) have been assigned to experimental and control conditions, the program randomly assigns the next subject from that group to the experimental or control condition; otherwise, the next subject is assigned to that condition whose cell count is lower. Immediately following each experiment, the experimenter could access a cell frequency form which indicated the current cell frequencies for each color group (disposition and gender), as well as the total number of subjects.

Health-Related Behavior Form. Because recent physical exercise and drug intake may affect subjects’ blood pressure and heart rate during the experiment, a short

questionnaire is included in the program to obtain data about these health-related behaviors. The questions and response options from this form are displayed in Appendix D.

“Psychological Sensitivity Test” (PST) Form. The program described and recorded answers for a bogus test that reportedly assesses “psychological sensitivity” -- the ability to understand the thoughts, feelings, and tendencies of other people. Bogus tests that purportedly measure psychological sensitivity, as well as bogus evaluations of these tests, have been found to be effective, credible manipulations in social psychological research (e.g., Mettee, 1971). What follows is the description of the test presented sequentially by the PST Description Form.

PAGE 1

Before you begin the Psychological Sensitivity Test, you should read and understand the following description.

Click “Next Page” to proceed through the description.

PAGE 2

Psychological Sensitivity simply refers to a person’s ability to understand people’s thoughts, feelings, values and tendencies. The ability to estimate the thoughts, feelings, values and tendencies of the average person is the most reliable feature of Psychological sensitivity; therefore, the test requires that you judge whether or not the majority of persons in the world think, feel, or tend to behave in a certain way.

PAGE 3

On the table next to you is a form sheet (from a booklet) labeled “Psychological Sensitivity Test.” On this sheet are 30 statements from standard personality inventories, which 30,000+ people have completed. Your task is to read each sentence and decide whether or not MOST people would agree or disagree that the statement describes themselves. Note: each statement has a correct answer regardless of age, sex, and race.

PAGE 4

A person’s performance on the PST is related to a number of things: High scorers on the PST are more likely to form intimate relationships with others, and they are more liked by other people. High scorers are more intelligent than low scorers. Low scorers are more likely to be fired from their jobs and give

up long-term goals. Low scorers have children who are difficult to raise; and, more often than high scorers, low scorers get divorced.

Following the test description were two, sequentially presented questions designed to assess the person's expectations about performance on the PST: a) "Given the above description, how psychologically sensitive do you think you are?" (1 = "not at all," 4 = "somewhat," and 7 = "extremely") and b) "Based upon your understanding of yourself, how well do you think you will score on the PST?" (1 = "very poor," 4 = "average," and 7 = "very well").

Following these ratings and a brief pre-programmed message from the experimenter, the computer presented the computerized answer sheet, which included brief instructions for the test:

For each statement on the exam sheet, decide whether people would agree with it or disagree with it. Use the computerized answer sheet below to record your answers. Each time you point and click on an option circle below, a new number will appear in the "Statement Number" box, indicating that you should judge the next statement. This process continues until you have judged all 30 statements.

as well as the current test item number and two option buttons labelled "most people would AGREE with this statement" and "most people would DISAGREE with this statement."

On the writing desk beside the subject, was the laminated test form bearing the title "PST" and "Psychological Sensitivity Test, Form b" in advanced graphics layout (see Appendix E). On this form were instructions to participants to carefully read the instructions for the test presented by the computer. Below the instructions were 30 statements taken from early versions of the California Psychological Inventory and the 16-PF scale. Selected items represented a broad range of topics.

PST “Verification” Form. Of critical importance to the experiment was the subject’s belief that the first test evaluation he/she received (a failure) was incorrect and that the second evaluation (a success) was correct. To do this, the computer induces the subject to enter an incorrect test label prior to the first test evaluation. Later, this “error” is mutually discovered by the subject and “experimenter” (actually preprogrammed messages), and the subject’s test answers are then re-evaluated using the “correct” answer key. Immediately following completion of the PST, the computer presents a PST Form Verification Form with the following instructions:

The Psychological Sensitivity Test has several versions. Please check to see whether the form letter displayed below matches the form letter of the laminated exam sheet (at the top of the sheet). If so, click ‘OK.’ If not, click once on the letter, backspace or delete as necessary, enter the appropriate letter (e.g., ‘A’) and click ‘OK.’

Beneath these instructions and next to the word “FORM” is a small white text box in which a capital letter “B” displayed. Next to the text box is a mouse-clickable command button with the word “OK” on it.

Prior to the failure evaluation, the subject was required to click on the OK button before the PST Verification Form was removed from the screen and the next form was called. Prior to the success evaluation, a timer governed the modification of the text box from “B” to “b” in such a way that appeared as though the experimenter was changing the text box entry from a remote terminal (i.e., first the placement of the cursor, then a backspace, then the new letter, then the command button click).

The computer was programmed to disallow subjects from changing the text box entry from “B” to “b” prior to the first evaluation; in the event that the subject tried to

change the form, the program tagged the subject's data and later presented different messages to the subject. Because no subject in the present study tried to change the form entry, I omit descriptions of the alternative messages.

PST Evaluation Progress Form. To increase the subject's anticipation of the test evaluation, the program engaged in a 6-second period of bogus test processing, during which a progress bar indicated the apparent progress of the test evaluation. During the presentation of this form, blood pressure and heart rate were recorded at one-second intervals.

PST Evaluation Form. The program presented the initial failure evaluation and subsequent success evaluation on the PST as modifications of the same general form. As displayed in Figure 1, the feedback was organized into two components: a) a sentence describing the percentile at which the subject scored on the PST and b) a graph displaying the subject's score relative to the population distribution of scores on the PST. The failure evaluation described the subject's PST score as falling in the 23rd percentile and graphed the subject's score near the bottom of the distribution.

The bogus distribution of PST scores was negatively skewed such that there was only a little difference between the modal score and the perfect score. As shown in Figure 2, the success evaluation described the subject's score as falling in the 75th percentile, and graphed the subject's score between the average score and the perfect score.

Writing Task Form. In addition to manipulating relief in the study by removing some threatening stimulus (the PST failure or the security check), the experiment also

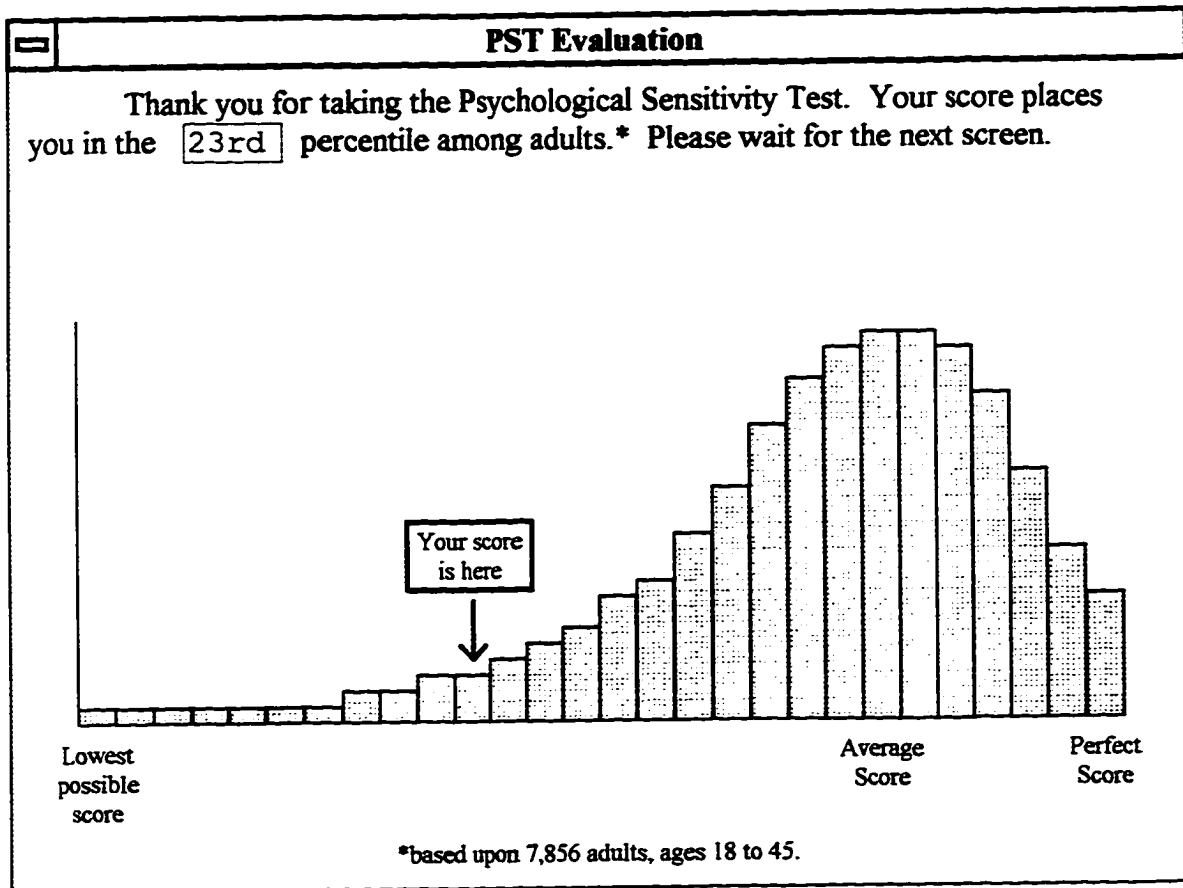


Figure 1: Bogus Evaluation of Failure on the “Psychological Sensitivity Test”

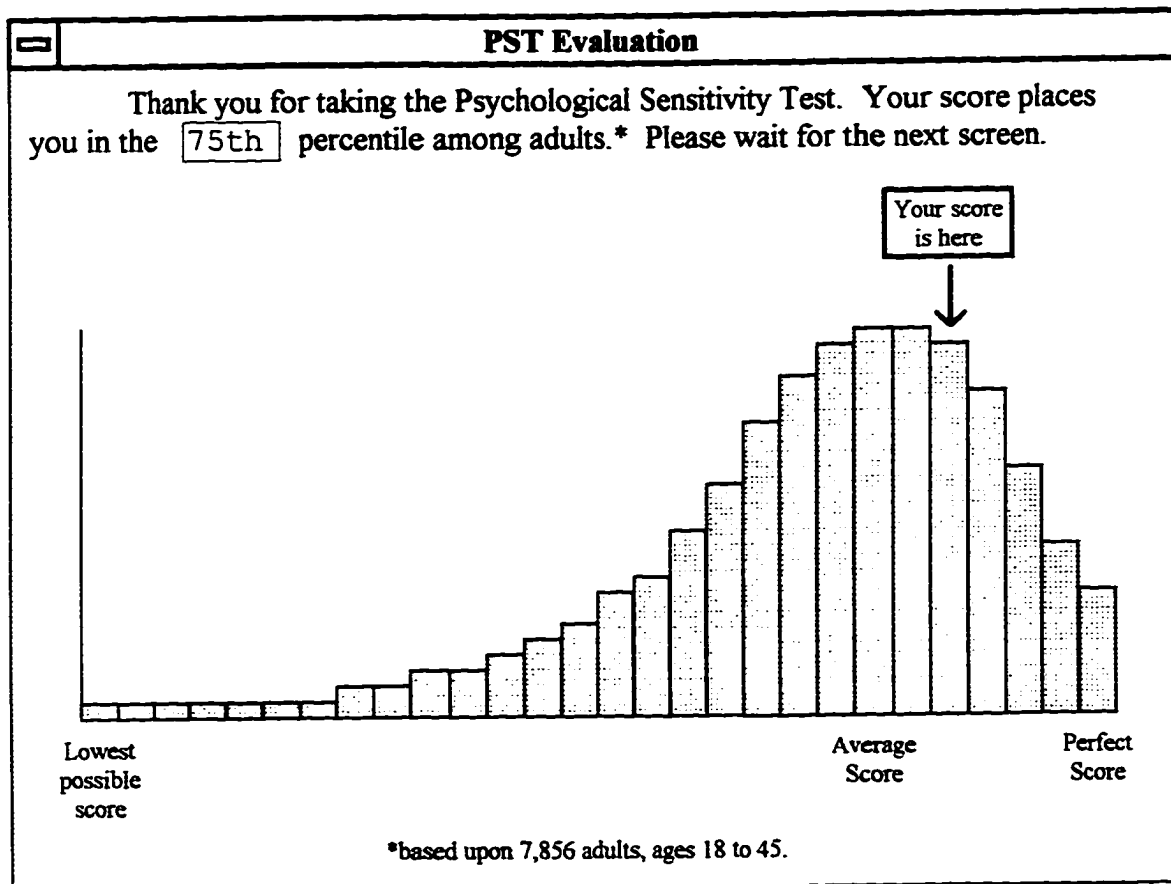


Figure 2: Bogus Evaluation of Success on the “Psychological Sensitivity Test”

provided an opportunity for half of the subjects to create their own relief by thinking about their failure on the PST. Following the bogus failure evaluation, a filler task, and a mood assessment, the computer presented a writing task for the subjects to engage in for approximately two minutes. For participants assigned to the experimental condition, the instructions were as follows:

Now that you have taken the Psychological Sensitivity Test, the Psychology Department would like to know your thoughts and feelings about your performance on the test. On the sheet of paper labeled 'Reflections,' spend two minutes writing down any implications (if any) for your life your test performance suggests. Afterwards, the computer will signal you with a beep and ask you a few questions.

For subjects in the control condition, the instructions were as follows:

Because the computer needs time to integrate the blood pressure data with mood assessments, the Psychology Department would like to take this opportunity to ask you about a typical day in your life. On the sheet of paper labeled 'Reflections,' spend two minutes writing down everything you do in a typical day. Afterwards, the computer will signal you with a beep and ask you a few questions.

Blood pressure and heart rate were recorded at 5 second intervals during the writing task.

On the writing table was the paper used for the writing task bearing the heading "REFLECTIONS," under which were instructions to use the paper to complete the writing task described by the computer and to stop writing when the computer indicated to do so (with a BEEP).

After 2.5 minutes following the presentation of the writing task instructions, the program signals the subject with a beep to stop writing and instructs the subject to answer a few questions. In order of appearance, the questions are 1) "In your opinion, how important is it to be psychologically sensitive?" (1 = "not at all," 2 = "somewhat," 3 =

“extremely”); 2) “Now that you have taken the test, how psychologically sensitive do you think you really are?” (same anchors); 3) “How PLEASANT do you feel right now?” (same anchors, except substituting “very” for “extremely”); and 4) “How hard did you try on this test?” (same anchors as question 3).

Experimenter Message Forms. A critical component of the programmed experiment was the communication to the subject that his/her test had been incorrectly evaluated and the failure was wrong. In a previous study, this communication took the form of the experimenter apologizing for initially using the wrong answer key to grade the sensitivity test. In subsequent pilot research, it was determined that people were dubious of an answer-key mix-up when the computer was grading the exam. Pilot studies revealed that a much more credible scenario involved convincing subjects that they had made a mistake in identifying the test form on the computer, which led to an incorrect test evaluation by the computer. The scenario was even more credible when the subject helped to discover the “mistake.”

The form-entry mix-up is revealed with two messages to the subject. The first message appears (with spelling errors) as follows:

Sorry to interrupt, but was your test labelled form 'B' -- as you indicatd - or form 'b' -- little b?

The message is presented character-by-character according to a random process. Every 70-90 msec, a timer calls for the random generation of either a 1 or a 0 (50% probability of either). Only if the result of the call is a 1, the next character in the above message is displayed. Feedback from pilot subjects indicated that the message appeared to be typed in by the experimenter. Following the presentation of the last character of the message,

the cursor is refocused on a reply box, in which the subject can type an answer. After the computer receives input from the keyboard by the subject, a button appears below the reply box with instructions to click on the button to send the reply. When the send-reply button is pressed, the program clears both the message and reply boxes and then presents the following message:

no sweat. Let me back up the program a little and plug in the right form.

Following the presentation of the last character of this message and a 5 second delay, the Experimenter Message Form clears, the PST-Form-Entry Form reappears, the form entry is changed by the program, and the subject's answers are apparently re-evaluated (leading to the success evaluation.)

Filler Task Form. In pilot research, it was determined that subjects were suspicious about the fact that the mood questionnaire appeared immediately after the test evaluations. To prevent such "suspicion-by-contiguity," the program included a filler task between the PST Evaluation Form and the Mood Assessment Form. This form was designed to help subjects maintain their bad moods following failure and their good moods following success by probing subjects' memory about the implications of the test. The filler task simply asked subjects to indicate whether or not they remembered that psychological sensitivity was associated with intelligence, social acceptance, . . . (etc.).

The Filler Task Form is presented immediately following both the failure and success evaluations. Following the success evaluation, the instructions for the filler task are partly obscured by a "Memo" from the experimenter, which asks the subject to complete the task again, while the experimenter tries to advance the program to where it

was interrupted (following the writing task). The program presents the Filler Task Form and then a Mood Assessment Form following both failure and success evaluations.

Affect Intensity Form. A potential third variable accounting for variance in state anxiety and relief as well as their covariation is dispositional emotionality. Accordingly, the computer program asks subjects to complete a reliable measure of emotionality. The Affect Intensity Measure (Larsen & Diener, 1987) is a 40-item self-report measure of how intensely people feel positive and negative emotions (see Appendix F). The test-retest reliability of the scale across one-to-three months is about .81; and its test-retest reliability across two years is .75. The AIM demonstrates a moderate positive correlation (.49-.61) with daily mood intensity and mood variability across 12 weeks. Finally, the AIM is moderately correlated with measures of emotionality, arousability, sociability, and activity level.

“Security Check” Form. Because the failure and success evaluations were separated by several other tasks (i.e., writing task, the filler task, a mood assessment, a message from the experimenter), the relationship between relief and prior anxiety may have been significantly moderated by these tasks; also differing expectations about performance on the PST may have moderated this relationship. Thus, for a subset of the sample ($n = 101$), the computer program included a second set of manipulations in which the removal of a threatening stimulus followed directly after the presence of that stimulus. The threatening stimulus was a bogus security check with the following heading and instructions:

Security Check

Warning! You have been randomly selected for an additional security check. If you do not pass this security check, your data will be discarded and you will not receive credit for this experiment.

At the beginning of the semester, persons in PSYC 401 completed a survey in which they indicated, among other things, their mothers' maiden names. To demonstrate that you are not standing in for another student, please indicate below what your mother's maiden name is. (If you did not indicate a maiden name on the survey, then choose "none of the above.") Please do not call the experimenter during this security check because he can not help you.

Below these instructions were three surname options and "none of the above" (each next to an option button). The surname options were chosen such that for each subject "none of the above" was the correct answer. I anticipated that choosing this option would create a little uncertainty in subjects.

The relief manipulation in this security check follows 10 seconds after the subject chooses a response. The relief manipulation occurs as the following message:

The message that the subject has passed lasts for 10 seconds. Following the relief message, the computer asks subjects to indicate how pleasant they felt (on a 7-point Likert scale) during the security check and after the security check.

Cardiovascular assessment. Communication between the computer and Finapres is first established with a Finapres Communication Form and then later reinitiated within various other forms at critical times during the experiment. Three times during the experiment baseline cardiovascular activity is recorded. Immediately prior to the informed consent, but approximately 5 minutes after the blood pressure monitor is turned on, the computer takes 3 consecutive samples of blood pressure and heart rate, spaced 5 seconds apart, which serve as the initial baseline readings. The later two baseline readings are taken during mood assessments immediately following the informed consent and then

immediately prior to the security check. In addition to these baseline measures, cardiovascular activity is sampled every second (6 seconds total) during the presentation of the PST Progress Form, every 5 seconds (30 seconds total) during the presentation of each PST Evaluation Form, every 5 seconds (150 seconds total) during the writing task, every 5 seconds (15 seconds total) both prior to and after the message that the subject has passed the security check, and at the beginning middle and end of each Mood Assessment Form. Each of these intervals are only approximate, however, varying (independently) by as much as 1 or 2 seconds when communication lags between the Finapres and the computer.

Mood assessment. There is currently no published precedent for measuring self-reported emotional relief. The most straightforward approach would involve asking subjects to rate their emotional relief on a Likert scale; however, this approach would probably make subjects aware of the fact that the PST evaluations were merely manipulations, designed to produce anxiety and then relief. An alternative approach would involve assuming that emotional relief can be adequately represented on diffuse measures of mood, such as those measuring how pleasant a person feels (e.g., Brief Mood Introspection Survey, Mayer & Gaschke, 1988) or those measuring how much positive and negative affect he/she feels (e.g., Positive Affect and Negative Affect Scales, Watson, Clark & Tellegen, 1988). Because there is no theoretical rationale for choosing to measure relief as pleasantness rather than positive and negative affect (or vice-versa), I decided to use both affect and pleasantness measures in the present study. Because mood is sampled several times during the study, subjects could become bored or annoyed by the

task of reporting their moods so many times. To minimize the negative impact of mood assessment on subjects' moods, I decided to a) present abbreviated scales of pleasantness, positive affect, and negative affect at the most critical times during the experiment and b) present a one-adjective rating of "pleasantness" at all other times.

The Mood Assessment Form consists of three pleasantness adjectives (happy, sad, and pleasant; the former two taken from the Brief Mood Introspection Survey (BMIS), four positive affect adjectives (enthusiastic, proud, excited, and inspired; from the Positive Affect and Negative Affect Scales, PANAS), and four negative affect adjectives (ashamed, upset, angry, and worried; from the PANAS), each randomly ordered and sequentially presented. Responses are made on a 7-point Likert scale having the following anchors: 1 = "not at all," 4 = "somewhat," and 7 = "very." These same anchors are used for the one-item pleasantness measure. Composite scores for positive affect and negative affect are produced by taking the mean of the responses to all adjectives in each scale. The composite score of pleasantness requires that sad be reverse-scored before summing the responses for the scale.

For exploratory purposes, five items from a meta-mood experience scale (Mayer & Stevens, 1994) are presented at the end of the other mood scales. These items are "I am currently trying to change my feelings," "I am currently feeling the way I should feel," "My current feelings have changed my thinking," "I know exactly how I am currently feeling," "My current feelings are typical for me," and "My feelings reflect how I currently feel about myself." (the last item was not included in Mayer & Stevens, 1994). The anchors for these meta-mood experience items are 1 = "strongly disagree," 4 = "neither

agree nor disagree,” and 7 = “strongly agree.”

The instructions for the Mood Assessment Form are as follows:

A mood adjective or sentence description appears below in a box next to a rating scale. By pointing and clicking on one of the numbered circles in the scale, indicate how much you CURRENTLY feel the way the adjective or sentence describes. After your selection, a new adjective or sentence will appear in the box, which you will also rate. This process will continue for several adjectives/sentences.

The Mood Assessment Form is presented four times during the experiment: immediately following the informed consent, immediately following the failure evaluation and then the success evaluation, and immediately before the security check. The one-item measure of pleasantness is presented immediately after the writing task and two times immediately after the security check. During these latter two pleasantness assessments, subjects are asked to rate their moods in retrospect, during the security check and after the message that they passed the security check.

Procedure

Participant-apparatus interface. Prior to the experiment, each subject takes a seat at the computer and allows his/her finger (from the nonwriting hand) to be connected to a finger cuff from the Finapres. The subject's hand rests face-down on the portable table, which is then adjusted so that the hand rests at about heart level. After informing the subject what he/she will soon feel, the experimenter starts the Finapres machine, which gradually inflates the cuff. After the cuff has fully inflated and the Finapres begins to display readings (on a monitor which is oriented away from the subject), the experimenter examines these initial readings to make certain that they fall within an acceptable range of values (e.g., $100\text{mmHg} < \text{systolic blood pressure} < 150\text{mmHg}$). When readings do not

fall within these values, the experimenter deflates and adjusts the cuff and then re-examines the readings. In several cases, subjects were asked to warm their hands prior to the readings (either by rubbing their hands together or by running their hands under warm water). After initial adjustments, the experimenter calls up the Finapres Communication Form, which then takes the first three baseline samples of heart rate and blood pressure. *Subjects are not informed what their blood pressure or heart rate is at any time during the experiment.*

Computer program sequence. The experiment begins with the Main Screen Form, which is followed by the Finapres Communications Form, and the Main Screen Form -- all of which are presented while the experimenter is in the room with the subject. After the subject clicks a start button on the Main Screen Form, the Informed Consent Form appears. After the subject clicks on a button indicating his/her consent to participate, the Subject Identification Form Appears, requesting the subject's social security number, age, and gender. (Again, it is during this time that the subject's disposition code is identified and he/she is assigned to the experimental or control writing task.) Immediately after the verification, the Mood Assessment Form appears for the first time. Then, the order is as follows: Health-Related Behavior Form, PST Description Form, the first Experimenter Message Form (reminding the subject that his/her performance is being monitored), PST Form, PST Verification Form, PST Evaluation Progress Form, PST Evaluation Form (failure version), Filler Task Form, the second Mood Assessment Form, Writing Task Form, the second Experimenter Message Form (asking the subject whether his/her form entry was a mistake), an automated version of the PST Verification Form, PST Evaluation

Progress Form, PST Evaluation form (success version), Filler Task Form (with memo described above), the third Mood Assessment Form, Affect Intensity Form, the final Mood Assessment Form, and the Security Check Form. At the conclusion of the Security Check Form, the program returns to the Main Screen Form and displays a message informing the subject to tap on the two-way mirror and to wait for the experimenter to return.

Post-experimental interview and debriefing. Once the experiment program terminates, the experimenter returns to detach the blood pressure cuff from the subject and to administer a verbal debriefing. For about thirty seconds prior to the debriefing, the experimenter engages the subject in small talk (e.g., “what did you think of the study? or “how’s it going?”) and allows the subject an opportunity to spontaneously voice any apologies regarding the form entry mix-up or any suspicions regarding the study. During this time, the experimenter forms a general impression regarding how genuine the experimental manipulations were for the subject. For 20 preselected subjects, this informal assessment was replaced with verbal probing, taking the form of the following 3 questions: a) “In your mind, what was the study about?” b) “Did you notice any deception in the study?” and c) “Were you suspicious of anything?” Answers to these questions were recorded in a log file.

The verbal debriefing for subjects begins with the disclosure that the form entry mix-up was a manipulation in the study and that the subject’s experience of anxiety and relief was the true focus of the study. The experimenter then summarizes the research on repressive coping style and poses the general question, “Do repressors feel relief; and, if so, will they admit it?” The experimenter explains the specific hypotheses of the study

regarding the effect of the anxiety and relief manipulations, as well as the writing task. Then, the experimenter asks for general feedback regarding the experiment, including whether the subject was suspicious of the manipulations. During the debriefing, the experimenter stresses that a) he doesn't know whether the subject is a repressor or nonrepressor, b) that there is a greater probability of the subject being a nonrepressor, and c) that repressive coping is not necessarily a bad way of dealing with threats. Finally, the experimenter administers a written debriefing and dismisses the subject (see Appendix G).

Design

The present experiment has a mixed design that can be decomposed into sets of between-subject variables, repeated-measures variables, and dependent measures.

The set of between-subjects variables is composed of one four-level organismic variable (disposition category) and one two-level, randomly assigned manipulation (the writing task). The four levels of subject disposition are a) repressors ("Rep"); b) high defensive, admittedly anxious subjects ("Anx/HDef"); c) low defensive, admittedly anxious subjects (Anx/LDef); and d) nondefensive, truly nonanxious subjects ("LAnx"). The levels of the writing task are "experimental" (write about test performance) and "control" (write about typical day).

In contrast to the between-groups variables, the repeated-measures variables are fairly complex, which is in part due to the asynchronous timing of stimulus presentations and subsequent self-reported mood assessments. Figure 3 displays a timeline of stimulus presentations, mood assessments and cardiovascular assessments. The stimulus timeline portion of Figure 3 traces stimuli in the experiment from three different perspectives. First, an "event" refers to the presentation of any meaningful stimulus during the

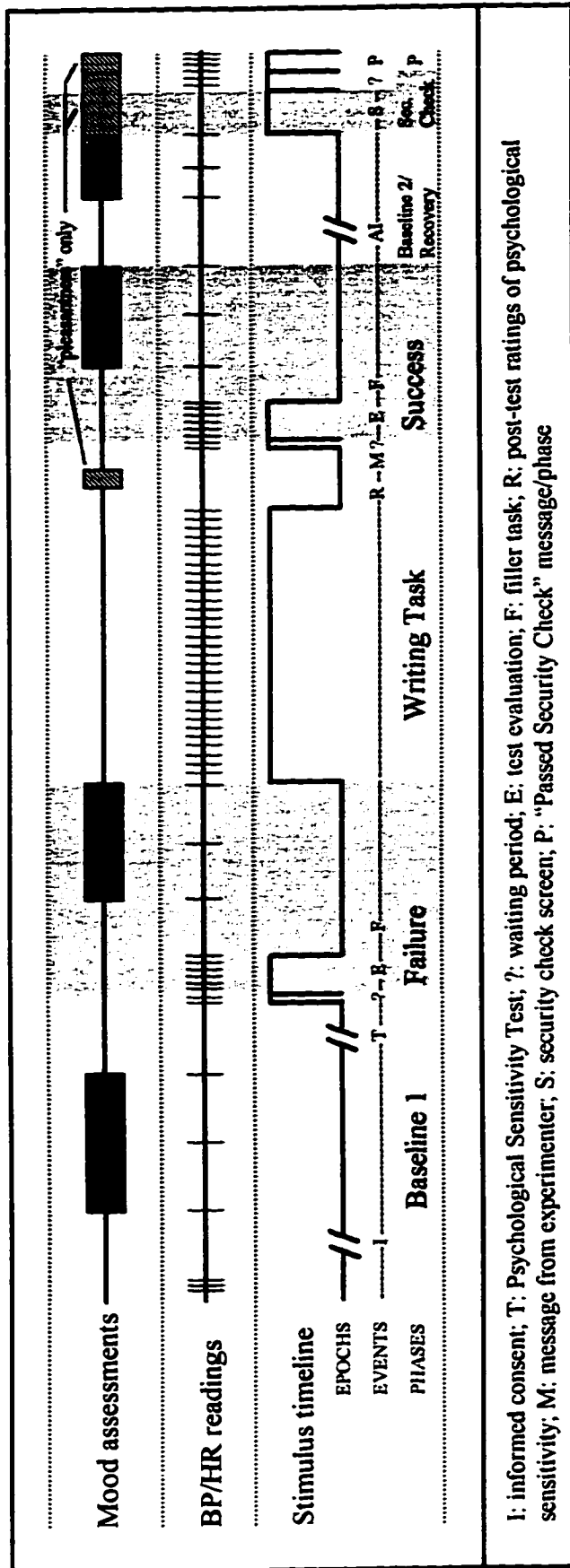


Figure 3: Experimental Timeline for IVs and DVs

experiment, whether or not that stimulus has an effect on mood. For brevity, Figure 3 displays only selected events during the experiment. Second, a “epoch” refers to the presentation and duration (i.e., onset and offset) of a stimulus that was designed to have a theoretically meaningful influence on mood (e.g., the Failure PST Evaluation Form or the Writing Task Form). Third, a “phase” refers to an interval in the experiment in which the residual effects of a previous epoch are presumably present (e.g., failure affects mood even after the evaluation screen disappears) or, in the case of baseline readings, presumably absent. Throughout the experiment, self-reported mood is assessed during phases, following epochs,²² while cardiovascular data is assessed during epochs and during the remainder of phases, following epochs. Because I anticipate that the epochs will have a stronger impact on blood pressure and heart rate than will the remainder of phases following the epochs, cardiovascular response measures will consist of data aggregated across epochs only. A necessary exception to this approach is the assessment of baseline cardiovascular response, where Baseline 1 measures will be aggregated across the pre-informed-consent period and Baseline 2/Recovery measures will be aggregated across the fourth Mood Assessment.

The repeated-measures variables can be organized hierarchically into fixed and random effects. The fixed effects are the theoretically meaningful phases in the experiment program: a) the beginning of program (Baseline 1); b) the first test evaluation (Failure); c) the writing task (Write), within which time is a fixed effect; d) the second test evaluation

²² Self-reported mood during the Security Check is displayed as spanning the epochs defined by the Security Check message and “Passed Check” message. This is because subjects were asked to retrospectively report their moods during these epochs.

(Success), e) completion of the the Affect Intensity Measure and subsequent mood assessment (Baseline 2/ Recovery), f) the Security Check, and g) the message that the subject passed the security check (Passed Check).

For each of the theoretically meaningful events, several sampling units of data are recorded, which are here considered random effects. For the mood assessment data, the random effects consist of the individual mood adjectives that make up the scales. For the cardiovascular data, the random effects are the 3-to-6 samples of blood pressure and heart rate that are collected during baseline phases and epochs in the experiment. Within the writing task, 30 samples of blood pressure and heart rate are aggregated into 6 fixed effects (each with 5 samples) so that linear trend can be examined.

The major dependent measures in this study are the assessments of cardiovascular (CV) activity and self-reported mood. Cardiovascular activity is composed of systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). Self-reported mood is measured as a composite of pleasantness (P), which can be broken down into positive affect (PA) and negative affect (NA), or as a single-item measure of “pleasantness” (following the writing task and the security check manipulations). Because the major interest is in change in mood and cardiovascular activity from one experimental event to the next (or across the writing task), the dependent measures will consist of residuals of mood and CV activity. Specifically, mood and CV activity at Failure will be controlled for Baseline 1 measures (or vice-versa). Similarly, mood after the writing task will be controlled for mood at Failure. Mood and CV activity at Success will be separately controlled for Failure measures and Baseline 1 measures (i.e., there will be two

residual values for each DV at Success). For the Security Check, mood and CV activity will be controlled for Baseline 2/Recovery measures. Finally, for the Passed Check assessment, mood and CV activity will be separately controlled for Baseline 2 and the Security Check assessments. Change in CV activity during the Writing Task will consist of a linear contrast score (see Rosenthal & Rosnow, 1985), in which the 6 aggregate readings are each multiplied by a contrast coefficient and then summed. (The more negative the linear contrast score, the greater the linear decrease in CV activity during the Writing Task.)

In previous research, three basic between-groups contrasts have been analyzed: repressors vs. nonrepressors (e.g., Baumeister & Cairnes, 1992), repressors vs. low anxious (e.g., Weinberger et al., 1979), and more defensive vs. less defensive (e.g., Tomaka et al., 1992). In the present study, all disposition main effects and interactions will be analyzed within each of these three contrasts; however, for the purposes of Type I error control (see below), I will formally test only the repressor-vs.-nonrepressor contrast effects.

As mentioned above, in addition to cardiovascular activity and self-reported mood, several measures of subjects' thoughts regarding psychological sensitivity and the PST are assessed. Prior to the test, the subject is asked how well he/she expects to do on the test and how psychologically sensitive he/she is. Following the failure evaluation, the subject is asked to write about his/her thoughts regarding the implications of his/her test performance, how much effort he/she gave in completing the test, how psychologically sensitive he/she now thinks he/she is, and how important psychological sensitivity is.

These measures were expected to differentiate repressors from nonrepressors and thereby support the construct validity of repressive coping style. In particular, repressive behavior was expected to manifest itself in a) lower ratings of importance of psychological sensitivity, b) lower ratings of effort on the PST, c) higher post-failure ratings of one's own psychological sensitivity, and d) fewer words written about the implications of the subject's test performance (experimental condition only).

As previously mentioned, perceived importance of psychological sensitivity is expected to play a pivotal role in the relationship between intensity of prior negative feeling and subsequent relief and between repressive coping and relief. As such, rated importance was examined as a moderator variable and mediator variable in these relationships, respectively.

Psychophysiological Method Considerations

Cacioppo et al. (1993) provide ten methodological suggestions regarding psychophysiological differentiation of the emotions. These are 1) two or more emotions should be examined (preferably in each subject); 2) the stimuli should elicit relatively discrete emotions; 3) the eliciting stimuli should be organized into discrete epochs of comparable length; 4) an independent assessment of the intensity/presence of a particular emotion during an epoch; 5) each subject's data should be examined for movement artifacts, unintended mood changes, and/or unintended cognitive activity; 6) the emotional intensity of each emotion elicited should be assessed to determine departure from equality; 7) the psychophysiological data should be synchronized with the independent evidence of the elicited emotion; 8) the psychophysiological data should consist of several aggregated

samplings; 9) procedures should be taken to minimize the influence of Type I errors in the data analysis, including (when possible) internal replications of the manipulations; 10) different mood manipulations should be employed (when possible) to eliminate the alternative explanation that the effects are manipulation-specific, rather than mood specific.

For the most part, I have followed the above suggestions. My study consists of two manipulations of emotion (failure and success), which are expected to be of equal intensity. Mood assessments are made as independent evidence for the intended emotions (as well as evidence for unintended emotions). The mood manipulations are time-controlled and the mood and CV data are time-stamped so that approximate synchronization of the data is possible. All CV data is aggregated within the discrete epochs. Finally, a second set of manipulations (the Security Check and Passed Check) have been included for examination of replicated and nonreplicated effects. After careful consideration, movement artifact data was not recorded for two reasons. First, the collection, coding, and analysis of movement artifact data represents an enormous investment of resources. Second, the statistical control of movement artifacts might actually eliminate theoretically important variance in the CV data; persons who are more anxious might be more likely to fidget or display other types of movement artifact. Therefore, for the present study, movement artifact was not examined.

Graphical Display of Major Hypotheses

Having considered the experimental design in the present study, one can visually trace the expected course of cardiovascular activity and experienced mood across the entire experiment for repressors and nonrepressors. Figure 4 displays the predicted course

of cardiovascular activity (without differentiating between SBP, DBP, and HR) as it rises following failure, diverges for repressors and nonrepressors during the experimental writing task (with the latter displaying a fall in cardiovascular activity), falls below baseline levels following success, stabilizes during the recovery period, and rises and falls during the security check manipulations. Figure 5 displays the predicted course of feelings of pleasantness/unpleasantness, in which repressors are expected to show little change across the experiment, while nonrepressors are expected to show a significant fall in pleasantness following failure and during the security check, a significant rise in pleasantness following success and passing the security check, and a significant rise in pleasantness during the experimental writing task (writing about their failure). Obviously, these two figures are idealized representations of the expected cardiovascular and mood data. In reality, one should expect significant departures of the cardiovascular data from the illustrated profile due to the various artifacts (e.g., movement, stimulus-presentation, individual response-stereotypy. . . etc.) that generally contaminate such data. Likewise, because the strength of the various manipulations (test evaluations, writing task, and security check) are unknown, both mood and cardiovascular changes may be more subtle than portrayed in these figures.

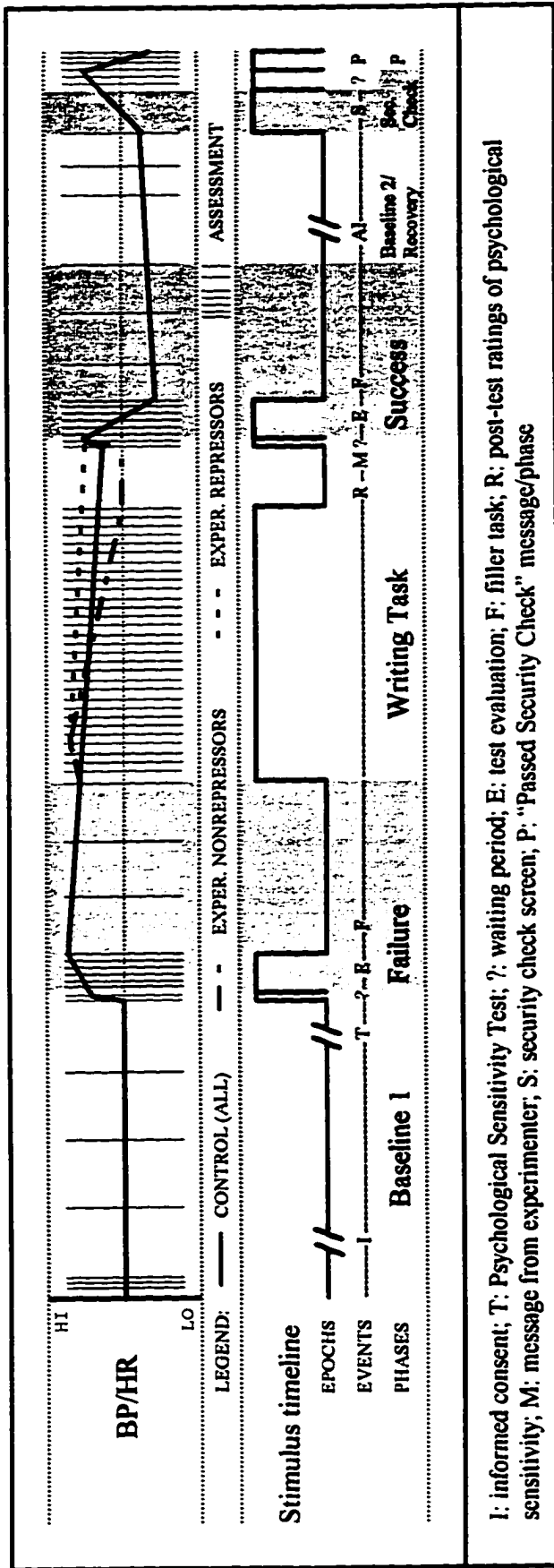


Figure 4: Predicted Changes in Cardiovascular Activity Across the Experiment

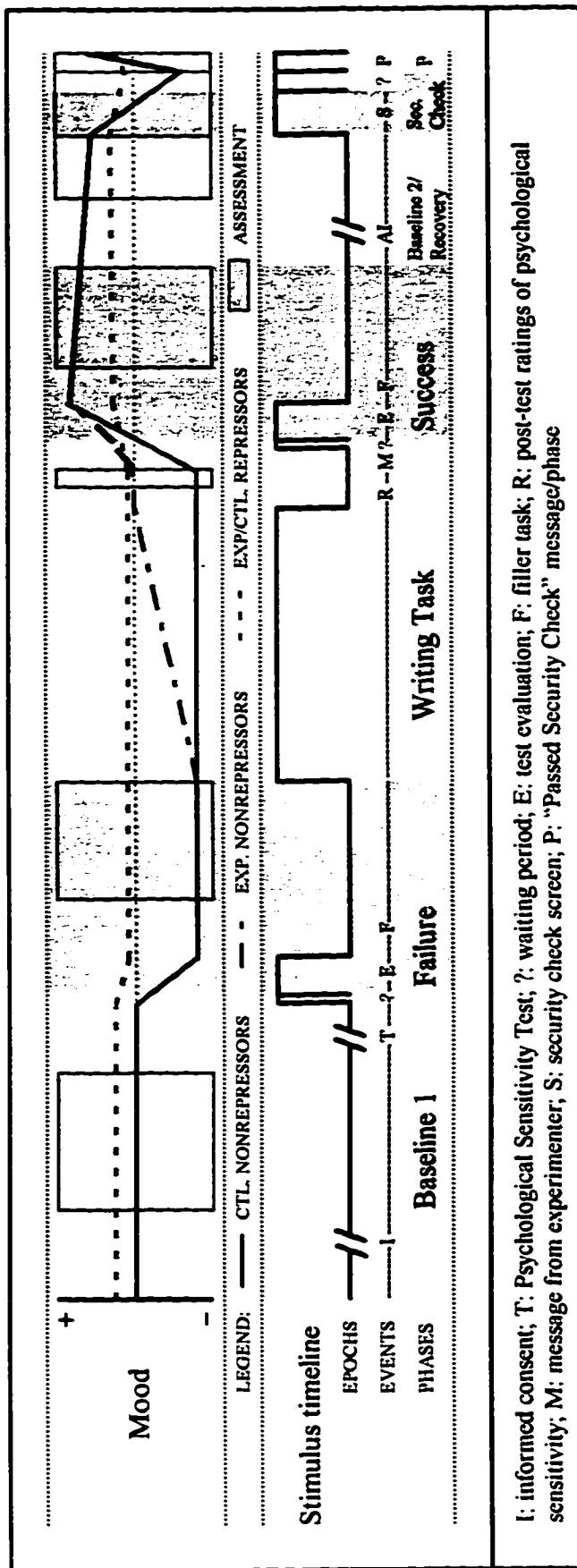


Figure 5: Predicted Changes in Self-reported Mood Across the Experiment

SECTION V.

RESULTS

Statistical analyses of the present study are divided into three sections. In the first section, I summarize my approach to data analysis and presentation of results, the psychometric properties of various measures, including the construct validity of repressive coping style, as well as the effectiveness of the manipulations in the study. In the second section, I present results from tests of the experimental hypotheses detailed in the Method section. In the third and final section, I present results from some exploratory analyses.

Preliminary Considerations

How Shall the Data Be Summarized and Evaluated?

Very recently, several articles (see Psychological Science, January, 1997) have addressed the need to re-evaluate the role of statistical analysis in psychological research. At what could be regarded as the first “behavioral statistics summit,” an APA Task Force on the issue developed several suggestions for how to use statistical analysis in psychological research. For instance, they recommended reporting effect sizes that are not sensitive to sample size, statistics such as d or r (Baumeister & Tice, 1997). In general, statistical analyses in the present study will conform to recommendations and insights provided by members of this task force (e.g., Abelson, 1995; Cohen, 1988; Cohen & Cohen, 1983; & Rosenthal & Rosnow, 1991), as well as other other researchers who have recently published articles on the issue (e.g., Hunter, 1997; Schmidt, 1996).

Representation of effects. All of the single-degree-of-freedom effect sizes in the present study will be translated into correlation coefficients, as recommended by Robert

Rosenthal (Rosenthal, 1985; Rosenthal & Rosnow, 1991). There are several advantages to such a conversion. First, the values of correlation coefficients are readily interpretable both in terms of direction and magnitude of effect (Cohen, 1988), and they represent the relative advantage in using predictor variables to predict the dependent variables over simply using the grand means of the dependent variables. Second, the value of the correlation coefficient (but not t or F) is independent of the sample size, n , which facilitates comparisons of effects with different n 's. Third, the standard error about the correlation coefficient (when a Fisher transformation is applied) depends only upon n , a fact which facilitates the calculation of p values, statistical power, and confidence intervals.

Among others, Abelson (1995) recommends that confidence intervals be calculated and displayed about standardized effect sizes, such as r , rather than raw effects, such as the difference between means. When such confidence intervals are adjusted to minimize Type I error (as in a Bonferroni correction), they can be used as both a representation of the likely sampling distribution of r 's for the studied effect and as a test of statistical significance. In the present study, confidence intervals will be displayed where they are deemed appropriate and informative.

Control of inferential errors. To maintain a good balance between the probabilities of Type I and Type II errors, I will follow the recommendations of Myers & Wall (1991), who suggest that Bonferroni alpha correction be applied within (but not across) each "family of comparisons" within a study. A family of comparisons in this study will consist of the set of statistical tests carried out for each research hypothesis or research question

(and hence the number of p values associated with each test). To minimize Type II error, only the contrast of repressors vs. nonrepressors will be formally evaluated in the hypothesis tests²³; however, for display purposes, the other two contrasts will be ornamented with superscripts indicating the level of statistical significance they would have attained had they, instead of the repressor-vs.-nonrepressor contrast, been the focus of the hypothesis tests.

In previous research, effect sizes near $r = .40$ have been reported for differences between repressors and nonrepressors on both cardiovascular measures of reactivity and self-report measures of mood during manipulations such as viewing a film or doing mental arithmetic (e.g., Asendorpf & Scherer, 1983; Weinberger et al., 1979). Having no reason to suspect that manipulations in the present study would be any weaker than those in previous studies, I expected effect sizes near $r = .40$ in the present study. The power for detecting such an effect with 141 subjects and a per-comparison two-tailed alpha criterion no less than .01 (after Bonferroni correction) is greater than .99 (Cohen, 1988), in which case the Type II error is deemed acceptably low. Anticipating that the published effect sizes are actually slight overestimates of the true population effect (see Rosenthal, 1985), the present study has statistical power of .85 to detect an effect of $r = .30$.

Statistical significance testing. In response to several recent warnings and attempts

²³ Bonferroni correction procedures inflate Type II error to the degree that members of a family of comparisons are not independent. The planned contrasts in this study share considerable variance with one another; therefore, Bonferroni correction would be an overcorrection. Because systolic and diastolic blood pressure share approximately 50% of the variance (see Table 2), Bonferroni correction will be a bit too conservative; however, because no appreciable differences in statistical significance were noted when considering SBP and DBP as a single entity in Bonferroni correction vs. two entities, the latter, more conservative correction is displayed.

at consciousness-raising regarding null hypothesis significance testing (e.g., Schmidt, 1996), I have decided to use the information provided by each r and its standard error for the purpose of two different inferences. The first inference is the conventional inference concerning whether or not there is sufficient evidence to expect (with “95% confidence”) that future samples of the effect would be in the same direction (whether $+r$ or $-r$) as those obtained in the present study (Tukey, 1991)²⁴. When the obtained p value for an effect exceeds the criterion alpha, the null hypothesis of no effect is rejected and the above inference is made.

Although the first inference described above has tremendous theoretical merit, it is seriously limited in its application to future inferential research. When a p value for an effect is less than the alpha criterion, one can only be confident in the direction of the effect in future studies, not that future effects will themselves be of sufficient magnitude to reject the null hypothesis again²⁵. Here, a second inference is in order -- one that concerns beta (the probability of Type II error) rather than merely alpha (the probability of Type I error). Once an effect is obtained in a study, the researcher can assume that this

²⁴ In reality, the first inference is more formally stated as “if the null hypothesis were true, then the probability of obtaining an effect as large or larger than the one actually found would be less than alpha.” Technically, the confidence intervals that one develops for an obtained effect should be placed around the value of the null hypothesis (i.e., zero, the a priori expected effect size) to make such a formal inference; however, once an effect is obtained in one’s study, the best estimate of the population effect (and thus all future sampled effects) becomes the obtained effect, not zero; in anticipation of future studies, one should thus place the confidence intervals about the obtained effect and shift one’s focus of confidence away from the surprisingness of the effect to the reliability of the direction of the effect.

²⁵ Of course, conducting a conventional null hypothesis test on an exact replication is really inappropriate (see Schmidt, 1996). If one is concerned with the true value of the population effect, one should combine the replication effect with the originally obtained effect, pool their standard errors and make a new inference about the direction of the effect. Even when an approximate replication is attempted, the researcher might still regard the obtained effect in the original study and the obtained effect in the replication study as coming from roughly the same population distribution of effects.

obtained effect is the best estimate of the population effect and then use the standard error about the effect to calculate the probability of a future replication study rejecting the null hypothesis at some specified alpha level. This probability of replication at a certain alpha (and with a certain n) is referred to as statistical power ($1 - \beta$). Just as there are conventions for acceptable alpha levels (namely, .05), there are conventions for acceptable beta levels (namely, .20; see Cohen, 1988); thus, one can make an inferential decision about the confidence of replicability of a study (null-hypothesis-wise) by determining whether the estimated frequency of future sampled effects is below a critical value of t (at say $\alpha = .05$, two-tailed, with the same n) is less than .20.

Collectively, “alpha inferences” and “beta inferences” described above (along with confidence intervals for identifying marginal effects) provide considerable information for guiding theory and research. For this reason, all effects will be designated as having met neither criterion (no superscript), the alpha criterion only (α superscript)-- meaning that we can be confident in the direction of the effect, or both the alpha and beta criteria (β superscript) -- meaning that we can be confident in the replicability of the null-hypothesis significance test of the effect.

Calculation of major dependent measures. Another recommendation of the aforementioned Task Force on Statistical Inference was that researchers should, whenever possible, simplify designs that are submitted to statistical analysis (Baumeister & Tice, 1997). Accordingly, rather than conducting mixed-model contrast analyses, I have

decided to use DV residuals²⁶, rather than raw scores in many of my analyses. For instance, to examine how the failure evaluation affects repressors' vs. nonrepressors' moods, I will conduct a t-test between repressors' and nonrepressors' ratings of pleasantness following Failure, controlling for pleasantness at Baseline.

One of my hypotheses states that there will be a relationship between the intensity of pleasantness following Success and the intensity of pleasantness following Failure. In terms of residual scores, one could merely examine the relationship between pleasantness at Success and Failure controlling for Baseline; however, such an analysis would yield a correlation of zero if relief represented a return to baseline levels of pleasantness ("homeostasis") rather than an overshoot in pleasantness across Baseline ("rebound"). To examine the homeostatic model of relief, one should correlate pleasantness at Baseline and Success, controlling for Failure. Figure 6 displays the rebound and homeostatic models of relief, as well as equations for predicting each kind of relief from raw scores and Baseline and Failure residuals. Because one of the major purposes of this study is to explore the nature of relief, I will use both Baseline and Failure residuals in many of the analyses.²⁷

²⁶ I elected not to use change scores because change scores add negatively weighted variance to the dependent measure; residuals, on the other hand, remove variance. This distinction is important when one considers the relationship between two dependent measures, from which a third variable has either been subtracted or partialled. If the two dependent measures are really independent, the subtraction of a third variable from them both will produce an artifactual correlation of up to +.50, whereas the partialling of the third variable will not produce an artifactual correlation.

²⁷ The one exception to this is that I will not examine between-subject differences separately for Failure DVs controlling for baseline and baseline DVs, controlling for Failure.

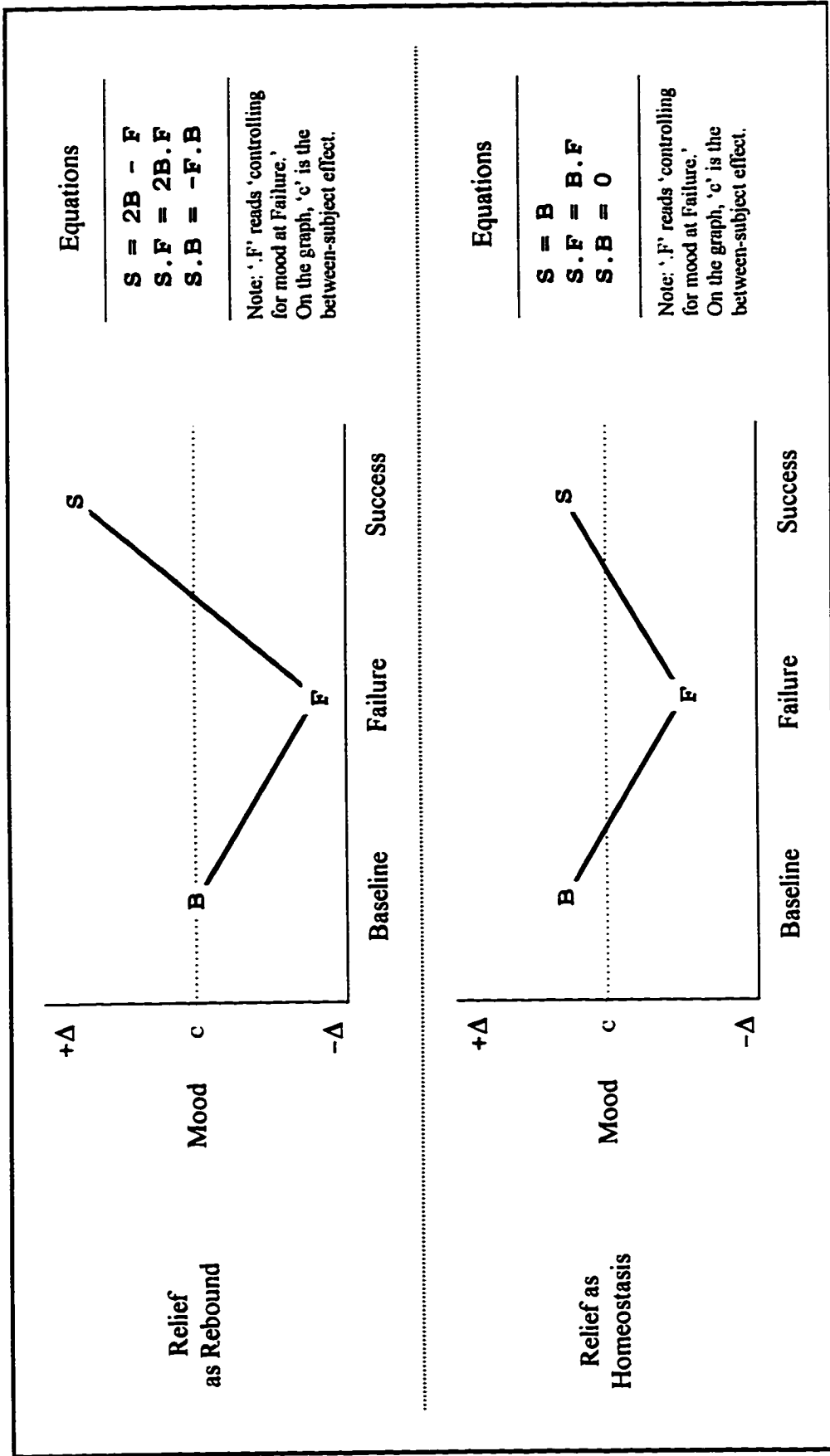


Figure 6: Models of Relief and Associated Prediction Equations Using Raw Scores and Residuals

Do the Dependent Measures Have Suitable Psychometric Properties?

Treatment of outliers. Each of the major dependent measures (see Table 1) were examined for outliers, as defined by standardized scores greater than 3.0 in absolute value (Stevens, 1992). Before the rest of the analyses were carried out on the data, all outliers were winsorized (replaced with the mean score ± 3.0 times the standard deviation). A preliminary examination of the results with and without outliers indicated no appreciable differences; however, the outliers were winsorized to better estimate the standard error about the population effects.

Gender differences. A preliminary examination of the data revealed no statistically significant gender differences in any of the analyses in the present study, excluding Baseline cardiovascular measures, where men generally exhibited higher blood pressure and marginally lower heart rate than heart rate than women. Because the analyses of cardiovascular data control for Baseline (or readings at Failure, which is highly correlated with Baseline readings), the Baseline gender differences had no reliable effect on the analyses. All further analyses in this paper refer to the combined sample, collapsed across gender.

Homogeneity of variance. Although t-tests are robust with respect to violations of normality, they are sensitive to violations of heterogeneity of variance when the group n's are unequal (Glass & Hopkins, 1996). Because each of the planned contrasts in the present study are conducted on groups of unequal n, I examined homogeneity for each contrast on each dependent measure. The results of these analyses are displayed in Table 1, along with the means and standard deviations of the dependent measures. As shown in

Table 1

Distribution Moments and Homogeneity Tests for Baseline Dependent Variables and Residuals¹ At Failure, Writing, and Success Events

DV	Event	Variance Removed ¹	Distribution Moments				Bartlett-Box F for Planned Contrasts ²		
			MEAN	SD	Skew.	Kurt.	R/NR	R/LA	HD/LD
PU	Baseline		5.25	.76	-1.16	3.25**	7.05*	.26	1.04
PU	Baseline	Failure	-.05	.49	-.69	2.63**	2.60	.00	.01
PU	Failure	Baseline	.08	.55	-.90	1.10	4.58*	1.53	4.17*
P	Writing	Failure	.00	.87	.44	2.03	.31	.96	1.33
PU	Success	Failure	-.06	.55	-.52	2.59**	.91	1.12	.29
PU	Success	Baseline	-.02	.47	-.07	.69	1.10	.03	.17
PA	Baseline		3.75	1.19	-.31	-.40	3.69	1.36	1.02
PA	Baseline	Failure	-.05	.65	-.15	.20	9.93*	6.92*	3.80*
PA	Failure	Baseline	.04	.71	-.05	.40	1.71	2.56	1.33
PA	Success	Failure	-.10	.77	1.01	1.07	.17	.87	.09
PA	Success	Baseline	-.06	.82	-.14	1.41	.44	.43	.71
NA	Baseline		1.83	.82	1.55**	2.55**	6.18*	2.16	2.32
NA	Baseline	Failure	.03	.65	1.04	1.92	2.76	1.10	.69
NA	Failure	Baseline	-.12	.80	1.19	2.46**	8.22*	2.28	3.33
NA	Success	Failure	.02	.53	1.13	3.44**	.37	2.50	.75
NA	Success	Baseline	-.02	.51	.68	5.46**	.08	.96	.38
SBP	Baseline		138.64	19.83	-.09	.25	.05	.29	.05
SBP	Baseline	Failure	.61	13.73	.13	-.40	.01	.32	.53
SBP	Failure	Baseline	.48	13.31	.02	.41	.02	.40	.26
SBP	Writing	(Slope)	-4.04	66.53	.82	1.91	3.34*	2.73*	3.00*
SBP	Success	Failure	-.23	9.59	.04	.72	1.19	.11	.01
SBP	Success	Baseline	.13	14.89	.07	.38	.20	1.80	1.28
DBP	Baseline		82.17	13.43	.08	.27	.12	.25	.80
DBP	Baseline	Failure	.53	7.27	-.01	-.25	.05	.37	1.67
DBP	Failure	Baseline	.01	6.52	-.01		2.25	1.68	1.41
DBP	Writing	(Slope)	16.28	30.78	-.07	.24	.27	1.10	.30
DBP	Success	Failure	-.12	4.95	.39	.93	2.09	1.60	.62
DBP	Success	Baseline	-.20	7.09	.11	-.53	1.59	.86	1.03
HR	Baseline		78.75	13.52	.01	.39	.27	.43	1.36
HR	Baseline		.14	8.56	.07	1.00	.05	.21	.01
HR	Failure	Baseline	.09	7.47	1.33	.38	.43	.44	.61
HR	Writing	(Slope)	-7.31	36.36	.36	.73	.83	.90	2.15
HR	Success	Failure	-.35	5.11	-.50	1.27	1.40	3.40	2.03
HR	Success	Baseline	-.32	6.69	-.21	1.11	.22	.16	.24

Note: "R": Repressors. "NR": Nonrepressors; "LA": Low Anxious; "HD": Defensive. "LD": Low Defensive. PU: Pleasantness (Full Scale). P: "Pleasantness" (single-item). PA: Positive Affect. NA: Negative Affect. SBP: Systolic Blood Pressure (mmHg). DBP: Diastolic Blood Pressure. HR: Heart Rate (BPM); $SE_{skew} = .20$; $SE_{kurt} = .41$; * $p < .05$; ** $p < 1.0E^{-9}$

¹ Residuals were obtained by regressing DVs at a focal event (e.g., Success) on DVs at the control event (e.g., Failure).

² For DVs at writing, homogeneity tests reflect personality-group-by-writing-task breakdown

Table 1, for the repressor-vs.- nonrepressor contrast (the focus of this study), significant heterogeneity was observed for pleasantness at Baseline, pleasantness at Failure controlling for Baseline, positive affect at Baseline controlling for failure, negative affect at Baseline and at Baseline controlling for Failure, and the slope of SBP during the writing task. To guard against inflated Type I error due to heterogeneity of variance, each of the heterogeneous DVs were transformed into ranks (across the entire set of observations, regardless of group), and then contrasts were performed on both the ranks and the raw data. Because no appreciable differences were obtained with these analyses, only analyses on the raw data are presented.

Scale reliabilities. The reliabilities and intercorrelations of the personality and dependent measures are summarized in Table 2. As expected, the reliabilities are strong for the cardiovascular measures, self-reported pleasantness, and positive affect, and adequate for negative affect.

Validity of cardiovascular and mood measures. Also illustrated in Table 2, The discriminant validity of the positive and negative affect scales was consistently demonstrated by their small correlations with each other at each assessment interval. Despite this discriminant validity, items from the positive and negative affect scales combined with ratings of “pleasantness,” “happiness,” and “sadness” to form a highly reliable scale of pleasantness. As has been demonstrated in previous research, there were strong positive correlations between systolic and diastolic blood pressure; however, there were no reliable correlations between blood pressure and heart rate or between any of the cardiovascular measures and any of the self-reported mood measures.

Table 2

Intercorrelations and Reliabilities¹ (On Diagonal) of Major Dependent Variables

DV	Event	Variance Removed	DV At Same Event and With Same Control Event As Row Variable					
			PU	PA	NA	SBP	DBP	HR
PU	Baseline		.80					
PU	Baseline	Failure						
PU	Failure	Baseline	.84					
P	Writing	Failure						
PU	Success	Failure	.83					
PU	Success	Baseline						
PA	Baseline		.48 [†]	.80				
PA	Baseline	Failure	.56 [†]					
PA	Failure	Baseline	.55 [†]	.87				
PA	Success	Failure	.61 [†]	.89				
PA	Success	Baseline	.70 [†]					
NA	Baseline		-.65 [†]	-.11	.69			
NA	Baseline	Failure	-.66 [†]	-.06				
NA	Failure	Baseline	-.75 [†]	-.20*	.75			
NA	Success	Failure	-.59 [†]	-.23*	.71			
NA	Success	Baseline	-.43 [†]	-.05				
SBP	Baseline		-.04	.02	.02	.96		
SBP	Baseline	Failure	.03	-.05	-.14			
SBP	Failure	Baseline	.02	-.06	-.08	.98		
SBP	Writing	(Slope)	-.03	—	—	—		
SBP	Success	Failure	.01	.04	.14	.98		
SBP	Success	Baseline	-.07	-.08	-.02			
DBP	Baseline		-.03	.04	.06	.73 [†]	.98	
DBP	Baseline	Failure	.01	.04	-.11	.70 [†]		
DBP	Failure	Baseline	-.03	-.07	-.09	.74 [†]	.98	
DBP	Writing	(Slope)	.02	—	—	.70 [†]	—	
DBP	Success	Failure	-.06	-.04	.10	.75 [†]	.99	
DBP	Success	Baseline	-.04	-.07	-.07	.72 [†]		
HR	Baseline		.06	.05	-.14	.17*	.05	.96
HR	Baseline	Failure	.05	.11	-.05	.13	.16	
HR	Failure	Baseline	-.01	.05	.01	.08	.17*	.97
HR	Writing	(Slope)	-.05	—	—	-.04	.22 [†]	—
HR	Success	Failure	.03	.02	.07	.13	.09	.93
HR	Success	Baseline	-.15	.02	.19*	.10	.22 [†]	

¹ Displayed reliabilities were standardized Cronbach's alphas, calculated on raw scores, not residuals.

² PU: Pleasantness (Full Scale); P: "Pleasantness" (single-item); PA: Positive Affect; NA: Negative Affect; SBP: Systolic Blood Pressure (mmHg); DBP: Diastolic Blood Pressure; HR: Heart Rate (BPM).

* $\rho \neq 0$ (or rejection of $\rho = 0$) reliable at $\alpha_2 = .05$ (no Bonferroni adjustment);

[†] $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

Note: Alternative superscript symbols were used for this table to avoid confusion with reliability alpha.

As a crude check on the validity of the blood pressure and heart rate readings, I conducted a short study using myself and a female graduate student as subjects. For two two-minute periods, cardiovascular activity was simultaneously sampled every two seconds from the index fingers of the right and left hands by two different Ohmeda 2300 Finapres machines. The trials were separated by about 5 minutes, during which time the right and left blood pressure cuffs were switched. To introduce systematic variance in cardiovascular activity, subjects sang the National Anthem during the second quarter and last quarter of each two-minute trial. For each subject and each trial, correlation coefficients were calculated between each Finapres machine's samples of SBP, DBP, and HR. The average correlations were .81, SBP; .86, DBP; and .78, HR, suggesting reasonable validity for the cardiovascular measures.²⁸

Subject suspicion. Because the experiment involved several supposedly covert manipulations of mood, I expected that some subjects would become suspicious of the experimental events; therefore, I decided to examine the influence of suspicion on the major dependent measures. Specifically, subjects were placed into one of three categories depending upon their verbal behavior during the debriefing: subjects who reported believing the test performance evaluations (n = 116), subjects who reported being somewhat suspicious of the manipulations in the study (n = 14), and subjects who seemed fairly certain that the test performance evaluations were bogus manipulations of mood (n =

²⁸ The Ohmeda Finapres Monitor also coded the cardiovascular data for the "goodness" of the readings. These validity codes vary from "data reflects current cardiovascular activity." to "data reflects recent (i.e., with a second or two) cardiovascular activity" to "data not obtainable." Data falling into the last category was assigned a missing value. A rough inspection of the data indicated very few instances of the second category.

11). A linear contrast²⁹ of degree of suspicion (with -1, 0, and 1 weights for the three categories, respectively) was calculated on each DV, and these linear contrast scores were correlated with the major dependent variables. As shown in Table 3, the degree of subject's suspicion (apparent to the experimenter) was significantly related to a few of the dependent measures; however, these effects are relatively weak and do not lend themselves to a consistent interpretation³⁰ of the effects of suspicion on mood or cardiovascular activity.

Were the Manipulations Effective?

Raw data (i.e., not residuals) from the three nonrepressor groups were used to examine the effectiveness of several experimental manipulations. In particular, repeated-measures t-tests were separately conducted on pleasantness, systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) to evaluate the change from Baseline (1) to Failure and from Failure to Success. As shown in the top portion of Table 4, the self-reported mood data lend support for the effectiveness of the Failure and Success manipulations. Nonrepressors' moods became less pleasant following the failure evaluation (relative to Baseline) and more pleasant following the success evaluation (relative to mood at Failure); however, there was no reliable rebound in mood past Baseline at Success.

²⁹ The use of a zero-weighted group in a linear contrast/trend analysis presents some special difficulties. See Appendix H for details on linear contrast/trend analysis and how to deal with the special case of zero-weighted groups.

³⁰ For instance, one cannot conclude with confidence that the more suspicious subjects were more or less affected by the manipulations.

Table 3

Correlations between Subject Suspicion¹ and Major Dependent Measures

DV ¹	Experiment Event	Control	95% CIs for Effects		
			lower	r	upper
Pleasantness	Baseline		-.05	.11	.27
Pleasantness	Baseline	Failure	.00	.16	.32
Pleasantness	Failure	Baseline	-.28	-.12	.04
"Pleasantness"	Writing Task	Failure	.01	.17 ^α	.33
Pleasantness	Success	Failure	-.09	.08	.24
Pleasantness	Success	Baseline	-.21	-.04	.12
Systolic BP	Baseline		-.22	-.05	.11
Systolic BP	Baseline	Failure	-.26	-.11	.06
Systolic BP	Failure	Baseline	-.06	.10	.26
Systolic BP	Writing	(Slope)	-.15	.02	.18
Systolic BP	Success	Failure	-.10	.06	.23
Systolic BP	Success	Baseline	-.04	.13	.29
Diastolic BP	Baseline		-.24	-.08	.09
Diastolic BP	Baseline	Failure	-.24	-.08	.09
Diastolic BP	Failure	Baseline	-.12	.04	.20
Diastolic BP	Writing	(Slope)	-.22	-.05	.11
Diastolic BP	Success	Failure	-.06	.10	.26
Diastolic BP	Success	Baseline	-.05	.12	.28
Heart Rate	Baseline		-.18	.01	.16
Heart Rate	Baseline	Failure	-.29	-.13	.03
Heart Rate	Failure	Baseline	.00	.16	.32
Heart Rate	Writing	(Slope)	-.18	-.02	.15
Heart Rate	Success	Failure	-.13	.04	.20
Heart Rate	Success	Baseline	.02	.18 ^α	.34

Note: Pleasantness: Full Scale: "Pleasantness": single-item rating

^α $\rho \neq 0$ reliable at $\alpha_2 = .05$ (not Bonferroni-adjusted)

^β $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

¹ "Suspicion" is trichotomous variable where -1 = "no (posthoc) suspicion of experimental manipulations reported." 0 = "some (posthoc) suspicion of manipulations reported." and 1 = "(posthoc) suspicion that manipulations were designed as a manipulation of mood." Codes were assigned by the experimenter on the basis of information obtained during the debriefing.

The cardiovascular data lend mixed support for the manipulations. While SBP and DBP exhibited predicted increases from Baseline to Failure, they also exhibited unpredicted increases from Failure to Success. While HR did not change significantly from Baseline to Failure, it did exhibit predicted decreases from Failure to Success. These results do not conform well to the predictions and suggest either a complex pattern of arousal during the manipulations and/or the existence of significant error produced by previously mentioned artifacts (e.g., movement, stimulus presentation). In all, then, only the self-reported mood changes uniformly conformed to predictions.

To examine the effectiveness of the experimental writing task (writing about PST failure), separate mixed-model ANOVAs were conducted on pleasantness, SBP, DBP, and HR. The independent variables were the nature of the writing task (writing about failure - "Experimental" vs. writing about a typical day -- "Control") and the experimental event. For the mood data, there were two levels of experimental event -- after Failure and after Writing. For the cardiovascular data, there were 6 levels of experimental event -- the 6 consecutive aggregates of CV data during the writing task -- which collectively were analyzed as linear contrasts. For each of the four dependent measures, a significant Event X Task interaction was predicted. The bottom portion of Table 4 displays the results of these interaction effects as well as the simple effects of Event within Task (for additional information only). Unfortunately, none of the interactions were statistically significant. Furthermore, the simple effects within Task for DBP and HR indicated that DBP significantly increased during both tasks, while HR marginally decreased during both tasks. Clearly, these data do not support the predicted effects of the writing task on mood

Table 4

Manipulation Checks on Nonrepressors' Data

DV	Event 1	MEAN(SD)	Event 2	MEAN(SD)	Effects (r) & 95% CIs
Pleasantness	Baseline	5.09(0.78)	Failure	4.70(0.82)	.4862^β73
	Failure	4.70(0.82)	Success	5.11(0.78)	.4660^β71
	Baseline	5.09(0.78)	Success	5.11(0.78)	-.160423
Systolic BP	Baseline	138.08(20.04)	Failure	148.16(19.44)	.4358^β69
	Failure	148.16(19.44)	Success	150.31(20.85)	-.41 -.23^α -.04
	Baseline	138.08(20.04)	Success	150.31(20.85)	-.73 -.63^β -.49
Diastolic BP	Baseline	81.28(13.57)	Failure	84.24(13.21)	.2038^β54
	Failure	84.24(13.21)	Success	86.10(13.67)	-.53 -.38^β -.19
	Baseline	81.28(13.57)	Success	86.10(13.67)	-.67 -.54^β -.39
Heart Rate	Baseline	78.08(13.78)	Failure	78.59(12.25)	-.25 -.0614
	Failure	78.59(12.25)	Success	74.85(10.84)	.3954^β67
	Baseline	78.08(13.78)	Success	74.85(10.84)	.1736^β52

DV	Task	Event Means		Source	Effects r & 95% CIs
		Failure	Writing		
Pleasantness	EXP	4.54(1.23)	4.32(1.39)	Event Within Task:	-.042549
	CTL	4.10(1.08)	4.16(1.22)	Event Within Task:	-.220634
				Event X Task:	-.051534
Systolic BP	EXP	Slope:	-4.15(60.38)	Event Within Task:	-.210735
	CTL	Slope:	-.83(57.30)	Event Within Task:	-.260129
				Event X Task:	-.080110
Diastolic BP	EXP	Slope:	15.28(32.20)	Event Within Task:	-.64 -.44^β -.18
	CTL	Slope:	16.44(31.39)	Event Within Task:	-.67 -.48^β -.23
				Event X Task:	-.12 -.0306
Heart Rate	EXP	Slope:	-11.73(37.14)	Event Within Task:	.0331^α54
	CTL	Slope:	-9.23(34.64)	Event Within Task:	-.012651
				Event X Task:	-.070211

Note: negative r 's indicate effect in unpredicted direction; $N = 101$.

^α $p \neq 0$ reliable at $\alpha_2 = .05$:

^β $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

and cardiovascular activity; therefore, any between-groups differences should be interpreted with caution.

Were Repressors and Nonrepressors Well-Categorized?

To examine how well-categorized participants in the study were, I examined the means for anxiety, defensiveness (approval motive), and the proximity measure of repressive coping for subjects in each of the four disposition groups. These data are presented in Table 5. As shown in Table 5, the different groups do significantly differ predictably in anxiety, defensiveness and repressive coping (proximity measure.). Most importantly, repressors received higher scores on defensiveness and the proximity measure and lower scores on anxiety than nonrepressors.

Did Repressors in This Study Behave as Repressors in Previous Studies?

Previous research has shown that repressors ostensibly forget, dismiss, or otherwise distance themselves from ego-threatening information; additionally, they deny feelings of anxiety arising from such information, despite manifesting all of the physiological signs of this anxiety. Some of these behaviors were examined in the present study in order to verify that repressors engaged in repressive coping during the study. In particular, I expected to observe that after receiving the failure evaluation, repressors would a) rate their psychological sensitivity as higher than nonrepressors, b) judge psychological sensitivity to be less important, c) rate their effort on the test as lower, and d) write fewer implications during the experimental writing task. As displayed in Table 6, these measures of repressive coping did not reliably differentiate repressors from nonrepressors.

In previous studies, repressors reported more pleasant moods than nonrepressors

Table 5

Goodness of Subject Selection and Categorization: Means, Standard Deviations, and Planned Contrasts of Anxiety, Defensiveness, and Repressive Coping (Proximity Measure) by Personality Category

DV	Personality Category					Planned Contrast	95% CIs for Effects	
	Repressors (n = 40)	Anx/HDef (n = 21)	Anx/LDef (n = 40)	LAnx (n = 40)			lower	upper
Trait Anxiety	3.53(.31)	10.19(2.27)	11.45(2.80)	3.53(1.85)		Rep v. NRep Rep v. LAnx HDef v. LDef	.60 -.22 -.03	.77 .22 .29
Defensiveness	21.45(2.69)	21.10(2.57)	12.05(3.19)	10.35(3.03)		Rep v. NRep Rep v. LAnx HDef v. LDef	.64 .83 .81	.80 .93 .90
Repressive Coping (proximity measure)	5.58(.54)	4.67(.54)	3.07(.67)	3.46(.62)		Rep v. NRep Rep v. LAnx HDef v. LDef	.74 .82 .77	.86 .92 .88

^a $\rho \neq 0$ reliable at $\alpha_2 = .05$; ^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

Table 6
Means, Standard Deviations, and Planned Contrasts of Behavioral Measures of Defensiveness by Personality Category

DV	Personality Category					Planned Contrast	95% CIs for Effects	
	Repressors (n = 40)	Anx/HDef (n = 21)	Anx/LDef (n = 40)	LAnx (n = 40)			lower	upper
PS self-assess. (after failure)	4.23(1.33)	4.29(1.15)	3.90(1.41)	3.70(1.11)	Rep v. NRep	-.12	.09	.30
					Rep v. LAnx	-.07	.21	.46
					HDef v. LDef	-.04	.17	.37
PS importance (after failure)	4.58(1.17)	4.90(1.45)	4.33(1.25)	4.38(1.27)	Rep v. NRep	-.20	.01	.22
					Rep v. LAnx	-.20	.08	.35
					HDef v. LDef	-.06	.15	.35
PST effort (after failure)	5.38(1.03)	6.14(0.79)	5.35(1.27)	4.85(1.42)	Rep v. NRep	-.24	-.03	.18
					Rep v. LAnx	-.07	.21	.46
					HDef v. LDef	.05	.26 ^a	.45
Words written (exper. only)	48.85(21.62)	42.40(16.72)	47.38(17.28)	49.45(19.57)	Rep v. NRep	-.31	-.10	.11
					Rep v. LAnx	-.35	-.08	.21
					HDef v. LDef	-.20	.01	.22

^a $\rho \neq 0$, reliable at $\alpha_2 = .05$; $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

during Baseline conditions and during ego-threatening tasks. Table 7 presents cardiovascular activity and pleasantness for repressors and nonrepressors during Baseline, and Table 8 displays changes in these measures from Baseline to Failure feedback conditions. From Table 7, it is clear that, contrary to expectations, repressors reported feeling more pleasant than nonrepressors during Baseline; however, repressors did not differ from nonrepressors in Baseline heart rate or blood pressure. Also contrary to expectations, Table 8 shows that repressors and nonrepressors did not differ in the amount of change in pleasantness.

Tests of Hypotheses

As an overview to the hypothesis tests and a summary of some of the preliminary analyses, I here present two figures, which illustrate the actual changes in cardiovascular activity and self-reported “pleasantness”³¹ over time. As is apparent in Figure 7, blood pressure and heart rate do not conform well to the predicted patterns. Although, as predicted, there were no significant differences between repressors and nonrepressors, there were also no significant differences between experimental and control conditions. Also notable are a lack of the predicted upward spike following the failure evaluation, several seemingly artifactual spikes that occur at the beginning of each mood assessment³², and a spike in heart rate that occurs near the beginning of the writing task. Only the apparent rise and mixed fall of cardiovascular measures during the security check manipulations and the apparent fall of blood pressure during the success

³¹ The single item measure was used so that the mood reports after the writing task and during the security check could be graphed along with the mood reports surrounding the Psychological Sensitivity Test evaluations.

³² The four mood assessments are each denoted by three wide-spread vertical lines on the graph.

Table 7

Means, Standard Deviations, and Planned Contrasts of Baseline Dependent Measures by Personality Category

DV	Personality Category						95% CIs for Effects	
	Repressors ($n = 40$)	Anx/HDef ($n = 21$)	Anx/LDef ($n = 40$)	LAnx ($n = 40$)	Planned Contrast	lower	upper	
Pleasantness	5.63(.54)	5.03(.79)	4.83(.86)	5.39(.58)	Rep v. NRep Rep v. LAnx HDef v. LDef	.18 -.01 -.01	.34 ^a .21 .15	.48 .41 .31
Systolic BP	140.06(19.45)	142.20(20.03)	138.70(22.11)	135.29(17.83)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.17 -.14 -.10	.03 .13 .10	.23 .38 .30
Diastolic BP	84.42(12.94)	83.90(11.95)	81.53(15.81)	79.67(11.94)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.11 -.08 -.08	.09 .19 .13	.29 .43 .32
Heart Rate	80.43(12.85)	81.41(17.57)	79.02(13.44)	75.38(11.57)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.14 -.07 -.07	.06 .20 .13	.26 .45 .33

^a $\rho \neq 0$ reliable at $\alpha_2 = .05$ (adjusted); ^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

Table 8

Means and Standard Deviations of Change in Cardiovascular Activity and Mood From Baseline to Failure Conditions, With Planned Contrasts (On DV Residuals) For Personality Categories

DV	Personality Category						95% CIs for Effects		
	Repressors	Anx/HDef	Anx/LDef	LAnx	Planned	Contrast	lower	\bar{r}	upper
	($n = 40$)	($n = 21$)	($n = 40$)	($n = 40$)					
Pleasantness	-47(.65)	-.46(.58)	-.32(.44)	-.45(.54)	Rep v. NRep	Rep v. NRep	-.18	-.01	.16
					Rep v. LAnx	Rep v. LAnx	-.22	.00	.22
					HDef v. LDef	HDef v. LDef	-.21	-.05	.12
Systolic BP	10.91(14.83)	10.06(16.76)	11.20(14.50)	8.99(13.46)	Rep v. NRep	Rep v. NRep	-.16	.04	.24
					Rep v. LAnx	Rep v. LAnx	-.15	.12	.38
					HDef v. LDef	HDef v. LDef	-.15	.05	.25
Diastolic BP	.21(6.32)	1.94(6.18)	3.93(7.13)	2.51(7.68)	Rep v. NRep	Rep v. NRep	-.33	-.14	.06
					Rep v. LAnx	Rep v. LAnx	-.27	-.11	.16
					HDef v. LDef	HDef v. LDef	-.30	-.11	.10
Heart Rate	-1.75(8.38)	-1.88(8.69)	.36(9.17)	1.93(8.18)	Rep v. NRep	Rep v. NRep	-.28	-.08	.12
					Rep v. LAnx	Rep v. LAnx	-.40	-.15	.12
					HDef v. LDef	HDef v. LDef	-.32	-.12	.08

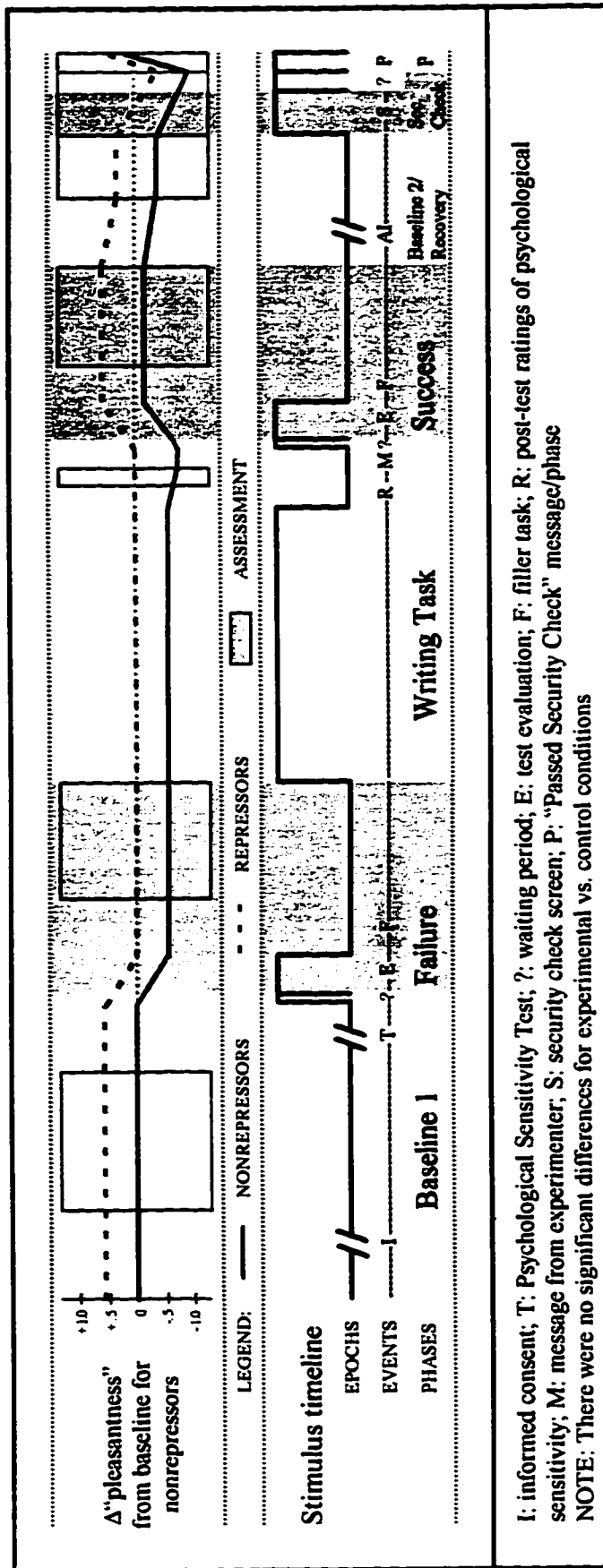
^a $\rho \neq 0$ reliable at $\alpha_2 = .05$ (adjusted); ^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., $>80\%$ likelihood of replication succeeding at $\alpha_2 = .05$)

^c Residuals were obtained by regressing DVs at Failure on DVs at Baseline.

evaluations conforms to the predictions. One last thing to note about Figure 7 is the fall in diastolic blood pressure and heart rate just prior to the corrected evaluation, a trend that suggests that subjects may have felt relief prior to the second evaluation, when the experimenter informed the subject that the first score was incorrect. Collectively, these features of the cardiovascular data suggest the presence of unintended artifactual influences on the cardiovascular data and additional error that may have prevented detection of effects of the manipulations and differences between repressors and nonrepressors.

Figure 8 illustrates the means of self-reported “pleasantness” (single item) across the experiment. While the pattern of self-reported mood conforms fairly well to the predicted pattern for nonrepressors, there are some notable exceptions. First, the success evaluation did not bring nonrepressors’ moods back to baseline, much less across baseline as a rebound in emotion. Second, however, the security check manipulations seemed to work much better -- producing more anxiety and more relief in the nonrepressors. For the most part, the repressors’ mood reports paralleled the nonrepressors’ reports, differing by a near-constant value (.5 on a 7-point Likert scale) from Baseline to the end of the experiment. The exception to this pattern is again during the security check, where the repressors seem to have exhibited a bit less anxiety and a bit less relief than the repressors.

Hypothesis I: Compared to nonrepressors, repressors will exhibit equal or greater decreases in cardiovascular activity following failure removal. The manipulation check on nonrepressor data indicated that heart rate, and not blood pressure, significantly decreased from Failure to Success events. Therefore, I decided to focus my test of Hypothesis I on



I: informed consent; T: Psychological Sensitivity Test; ? : waiting period; E: test evaluation; F: filler task; R: post-test ratings of psychological sensitivity; M: message from experimenter; S: security check screen; P: "Passed Security Check" message/phase
 NOTE: There were no significant differences for experimental vs. control conditions

Figure 8: Actual Changes in Self-reported Mood Across the Experiment

HR data for the repressors. As expected, repressors' heart rate significantly decreased [$r(39) = .33$, two-tailed 95% CI: $.02 < \rho' > .58$] from Failure, $M = 78.68(10.67)$, to Success, $M = 77.00(9.67)$. Not as predicted, but consistent with the nonrepressor data, both SBP and DBP increased (albeit nonsignificantly) from Failure to Success. Furthermore, planned contrasts on the residuals of the cardiovascular measures at Success (controlling for Failure) indicated no reliable difference between repressors and nonrepressors, as well as no reliable differences between repressors and truly low anxious subjects or between more and less defensive subjects. Change scores from Failure to Success for SBP, DBP, and HR are displayed in the bottom portion of Table 9.

Hypothesis II: Compared to nonrepressors, repressors will report less improvement in mood (i.e., less emotional relief) following failure removal. In the top portion of Table 9 are means, standard deviations and planned contrasts on the residuals of self-reported pleasantness (full scale) at Success, controlling for Failure. Contrary to predictions, repressors actually reported more pleasantness following Success than did nonrepressors. An informal examination of the change scores suggests that defensive subjects reported greater improvements in mood than nondefensive subjects (This contrast on the residuals, however, was marginally nonsignificant.)

For comparison purposes, Table 10 presents the results of planned contrasts on DV residuals at Success, controlling for Baseline. None of the planned contrasts for repressors vs. nonrepressors are statistically significant. Defensive subjects did exhibit less of a increase in diastolic blood pressure from Baseline to Success; however, this finding does not conform to predictions.

Table 9

Means and Standard Deviations of Change in Cardiovascular Activity and Mood From Failure to Success Conditions, With Planned Contrasts (On DV Residuals¹) For Personality Categories

DV	Personality Category						95% CIs for Effects	
	Repressors (<i>n</i> = 40)	Anx/HDef (<i>n</i> = 21)	Anx/LDef (<i>n</i> = 40)	LAnx (<i>n</i> = 40)	Planned Contrast	lower	upper	
Pleasantness	.51(.69)	.50(.51)	.38(.67)	.42(.48)	Rep v. NRRep Rep v. LAnx HDef v. LDef	.11 .01 .00	.26 ^p .23 ^a .16 .32	
Systolic BP	1.57(10.85)	.52(6.68)	.91(8.94)	4.23(10.37)	Rep v. NRRep Rep v. LAnx HDef v. LDef	-.21 -.36 -.26	.01 .16 -.06 .14	
Diastolic BP	1.37(5.64)	-.13(4.15)	1.63(4.69)	3.15(4.62)	Rep v. NRRep Rep v. LAnx HDef v. LDef	-.22 -.41 -.36	-.02 -.16 -.17 .19 .11 .04	
Heart Rate	-1.67(4.92)	-4.38(5.33)	-3.85(5.53)	-3.29(6.64)	Rep v. NRRep Rep v. LAnx HDef v. LDef	-.01 -.09 -.14	.19 .18 .07 .38 .42 .27	

^a $\rho \neq 0$ reliable at $\alpha_2 = .05$ (adjusted); ^p $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

¹ Residuals were obtained by regressing DVs at Success on DVs at Failure.

Table 10

Means and Standard Deviations of Change in Cardiovascular Activity and Mood From Baseline to Success Conditions, With Planned Contrasts (On DV Residuals) For Personality Categories

DV	Personality Category						95% CIs for Effects	
	Repressors (n = 40)	Anx/HDef (n = 21)	Anx/LDef (n = 40)	LAnx (n = 40)	Planned Contrast	lower	upper	
Pleasantness	.04(.43)	.04(.56)	.06(.58)	-.04(.42)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.05 -.08 -.09	.12 .15 .07	
Systolic BP	12.48(17.18)	10.58(18.56)	12.10(15.79)	13.23(13.94)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.18 -.25 -.20	.03 .02 .00	
Diastolic BP	1.58(6.58)	1.82(6.84)	5.55(7.53)	5.66(7.80)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.34 -.48 -.41	-.15 -.24 -.23 ^a	
Heart Rate	-3.43(8.43)	-6.26(10.78)	-3.49(9.24)	-1.37(6.22)	Rep v. NRep Rep v. LAnx HDef v. LDef	-.14 -.28 -.27	.06 -.02 -.08	

^a $\rho \neq 0$ reliable at $\alpha_2 = .05$ (adjusted); $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)
[†] Residuals were obtained by regressing DVs at Success on DVs at Baseline.

Hypothesis III: Rated importance of psychological sensitivity will moderate³³ the influence of failure and success evaluations on mood and mediate the influence of repressive coping style on relief (mood at Success, controlling for Failure). In order to examine the moderating influence of rated importance on mood at Failure, a standard multiple regression analyses was performed predicting self-reported pleasantness (raw scores) from a) rated importance, b) feedback (Baseline v. Failure), and c) the interaction of rated importance and feedback. To construct such a mixed-model interaction term, I followed procedures described in Cohen & Cohen (1983), who suggest removing the variance in mood due to subjects, treating each residualized mood observation (at Baseline and Failure) as a separate case, and then predicting mood from dummy codes for importance, feedback, and their interaction. The same approach was used to test the moderating effects of importance on Success mood, except that the feedback predictor consisted of pleasantness at Failure and Success. The results of these moderator analyses are displayed in the bottom portion of Table 11 as Analyses 1 and 2. Interestingly, but not as predicted, rated importance significantly interacted with feedback when feedback pitted Success mood against Failure mood, but the feedback-by-importance interaction was not significant for Failure versus Baseline mood. To clarify what this pattern of results means, the top portion of Table 11 displays the correlations between rated importance and Failure

³³ In an earlier footnote, I explained that moderators are independent variables. Usually, in order for a variable to be independent of other variables, it must be randomly manipulated; however, within a repeated-measures model, a variable such as rated importance that is constant across trials is independent of the trial effect and therefore can be treated as an "independent" moderator variable in the repeated-measures model. Rated importance can be examined as a mediator of the relationship between repressive coping and relief because I have constructed residuals of mood (at success, controlling for Failure mood) and thereby made the model completely between-subjects.

Table 11

Standard Multiple Regressions of "Relief" on Selected Predictor Variables, Including Expected Moderator and Mediator Variables

Predictor Variables	Intercorrelations			
	Relief ^d	1	2	3
1. Failure Pleasantness ²	-.51 ^a			
2. Expected Performanc on PST	.28 ^b	-.09		
3. Rated Importance of Psych. Sensitivity	.20 ^a	.05	.21 ^a	
4. Repressive Coping (proximity)	.24 ^a	-.20 ^a	.16	.09

Regression Analyses			
Analysis Number	DV	IV	sr
1	Failure Pleasantness ²	Importance of Psych. Sensitivity	(.02)
		Feedback (Baseline vs. Failure)	(.18)
		Importance X Feedback	-.02
2	Relief ^d	Importance of Psych. Sensitivity	(-.16)
		Feedback (Failure vs. Success)	(.00)
		Importance X Feedback	.17 ^a
3	Relief	Repressive Coping (proximity)	-.22 ^a
		Importance of Psych. Sensitivity	.18
4	Relief	Failure Pleasantness	-.48 ^b
		Expected Performance on PST	.24 ^b

Note: $N = 141$

¹ Relief is self-reported pleasantness after success feedback, controlling for pleasantness after failure feedback.

² Pleasantness at baseline, controlling for pleasantness after failure feedback., with reversed sign.

³ Pleasantness at baseline and after success controlling for pleasantness after failure.

⁴ Interaction is calculated using the methods described in Cohen & Cohen (1983).

^a $p \neq 0$ reliable at $\alpha_2 = .05$; Bonferroni adjustment = $.05/(\# \text{ predictors})$;

^b $\beta_{(1-\text{power})} < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

pleasantness (actually, Baseline controlling for Failure) and Success pleasantness (Success controlling for Failure). Simply put, rated importance of psychological sensitivity was significantly and positive correlated with the amount of relief (pleasantness) subjects reported feeling, but was not correlated with how badly they felt after Failure.

To examine the mediating influence of rated importance on the relationship between repressive coping style and relief, I conducted another standard multiple regression predicting Success pleasantness (controlling for Failure pleasantness) from rated importance of psychological sensitivity and the proximity measure of repressive coping. The mediator analysis is presented as Analysis 3 in Table 11. For importance to exhibit a significant mediating influence, repressive coping should be correlated significantly less with Success pleasantness when importance is in the regression equation versus when it is not in the equation (i.e., when Success pleasantness is merely correlated with repressive coping). A comparison of the zero-order correlation between Success pleasantness and repressive coping (top portion of Table 11) and the semipartial correlation controlling for rated importance suggests that importance was not a significant mediator of the relationship between repressive coping and relief.³⁴ In fact, repressive coping was not reliably correlated with rated importance, and therefore importance could not have been a significant mediator (Baron & Kenny, 1986).

³⁴ I also examined the mediational model using the categorical variable of repressors vs. nonrepressors and the interaction of dispositional anxiety (TMAAS) and defensiveness (Marlowe-Crowne). As with the proximity measure, neither of these measures of repressive coping were significantly mediated by rated importance.

Hypothesis IV: Self-reported pleasantness following failure removal (emotional relief) will be significantly predicted by self-reported pleasantness following failure feedback, and self-reported expectations about test performance. A standard multiple regression was performed, predicting the residuals of self-reported pleasantness at Success (controlling for Failure) from the residuals of pleasantness at Failure (controlling for Baseline) and subjects' pre-test estimates of their performance on the PST. The results of these analyses are displayed in Table 11 as Analysis 4. Consistent with the model of relief developed by Ortony et al. (1988), Failure pleasantness and performance expectations each uniquely predicted self-reported pleasantness at Success. The higher one's expectations, the greater one's relief. The less pleasant one felt after failure, the more pleasant one felt after relief.

Hypothesis V: Compared to nonrepressors, repressors will exhibit less decrease in cardiovascular activity during the experimental writing task and less improvement in mood following this task. In the manipulation check on nonrepressors, only heart rate decreased significantly during the writing tasks; also, there were no significant interactions between the type of writing task in which nonrepressors had engaged and pre-Writing vs. post-Writing mood or cardiovascular activity. Table 12 displays the main effects of writing task and planned contrasts, as well as the Task X Contrast interactions for the full sample. As shown in this table, none of the main effects or interactions were significant, giving further support to the conclusion that the writing task manipulation was ineffective as a manipulation.

Table 12

Effects of Writing about Failure (vs. Control) on Change in Self-Reported Pleasantness and Cardiovascular Activity

		Planned-Contrast Main Effects & Interactions (with 95% CIs)			
DV	EFFECTS	R/NR	R/LA	HD/LD	
"Pleasantness"	Writing Task	-27.....10.....07			
	Contrast	-17.....00.....17	-38.....-16.....07	-18.....-01.....16	
	Interaction	-22.....-05.....00	-16.....08.....30	-27.....-10.....07	
	<u>MEANS</u>	<u>Repressors</u>	<u>HDef/HAnx</u>	<u>LDef/Hanx</u>	<u>LDef/Lanx</u>
	Experimental:	-.35(.81)	.00(1.05)	-.35(.93)	-.20(.77)
	Control:	.00(.79)	-.18(.60)	-.20(.83)	.45(1.10)
	<u>EFFECTS</u>	<u>R/NR</u>	<u>R/LA</u>	<u>HD/LD</u>	
Systolic BP	Writing Task	-.15.....06.....26			
	Contrast	-.24.....-04.....17	-31.....-04.....24	-.24.....-04.....17	
	Interaction	-.14.....06.....27	-.09.....20.....45	-.08.....13.....33	
	<u>MEANS</u>	<u>Repressors</u>	<u>HDef/HAnx</u>	<u>LDef/Hanx</u>	<u>LDef/Lanx</u>
	Experimental:	7.64(67.06)	5.14(73.56)	1.39(58.95)	-14.34(56.36)
	Control:	-23.67(97.46)	-15.07(66.31)	-2.17(54.14)	8.35(56.45)
	<u>EFFECTS</u>	<u>R/NR</u>	<u>R/LA</u>	<u>HD/LD</u>	
Diastolic BP	Writing Task	-.18.....01.....23			
	Contrast	-.19.....02.....22	-.23.....05.....32	-.21.....00.....20	
	Interaction	-.20.....01.....21	-.18.....10.....37	-.14.....07.....27	
	<u>MEANS</u>	<u>Repressors</u>	<u>HDef/HAnx</u>	<u>LDef/Hanx</u>	<u>LDef/Lanx</u>
	Experimental:	18.03(27.04)	19.50(38.64)	18.67(37.30)	9.77(22.86)
	Control:	16.63(31.08)	10.34(40.11)	16.69(24.31)	19.56(33.53)
	<u>EFFECTS</u>	<u>R/NR</u>	<u>R/LA</u>	<u>HD/LD</u>	
Heart Rate	Writing Task	-.22.....-01.....19			
	Contrast	-.06.....15.....34	-.06.....22.....47	-.19.....01.....22	
	Interaction	-.20.....01.....21	-.23.....05.....32	-.15.....06.....26	
	<u>MEANS</u>	<u>Repressors</u>	<u>HDef/HAnx</u>	<u>LDef/Hanx</u>	<u>LDef/Lanx</u>
	Experimental:	.56(30.84)	12.91(44.79)	4.51(32.83)	18.35(37.78)
	Control:	.76(43.40)	20.19(48.88)	1.10(26.43)	11.32(32.54)

Note: No effects are reliable at .05 criterion.

Hypothesis VI: Compared to nonrepressors who write about a typical day (distraction task), nonrepressors who write about their failure will rate the importance of psychological sensitivity higher and their own psychological sensitivity lower; repressors, on the other hand, will exhibit the opposite pattern. A 2 (Repressors vs. Nonrepressors) X 2 (Experimental vs. Control) ANOVA was performed on ratings of importance of psychological sensitivity. As displayed in the top portion of Table 13, the interaction was not significant and neither were simple effects within disposition group. A 2 (Repressors vs. Nonrepressors) X 2 (Experimental vs. Control) X Time (Before Test vs. After Writing) mixed-model MANOVA was performed on ratings of one's own psychological sensitivity. As displayed in Table 13, the three-way interaction was not significant; however, simple effects within disposition suggest an effect in the unpredicted direction. Nonrepressors, but not repressors, rated their psychological sensitivity as higher (relative to ratings before taking the bogus test) when they thought about their failure. This finding does suggest that nonrepressors, but not repressors, used the writing task to re-evaluate the meaning of their test performance; however, nonrepressors apparently used the time to discount the negative implications of the test evaluation.³⁵

Hypothesis VII: Rated importance and self-assessment of psychological sensitivity will mediate the influence of writing about failure on mood after writing. Because experimental condition did not have a significant effect on mood after writing, neither rated importance nor self-assessment of psychological sensitivity could be a mediator of

³⁵ Another explanation for these findings is that subjects who participated in the experimental writing task were more suspicious of the validity of the failure evaluation; however, a t-test between experimental and control groups on the aforementioned suspicion variable was not statistically significant, $t(139) = -.82$.

Table 13

Effects of Writing about Failure on Repressors' and Nonrepressors' Rated Importance and Self-Assessment of Psychological Sensitivity and the Relationship between these Ratings and Self-Reported Mood after Writing

DV	Task	n	Disposition		Effects	
			Rep (n = 40)	NRep (n = 101)	Source	r & 95% CIs
Importance	EXP	70	4.70(1.08)	4.44(1.46)	Task Within Rep:	-.221142
	CTL	71	4.45(1.28)	4.49(1.16)	Task Within NRep:	-.22 -.0218
					Disposition X Task:	-.110522
Self-Assess. ¹	EXP	70	-.95(1.76)	-.52(1.53)	Task Within Rep:	-.240839
	CTL	71	-.95(1.76)	-1.22(1.46)	Task Within NRep:	.1130^β47
					Disp. X Task & Time:	-.071026

Predictor Variables	Intercorrelations	
	Mood After Writing ²	Rated Importance
Rated Importance of Psychological Sensitivity	-.40 -.25^β -.09	
Self-assessment of Psychological Sensitivity	.0320^α36	-.22 -.0512

¹ Descriptives reflect change in self-assessment (assessment at writing minus pretest assessment).

² Self-reported "pleasantness" (single item) after writing, controlling for "pleasantness" after failure.

^α 'p ≠ 0' reliable at $\alpha_2 = .05$:

^β $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

this relationship. While these variables could not be mediators, they could have significantly influenced mood following writing, regardless of the nature of the writing task. The bottom portion of Table 13 displays the zero-order correlations between the residuals of pleasantness after writing (controlling for Failure pleasantness), rated importance of psychological sensitivity, and the residuals of self-assessment of psychological sensitivity after writing (controlling for pretest ratings). As expected, the greater the self-assessment of psychological sensitivity after writing (relative to pretest), the more pleasant the mood after writing (relative to after Failure). Also, the higher subjects rated psychological sensitivity's importance, the less pleasant their mood after writing (relative to Failure). This latter finding is especially important to consider in light of the previous lack of relationship between Failure pleasantness and rated importance (see Discussion).

Exploratory Analyses

In light of the complexity of the above research findings, several additional exploratory analyses were conducted in order to develop a coherent story about the results.

Did the effects extend to the security check? For the purposes of convergent validity, several of the subjects in the study experienced a second set of manipulations -- the bogus "security check" -- designed to elicit anxiety and subsequent relief. For parsimony, I decided to focus my analyses of the security check on four major aspects. First, I examined the nonrepressors' data for the effectiveness of the Security Check and "Passed Check" manipulations. Second, I examined differences between repressors and

nonrepressors mood and cardiovascular activity as it changed from Baseline 2 to the Security Check and from the Security Check to "Passed Check." Third, I examined the extent to which persons' anxiety and relief during the PST test evaluation manipulations were correlated with their anxiety and relief during the security check manipulations. Finally, I examined the extent to which mood and cardiovascular activity during the security check manipulations conformed to the homeostatic and rebound models.

As displayed in Table 14, nonrepressors' self-reported pleasantness significantly decreased from Baseline 2 to the Security Check and significantly increased from the Security Check to "Passed Check." Furthermore, contrary to the test (PST) evaluation mood data, nonrepressors' pleasantness significantly increased from Baseline 2 to "Passed Check," thus indicating a reliable rebound effect. As with the test evaluation data, SBP and DBP significantly increased from baseline (in this case, Baseline 2) to the threatening situation (in this case, the Security Check); however, contrary to the test evaluation data, SBP and DBP exhibited predicted decreases from the threatening situation to the removal of the threat (in this case, the "Passed Check" message). Also contrary to the test evaluation data, heart rate increased as predicted from baseline to the threat, but did not reliably decrease from the threat to the removal of the threat. Collectively, then, the security check data are markedly different from the test evaluation data, and in most cases conform more to the hypotheses. Although I will address these differences more thoroughly in the general discussion, it is worthy to here note that the security check manipulations and data collection occurred over a much briefer time interval (about 1 minute, compared to over 5 minutes with the test evaluation manipulations) and also may have elicited very different emotions.

Table 14

Selected Analyses on Security Check DVs: Manipulation Checks on Nonrepressors' Data and Correlation between Security Check DVs and Repressive Coping and Psychological Sensitivity Test DVs

DV	Event 1	MEAN(SD) ¹	Event 2	MEAN(SD)	Effects (r) & 95% CIs
Pleasantness	Baseline 2	4.67(1.23)	S. Check	3.88(1.37)	.30..... .50^β65
	S. Check	3.88(1.37)	"Passed"	5.08(1.14)	.45..... .62^β74
	Baseline 2	4.67(1.23)	"Passed"	5.08(1.14)	.11..... .33^β52
Systolic BP	Baseline 2	152.33(20.20)	S. Check	155.57(20.41)	.11..... .33^β52
	S. Check	155.57(20.41)	"Passed"	153.96(21.64)	.01..... .24^α45
	Baseline 2	152.33(20.20)	"Passed"	153.96(21.64)	-.42..... -.2003
Diastolic BP	Baseline 2	88.34(13.94)	S. Check	89.38(14.07)	.00..... .23^α44
	S. Check	89.38(14.07)	"Passed"	87.79(14.28)	.17..... .39^β57
	Baseline 2	88.34(13.94)	"Passed"	87.79(14.28)	-.08..... .1537
Heart Rate	Baseline 2	78.45(10.18)	S. Check	78.09(11.28)	-.28..... -.0518
	S. Check	78.09(11.28)	"Passed"	78.00(12.23)	-.22..... .0125
	Baseline 2	78.45(10.18)	"Passed"	78.00(12.23)	-.17..... .0629

DV	Event	Mean (SD) Change ² & Effect of Repressive Coping			Correlation with Like PST DV ³
		Rep (n = 19)	NRep (n = 73)	Effect Size	
Pleasantness	S. Check ⁴	-.63(1.21)	-.79(1.39)	-.10..... .1131	.15..... .34^β51
	"Passed" ⁵	1.89(1.05)	1.21(1.57)	-.10..... .1030	.21..... .40^β56
Systolic BP	S. Check ⁴	5.18(9.18)	3.23(9.16)	-.10..... .1130	-.17..... .0424
	"Passed" ⁵	-3.39(4.63)	-1.60(6.68)	-.06..... .1434	.06..... .26^α44
Diastolic BP	S. Check ⁴	1.64(3.08)	1.05(4.47)	-.27..... -.0813	-.17..... .0424
	"Passed" ⁵	-2.44(2.21)	-1.59(3.88)	-.07..... .1433	.01..... .21^α40
Heart Rate	S. Check ⁴	2.87(8.56)	-.36(6.61)	-.06..... .1434	.08..... .28^β46
	"Passed" ⁵	.16(6.29)	-.09(6.66)	-.24..... -.0417	-.20..... .0020

Note: negative r's indicate effect in unpredicted direction; "Rep" = Repressors; "NRep" = Nonrepressors.

¹ N for Nonrepressors across Security Check manipulations = 73.

² For Security Check Event, change score = DV at Security Check - DV at Baseline 2; for Passed Check Event, change score = DV at Passed Check - DV at Security Check.

³ For instance, Pleasantness at Security Check is correlated with Pleasantness at Failure evaluation; Pleasantness at Passed Check is correlated with Pleasantness at Success evaluation.

⁴ Residuals after DV at Baseline 2 is regressed on DV at Security Check.

⁵ Residuals after DV at Passed Check is regressed on DV at Security Check.

^α p ≠ 0 reliable at α₂ = .05:

^β β < .20 for α₂ = .05 (i.e., >80% likelihood of replication succeeding at α₂ = .05)

Despite the fact that the security check manipulations appeared to be more effective in eliciting relief, repressors did not reliably differ from nonrepressors in terms of cardiovascular activity and mood pleasantness from Baseline 2 to the Security Check or from the Security Check to “Passed Check” (see Bottom of Table 14). The latter finding stands in apparent contrast to the finding that repressors reported more relief (mood pleasantness) than nonrepressors after receiving the “corrected” test evaluation; however, the lack of replication for repressors’ greater reported relief might simply be a matter of having sampled, during the security check manipulations, the lower end of the distribution of repressor-nonrepressor effects for self-reported relief. (Note that the direction of repressor-vs.-nonrepressor effects for the security check data and test evaluation data are the same and the security check effect is near the lower bound of the test evaluation effect; see top-most r in Table 9.) Alternatively, this discrepancy might be attributable to differences in the nature of the two sets of manipulations (an issue to which I return in the general discussion).

The security check manipulations were designed to provide convergent validation of findings for emotional relief. A question that is relevant to such convergent validation is whether persons who felt more relief following the success test evaluation felt more relief after being informed that they passed the security check. Similarly, did persons who felt worse following the failure test evaluation feel worse during the security check (prior to passing it)? Correlations between residuals of self-reported pleasantness (controlling for pleasantness at the threatening situation -- either Failure or the Security Check) conform to these expectations. However, consistent with the previous findings, the

cardiovascular data do not uniformly converge in the two sets of manipulations. In particular, BP changes from the Security Check to “Passed Check” were positively correlated with BP changes from Failure to Success evaluations, and HR changes from Baseline 2 to the Security Check were positively correlated with HR changes from Baseline to the Failure evaluation; however, BP changes from baseline to the threatening situations did not correlate for the two sets of manipulations, nor did HR changes from the threatening situations to their removal. These findings are particularly interesting in light of the fact that mean changes in BP exhibited the opposite pattern of results during Failure-to-Success and Security Check-to-“Passed Check” events and the fact that the only significant change in HR was from Failure to Success. Apparently, exactly when subjects as a group did not respond consistently to the two parallel manipulations, individual subjects did respond consistently.

What is the best model of relief in this study? I had hoped that threat removal (i.e., test success and passing the security check) would produce a rebound in emotional state, such that subjects would report feeling more pleasant at threat removal than during pre-threat (baseline) conditions. As it turned out, the data seemed to conform more to a homeostatic model of relief, in which post-threat mood returned to near-baseline (pre-threat) levels. One can test the goodness of fit of the data to such a homeostatic model of relief by a) performing a series of planned contrasts on the data with the coefficients 1, -2, and 1 (for baseline, threat, and threat-removal conditions, respectively) and b) examining the distributional properties of the residuals of this model to see whether they behave as random error should behave (e.g., with no additional variance that is significantly

accounted for by condition). For comparison purposes, one can perform the same analyses on the “rebound model” of relief, using coefficients 0 (baseline), -1 (threat), and 1 (threat removal). For cardiovascular measures, where decreases are predicted during relief, the sign of the coefficients for the above two models would be reversed.

In the special case of planned contrasts on three events, each contrast of interest has a complementary orthogonal contrast, which explains all of the remaining variance in the Event effect. For the homeostatic model (which is also a quadratic model), the complementary contrast is a linear model, which is composed of the following contrast weights: -1 (baseline), 0 (threat), and 1 (threat removal). For the rebound model (which is merely a rearrangement of the linear contrast coefficients), the complementary contrast model is what I shall here term the “arousal model,” which consists of a rearrangement of the homeostatic contrast weights: -2 (baseline), 1 (threat), and 1 (threat removal).

In addition to the contrast analyses, the rebound model of relief can be tested with a repeated-measures t-test analysis between pre-threat (baseline) mood and post-threat mood. If post-threat mood is significantly more pleasant than baseline, then there was a reliable rebound in mood. Whereas the contrast analyses compare the magnitudes of change in DVs from baseline to threat and from threat to threat removal, the t-test analyses evaluate the magnitude of change in DVs from baseline to threat removal.

The results of the repeat-measures model-fitting are displayed in Table 15 (test evaluation manipulations) and Table 16 (security check manipulations). For the test evaluation manipulations, the homeostatic model of relief accounted for more variance than the rebound model in pleasantness, positive affect and heart rate. Interestingly, however, the rebound model outperformed the homeostatic model in explaining the

Table 15

Examination of Goodness of Fit of Different Contrast Models to Repeated Measures of Self-Reported Pleasantness and Cardiovascular Activity at Baseline and Following Bogus Failure and Success Test Evaluations

DV	df _{res}	Omnibus η^2 for Event ¹	Post- vs. Pre-Threat Effect	Orthogonal Contrast Effects, Set 1			Orthogonal Contrast Effects, Set 2		
				Homostatic ²	Linear ²	Rebound ²	Homostatic ²	Rebound ²	Arousal ²
Pleasantness	280	.54 ^b	.05	.44.....54 ^b63	-.11.....-.0316	.37......48 ^b58	.37......48 ^b58	-.37.....-.25 ^b ... -.12	
Positive Affect	280	.45 ^b	-.10	.34......45 ^b55	-.20.....-.0706	.23......35 ^b47	.23......35 ^b47	-.40.....-.28 ^b ... -.16	
Negative Affect	280	.45 ^b	.42 ^b	.49......38 ^b26	-.36.....-.24 ^b11	-.55.....-.45 ^b34	-.55.....-.45 ^b34	-.15.....-.0211	
Systolic BP	280	.47 ^b	-.61 ^b	.26......1300	.34......45 ^b55	-.02......1124	-.02......1124	.34......45 ^b55	
Diastolic BP	280	.25 ^b	-.47 ^b	.00......14 ^a26	.08......21 ^b33	.09......22 ^b34	.09......22 ^b34	-.02......1124	
Heart Rate	280	.40 ^b	-.36 ^b	.48......37 ^b25	-.28.....-.15 ^a02	-.43.....-.3119	-.43.....-.3119	-.37.....-.2512	

¹ Event is baseline, failure, and success

² Contrast coefficients for the models are as follows: homostatic = 1 (baseline), -2 (failure), -1 (success); linear = -1, 0, 1; rebound = 0, -1, 1; arousal = -2, 1, 1; orthogonal complements for a particular contrast (e.g., linear for homostatic) account for all remaining variance in the Event effect and thus represent error in prediction of the DV means by the contrast;

Note Omnibus η^2 = $\sqrt{\frac{SS_{Event}}{SS_{Event} + SS_{Events, Subject}}}$; Contrast r = $\sqrt{\frac{SS_{Contrast}}{SS_{Event} + SS_{Events, Subject}}}$;

^a $\rho \neq 0$ reliable at $\alpha_2 = .05$ (each test adjusted for 2 unique contrasts); ^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$).

Table 16

Examination of Goodness of Fit of Different Contrast Models to Repeated Measures of Self-Reported Pleasantness and Cardiovascular Activity at 2nd Baseline and During and After Bogus Security Check

DV	df _{res}	Omnibus η^2 for Event ¹	Post- vs. Pre- Threat Effect	Orthogonal Contrast Effects, Set 1			Orthogonal Contrast Effects, Set 2		
				Homeostatic ²	Linear ²	Rebound ²	Homeostatic ²	Rebound ²	Arousal ²
Pleasantness	280	.53 ¹	.33 ¹	.36.....50 ¹61	.01.....17 ^a33	.38.....52 ¹63	-.26.....-1007		
Systolic BP	280	.31 ¹	-.20	-.42.....-27 ¹11	-.03.....1430	-.32.....1700	.10.....26 ¹40		
Diastolic BP	280	.32 ¹	.15	-.44.....-30 ¹14	-.27.....1106	-.45.....-31 ¹ ...-.16	-.11.....0622		
Heart Rate	280	.03	.06	-.18.....-02.....-15	-.14.....0319	-.17.....0016	-.13.....0320		

¹ Event is second baseline (following completion of a 40-item questionnaire), security check message, and "You Passed" message.

² Contrast coefficients for the models are as follows: homeostatic = 1 (baseline), -2 (failure), 1 (baseline); linear = -1, 0, 1; rebound = 0, -1, 1; arousal = -2, 1, 1; orthogonal complements for a particular contrast (e.g., linear for homeostatic) account for all remaining variance in the Event effect and thus represent error in prediction of the DV means by the contrast;

Note Omnibus $\eta^2 = \text{sqrt}(\text{SS}_{\text{Event}} / (\text{SS}_{\text{Event}} + \text{SS}_{\text{Event} \times \text{Subject}}))$; Contrast $r = \text{sqrt}(\text{SS}_{\text{Contrast}} / (\text{SS}_{\text{Event}} + \text{SS}_{\text{Event} \times \text{Subject}}))$;

"^a $p \neq 0$ reliable at $\alpha_2 = .05$ (each test adjusted for 2 unique contrasts) ; $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$).

dynamics of negative affect. SBP and DBP were best modeled by the linear contrasts, in which SBP and DBP increased from Baseline to Failure to Success. For the security check data, pleasantness better conformed to the rebound model, although the homeostatic model was still an excellent predictor. Unfortunately, the heart rate data did not significantly conform to the homeostatic or rebound models. Indeed, the repeated-measures effect was extremely weak, with very little difference in mean heart rate from Baseline 2 to the Security Check to “Passed Check.” In contrast with the test evaluation findings, SBP and DBP during the security check manipulations significantly conformed to the homeostatic model.

Is cardiovascular relief more evident in point-to-point comparisons? In contrast to the security check manipulations, the test evaluation manipulations spanned long time intervals in the study and several intermediate stimuli (i.e., mood assessment screens, filler tasks, the writing task). Perhaps, these time delays and intermediate stimuli obscured theoretically meaningful patterns in the cardiovascular data. Furthermore, it is possible that cardiovascular relief was manifested in unexpected, but intuitively plausible points during the experiment. With these possibilities in mind, I decided to peruse the graph of cardiovascular activity for patterns that conformed to my predictions regarding relief (i.e., a fall in SBP, DBP, and HR) and that occurred where relief could have been more strongly manifested. Focusing on individual data points at the end of each baseline period and at the end of each epoch (i.e., end of stimulus presentation), I conducted t-tests to determine the size of the apparent relief effects.

In the formal analyses, I compared the mean values of SBP, DBP, and HR during the Success epoch (i.e., Success Evaluation Form) with the mean values of these variables during the Failure epoch. As mentioned above, one problem with these comparisons was the considerable time span between Failure and Success, as well as the presence of a Mood Assessment Form and the writing task, both of which seemed to have artifactual influences on cardiovascular activity. Therefore, I decided to examine changes in CV activity from the end of the writing task to the end of the Success epoch. Interestingly, SBP, DBP, and HR significantly fell during this time. Also, each of these variables significantly fell during the success evaluation³⁶ (see Table 17). Both of these patterns lend support to a model of relief as relaxation of blood pressure and heart rate.

Interestingly, and contrary to predictions, SBP, DBP, and HR also significantly decreased during the Failure Evaluation Form/epoch. Coupled with the findings during the Success Evaluation Form/epoch, these patterns suggest that both the success and failure feedback could have been relieving in some sense. But relieving what? Immediately prior to each evaluation screen was a six-second screen that informed subjects that their tests were being scored (PST Evaluation Progress Form). Interestingly, from the point just prior to each Evaluation Progress Form to the end of each form, DBP and HR significantly rose, and SBP significantly (prior to Success) or marginally (prior to Failure) rose (see Table 17). These findings may suggest that anticipating each test evaluation was anxiety provoking, while receiving the test evaluation (whether the evaluation was good or bad) was a bit relieving. Alternatively, these patterns could reflect

³⁶ That is, cardiovascular activity significantly fell from the point immediately prior to the presentation of the Success Evaluation Form to the last sampling of CV activity at the end of the form's presentation.

Table 17

Comparisons of Cardiovascular Data at Selected Points During The Test Evaluation Manipulations

Point-To-Point Comparison	DV	Event 1 MEAN(SD)	Event 2 MEAN(SD)	Effects (r) & 95% CIs
End of 1st Mood Assessment vs. End of Progress 1	SBP	147.39(20.46)	153.94(20.78)	.4053^β64
	DBP	84.54(13.21)	88.31(13.57)	.4356^β66
	HR	80.01(12.87)	84.67(12.67)	.4154^β65
End of Progress 1 vs. End of Failure Evaluation Screen	SBP	153.94(20.78)	147.55(20.86)	-.57 -.45^β-31
	DBP	88.31(13.57)	84.32(13.29)	-.64 -.53^β-40
	HR	84.67(12.67)	76.68(12.14)	-.76 -.68^β-58
End of Writing Task vs. End of Success Evaluation Screen	SBP	150.90(22.10)	148.20(21.50)	.0421^α36
	DBP	88.36(14.25)	84.59(13.43)	.3750^β62
	HR	80.81(12.24)	75.28(13.06)	.3750^β62
End of Writing Task vs. End of Progress 2	SBP	149.21(21.09)	150.69(21.38)	-.021531
	DBP	84.60(13.51)	86.72(13.78)	.1733^β47
	HR	75.67(12.30)	77.58(11.46)	.0622^α38
End of Progress 2 vs. End of Success Evaluation Screen	SBP	150.69(21.38)	148.20(21.45)	.0219^α34
	DBP	86.72(13.78)	84.59(13.43)	.1430^β44
	HR	77.74(11.34)	75.28(13.06)	.0925^β40
End of Baseline 2/Recovery vs. Middle of Security Check	SBP	149.93(19.41)	157.76(19.73)	.3753^β67
	DBP	86.68(13.23)	90.69(13.54)	.4056^β69
	HR	78.80(10.45)	79.54(12.54)	-.051535
Middle of Security Check vs. End of Passed Check	SBP	157.76(19.73)	152.47(21.72)	.2241^β57
	DBP	90.69(13.54)	86.64(13.59)	.3552^β66
	HR	79.54(12.54)	77.34(13.23)	-.011938

Note: $N = 141$ for all comparisons except the security check manipulations, where $N = 92$; negative r 's are in unexpected direction; "Progress 1" and "Progress 2" are PST Evaluation Progress Forms preceding Failure and Success, respectively; "Middle of Security Check" is the first sampling of data immediately following the subject's selection of mother's maiden name choices.

^α $r \neq 0$ reliable at $\alpha_2 = .05$;

^β $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

the same sort of stimulus-presentation artifact that was observed at the beginning of each Mood Assessment Form.

For comparison purposes, such point-to-point comparisons of cardiovascular data were also carried out on the security check data. The points of comparison were the last reading of data during Baseline 2, the first reading of data during the Security Check (which occurred immediately after the subject chose the “none-of-the-above” option), and the last reading of data during Passed Check (which occurred approximately 30 seconds after the first reading during the Security Check). As shown in Table 17, the pattern of change for SBP and DBP was similar to that observed in the formal analyses with the aggregated data. The pattern of data for heart rate was again nonsignificant, but trends were more clearly in the predicted direction. Thus, as with the test evaluation data, the point-to-point comparisons of the security check data more clearly supported a model of relief as a general relaxation response following anxiety.

Although the more liberal point-to-point comparisons yielded patterns interpretable as cardiovascular relief, these comparisons were not more effective in differentiating repressors from nonrepressors. Mixed-model ANOVAs conducted on all of the point comparisons in the present section yielded no reliable interactions with the repressor-nonrepressor contrast or with the nature of the writing task.

Which mood adjectives showed the greatest increases during relief? While self-reported pleasantness increased following threat removal (relative to threat conditions), it would be interesting to determine which of the mood adjectives were responsible for this effect, which adjectives were responsible for differentiating repressors' from

nonrepressors' relief pleasantness, whether the threat-removal-sensitive adjectives were also threat-sensitive (i.e., demonstrating an effect following Failure). Because several individual mood adjectives were rated only during the test evaluation manipulations, the following analyses must focus on these manipulations to the exclusion of the security check manipulations.

Table 18 displays the descriptives and significance tests for change in self-reported mood from Baseline (1) to Failure to Success, separately for each mood adjective, positive affect and negative affect. Three findings are of interest in these analyses. First, with the exception of ratings of "sad" and "worried," the Failure and Success effects are fairly homogeneous across the mood adjectives. Second, for the entire sample, ratings of "worried" actually decreased following Failure (as well as following Success). Third, the correlation between effects for Failure vs. Baseline and Success vs. Failure is equal to .12 (bottom of Table 14), which suggests that the mood state following Success may, in fact, be qualitatively different from the mood state following Failure.

On what aspect(s) of self-reported pleasantness did repressors differ from nonrepressors? In previous research, some researchers have only found differences between repressors and nonrepressors in self-reported anxiety (e.g., Asendopf & Scherer, 1983). Accordingly, I calculated contrast effects for each of the self-reported mood adjectives at Baseline and at Success controlling for Failure. As shown in Table 18, the differences between repressors' and nonrepressors' moods at Baseline appear to be relatively homogeneous with respect to the individual adjectives. Repressors' greater reported relief seems most strongly related to ratings of negative affect and ratings of the

Table 18

Means, Standard Deviations, and Selected Contrasts of PA, NA, and Individual Mood Adjective Ratings

DV	Full Sample Means and SDs			Full Sample Contrasts			Targeted Effects & 95% CIs ¹								
	Baseline	Failure	Success	BASE v. FAIL	FAIL v. SUCC	Baseline Data	Success, Fail. Ctl.	Success, Fail. Ctl.							
Pos. Affect	3.75(1.19)	3.23(1.31)	3.67(1.40)	.47	.59 ^p	69	35	.49 ^p	60	14	.30 ^p	.44	-.04	.13	29
Neg. Affect	1.83(.82)	2.07(1.02)	1.56(.73)	12	.28 ^p	43	46	.58 ^p	68	06	.22 ^a	37	00	.17 ^a	32
"Pleasant"	5.05(1.03)	4.47(1.17)	4.98(1.14)	41	.54 ^p	65	31	.46 ^p	58	10	.26 ^p	41	02	.18 ^a	34
"Happy"	5.01(1.24)	4.31(1.35)	4.81(1.31)	44	.57 ^p	67	32	.46 ^p	58	02	.19 ^a	34	-.03	.14	30
"Sad"	1.74(1.11)	1.81(1.10)	1.55(.92)	.09	.08	24	26	.41 ^p	54	03	.20 ^a	35	-.20	-.04	13
"Enthusiastic"	4.46(1.38)	3.60(1.42)	3.94(1.54)	51	.62 ^p	71	14	.30 ^p	45	06	.22 ^a	38	-.01	.15	31
"Excited"	3.74(1.54)	3.22(1.58)	3.65(1.63)	26	.41 ^p	54	22	.38 ^p	51	02	.18 ^a	34	-.02	.14	30
"Inspired"	3.09(1.52)	2.78(1.57)	3.19(1.71)	12	.28 ^p	42	20	.36 ^p	49	20	.35 ^p	49	-.20	.04	13
"Proud"	3.72(1.54)	3.33(1.56)	3.89(1.53)	14	.30 ^p	44	31	.45 ^p	57	01	.17 ^a	33	-.08	.09	25
"Angry"	1.43(1.10)	1.70(1.17)	1.33(.75)	06	.22 ^a	37	21	.36 ^p	50	-.06	.10	26	-.04	.13	29
"Ashamed"	1.30(.73)	1.92(1.25)	1.32(.64)	31	.46 ^p	58	35	.48 ^p	60	11	.27 ^p	41	-.07	.09	26
"Upset"	1.73(1.11)	2.21(1.40)	1.56(.98)	17	.33 ^p	47	33	.47 ^p	59	02	.18 ^a	34	-.01	.16	32
"Worried"	2.87(1.54)	2.47(1.58)	2.02(1.41)	-.44	-.30 ^p	14	24	.39 ^p	52	-.02	.14	30	-.11	.05	22

Correlation between effects for BASE v. FAIL and FAIL v. SUCC¹ = .12NOTE: Significance-test superscripts are displayed for heuristic value only; no correction of alpha level for effects on this table; negative r 's indicate effect in direction opposite to the effect for pleasantness (see Tables 7-9).¹ Specifically, the effect size for the BASE v. FAIL contrast for a particular mood adjective was paired with the effect size for the FAIL vs. SUCC contrast for the same adjective; then the correlation across mood adjectives was calculated.^a ' $\rho \neq 0$ ' reliable at $\alpha_2 = .05$; ^p $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

single item “pleasant,” although all other adjectives (except “sad”) indicated (nonsignificant) greater relief for repressors.

Did repressors differ from nonrepressors regarding meta-mood experiences?

During debriefing, a self-proclaimed repressor indicated that she felt worse about her test performance than she indicated on the mood questionnaire; she explained that she was aware of feeling worse, but she wished to try to convince herself that the test was no big deal. Perhaps, then, repressors may have differed from nonrepressors in terms of certain “meta-mood experiences” (Mayer & Gaschke, 1988), such as semi-conscious mood-regulation. To explore this possibility, I conducted planned contrasts (e.g., repressor vs. nonrepressor) on each of the meta-mood ratings at Failure and Success events. The results of these analyses are displayed in Tables 19 and 20.

The pattern of results are nearly identical for meta-mood ratings at Failure and Success. In contrast with nonrepressors, repressors agreed more with the suggestion that their feelings at Failure and Success reflected how they felt about themselves (rather than other things). Also in contrast to nonrepressors, repressors reported more clarity about their current moods. Interestingly, however, repressors reported believing that their feelings after Success (and after Failure nonsignificantly) had less of an influence on their thinking, one of the few findings in this study that suggests more defensive behavior on the part of the repressor.

Are either TMAS anxiety or M-C defensiveness sufficient to account for the greater relief experience of repressors? A second standard multiple regression analysis was performed to examine the unique contributions of anxiety and defensiveness to the

Table 19

Means and Standard Deviations of Meta-Mood Ratings Following PST Failure Feedback, With Planned Contrasts (On DV Residuals) For Personality Categories

DV	Personality Category						Planned-Contrast Effects & 95% CIs						
	Repressors (<i>n</i> = 40)	Anx/HDef (<i>n</i> = 21)	Anx/LDef (<i>n</i> = 40)	LAnx (<i>n</i> = 40)	Rep v. NRep	Rep v. LAnx	HDef v. LDef						
Mood regulation	2.20(1.45)	3.19(1.54)	2.78(1.69)	2.68(1.75)	.39	-.19	.15	.42	-.15	.23	-.01	.21	
Mood acceptance	4.85(1.67)	4.52(1.50)	4.55(1.74)	4.78(1.64)	.16	.06	.28	.27	.02	.31	.22	.01	.00
Mood influence	3.10(1.65)	3.90(1.67)	3.78(1.39)	3.50(1.69)	.38	-.17	.05	.40	-.12	.18	.26	-.04	.18
Mood clarity	5.25(1.43)	3.86(1.82)	4.63(1.93)	4.73(1.45)	.00	.23 ^a	.43	.12	.18	.45	.26	-.04	.19
Mood typicality	4.68(1.75)	4.14(1.74)	4.43(1.81)	4.48(1.65)	.14	.08	.30	.24	.06	.35	.23	-.01	.21
Focus on self	5.33(1.43)	4.24(1.67)	4.48(1.32)	4.80(1.38)	.03	.25 ^b	.28	.11	.18	.45	.18	.05	.27

^a $p \neq 0$ reliable at $\alpha_2 = .05$ (Bonferroni-adjusted for 6 tests);

^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

Table 20

Means and Standard Deviations of Meta-Mood Ratings Following PST Success Feedback, With Planned Contrasts (On DV Residuals) For Personality Categories

DV	Personality Category												
	Repressors (n = 40)		Anx/HDef (n = 21)		Anx/LDef (n = 40)		LAnx (n = 40)		Planned-Contrast Effects & 95% CIs				
							Rep v. NRep	Rep v. LAnx	HDef v. LDef				
Mood regulation	2.08(1.35)	2.48(1.47)	2.55(1.49)	2.18(1.50)	.32	-.10	.12	.32	-.04	.26	-.25	-.03	.19
Mood acceptance	5.58(1.21)	5.10(1.04)	4.60(1.646)	5.30(1.13)	.03	.19	.40	.18	.12	.40	.08	.14	.35
Mood influence	2.95(1.78)	4.00(1.45)	3.45(1.47)	3.88(1.51)	.43	-.23 ^a	.01	.52	-.27	.02	-.28	-.06	.17
Mood clarity	5.50(1.32)	4.38(1.72)	4.63(1.67)	5.13(1.30)	.01	.23 ^a	.43	.15	.14	.42	.20	.02	.24
Mood typicality	5.23(1.38)	4.62(1.28)	4.78(1.46)	5.05(1.36)	.09	.13	.34	.23	.06	.35	.22	-.00	.23
Focus on self	5.45(1.26)	4.24(1.97)	4.48(1.40)	4.95(1.36)	.05	.27 ^b	.46	.11	.19	.46	.18	.04	.26

^a $p \neq 0$ reliable at $\alpha_2 = .05$ (Bonferroni-adjusted for 6 tests);

^b $\beta < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

prediction of relief pleasantness. As shown in Table 21, this analysis revealed that trait anxiety, and not defensiveness, had a significant impact on self-reported relief during the test evaluation manipulations. In other words, persons who had reported more anxiety in everyday life reported less relief when their Psychological Sensitivity Tests were re-evaluated. These results did not extend to the security check manipulations.

Table 21

Standard Multiple Regressions of "Relief" at Success Evaluation and Passed Security Check on Pleasantness During Failure or the Security Check and Self-Reported Dispositional Anxiety and Defensiveness

Predictor Variables	Intercorrelations				
	Success Pleasantness ¹	1.	2.	3.	4.
1. "Passed Check" Pleasantness ²	.40 ^β				
2. Failure Pleasantness ³	-.51 ^β	-.19			
3. Security Check Pleasantness ⁴	-.59 ^β	-.43 ^β	.34 ^β		
4. Dispositional Anxiety (TMAS)	-.36 ^β	-.05	.34 ^β	.29	
5. Defensiveness (Marlowe-Crowne)	.11	.15	-.11	-.10	-.13

Regression Analyses			
Analysis Number	DV	IV	sr
1	Success Pleasantness	Failure Pleasantness	-.45 ^β
		Dispositional Anxiety (TMAS)	-.18 ^α
		Defensiveness (Marlowe-Crowne)	.01
2	"Passed Check" Pleasantness	Security Check Pleasantness	-.42 ^β
		Dispositional Anxiety (TMAS)	-.08
		Defensiveness (Marlowe-Crowne)	.12

Note: $N = 141$ for test evaluation manipulations and $N = 92$ for security check manipulations.

¹ Self-reported pleasantness after success feedback, controlling for pleasantness after failure feedback.

² Pleasantness at "Passed Check," controlling for pleasantness during Security Check.

³ Pleasantness at Baseline 1, controlling for pleasantness after failure feedback., with reversed sign.

⁴ Pleasantness at Baseline 2/Recovery, controlling for pleasantness during Security Check.

^α $p \neq 0$ reliable at $\alpha_2 = .05$; Bonferroni adjustment = $.05/(\# \text{ predictors})$;

^β $\beta_{(1-\text{power})} < .20$ for $\alpha_2 = .05$ (i.e., >80% likelihood of replication succeeding at $\alpha_2 = .05$)

SECTION VI.

GENERAL DISCUSSION

Summary of Results

The major research question under investigation in the present study was *do repressors and nonrepressors differ in their relief experiences?* To answer this question, I asked repressors and nonrepressors to take a bogus "Psychological Sensitivity Test," presented subjects with a failure test evaluation, and later alerted the subjects to an error in the evaluation process and gave them a "corrected" success evaluation. These manipulations were designed to create anxiety and then relief in subjects, and the manipulations were partially successful in this task. In between the failure and success evaluations, half of the subjects had a chance to write about their failure. This task was designed to be an opportunity for subjects to create their own relief, a task with which repressors would have difficulty; however, the task apparently did not evoke relief in either repressors or nonrepressors. In general, the results of the present study provided little support for the hypotheses under investigation. Undoubtedly, this lack of support is partially due to the nature of the manipulations in the present study. Despite several unpredicted findings and problems with the manipulations, the present study does provide some insights and does pose some important questions regarding the nature of relief, the nature of repressive coping style, and the nature of repressors' relief.

Normative nature of relief. In my master's thesis study, I found that the corrected test evaluation made subjects feel more pleasant than they felt at the beginning of the study (baseline). I had hoped to find such a rebound effect in the present study. As it turned

out, self-reported pleasantness only conformed to a rebound model across the security check manipulations. Changes in pleasantness across the test evaluation manipulations conformed more to a homeostatic model, in which success feedback brought a return of pleasantness to near baseline levels.³⁷ The discrepancy in findings for the two sets of threat-threat-removal manipulations may be due to differences in the nature of the situations. First, as mentioned previously, the time interval between threat and threat removal was much shorter for the security check manipulations than for the test evaluation manipulations. Perhaps, the effect of failure on mood faded somewhat with time, consequently undermining the rebound in pleasantness following success. Second, and relatedly, the presence of several stimuli (e.g., the Filler Task, the Mood Assessment Form) and one mood manipulation (the Writing Task) may have weakened the impact of failure on mood and thereby weakened feelings of relief.³⁸ Third, the security check may have been more successful in eliciting anxiety in subjects, while the failure evaluation may simply have elicited disappointment, embarrassment, or shame. Although I did not collect data on anxiety vs. disappointment in the security check, I did collect this data in the test evaluation manipulations. As I will discuss more fully later, the test evaluation manipulations did not significantly elicit anxiety in subjects. If the rebound effect depends upon reduced anxiety, then perhaps this is why only the security check manipulations

³⁷ Ceiling effects were not apparent in this study. The maximum value of pleasantness (7.0) was more than 2 standard deviations above the mean reported pleasantness (5.25) for subjects.

³⁸ The nature of the Writing Task (whether writing about failure or writing about one's typical day) did not significantly affect one's self-reported relief following Success, nor did mood change significantly from Failure to the end of the Writing Task. One can not rule out the possibility, however, that the focus of persons' moods changed during or immediately following the Writing Task, which might have weakened the relief effect.

exhibited a rebound. Fourth, failure during the test evaluation was designed to be specifically threatening to a persons' self-esteem, while the security check was designed to threaten their anticipated grade in Introductory Psychology. Perhaps the threat to their grades was simply a more powerful manipulation, or perhaps psychological defenses for all persons (repressors and nonrepressors) exerted a greater regulatory influence over mood in the self-esteem threatening situation. This latter possibility would also explain why repressors' relief was reliably greater than nonrepressors' relief following success feedback, but not reliably greater after subjects' passed the security check. Lastly, the security check mood ratings were made in retrospect, while the test evaluation mood ratings were made on one's current mood following the test evaluations and a short filler task. Perhaps, the retrospective ratings were more influenced by subjects' implicit understanding of the relationship between anxiety and relief.

When one separately considers changes in positive affect, negative affect, and self-reported "worry" during the test evaluation manipulations, the pattern of mood becomes more complex. While the positive affect component of pleasantness conformed to the homeostatic model, the negative affect component conformed more to a rebound model. This finding is quite intriguing on the surface, but should be interpreted with caution, considering that self-reported "worry" actually decreased somewhat following the failure evaluation and fell still further following the success evaluation. Despite the fact that this downward linear trend does not conform very well to a rebound model of relief, it conforms much more strongly to a rebound model than to the homeostatic model (which is also a quadratic model); therefore, the greater apparent rebound in negative affect might

be partly due to the contribution of worry to the composite score. Alternatively, the rebound in mood that people often feel during relief could be mainly due to the dynamics of negative affect. A model of relief in which the negative-affect driven Behavioral Inhibition System (BIS; see Gray, 1987a) is deactivated following removal of a threat, while the positive-affect driven Behavioral Activation System (BAS) is not necessarily affected, conforms to the present findings.

The intensity of the relief experience was reliably predicted by the Ortony et al. (1988) model, which states that the intensity of relief is a function of the intensity of prior anxiety and the degree to which the prospective negative situation is disconfirmed. Self-reported pleasantness at success (controlling for failure pleasantness) was significantly predicted by pleasantness at failure (controlling for baseline) and self-reported expectations about test performance: persons who reportedly expected to get a higher score on the bogus test and who felt worse following the failure feedback reported more relief (pleasantness) after success feedback. These two variables left a considerable amount of variance in relief unexplained -- a fact that, for at least two reasons, does not jeopardize the goodness of Ortony et al.'s model of relief. First, whereas their model of relief was designed to handle the disconfirmation of unpleasant prospective events, the Test Evaluation manipulations in the present study were designed to create the disconfirmation of an unpleasant prior event having unpleasant prospective implications. This is an extremely important distinction that I will return to later in the discussion. Second, the fact that self-reported "worry" decreased after the failure evaluation suggests that the relief in the present study was qualitatively different from the kind of relief that

Ortony et al. had in mind when they proposed a relationship between fear and subsequent relief.

Contrary to predictions, rated importance of psychological sensitivity was not a reliable moderator of the impact of failure feedback on self-reported pleasantness. Rated importance was, however a reliable moderator of the impact of success feedback on pleasantness. I can think of several reasons for this pattern of results. First, the rating of importance was considerably nearer in time to the mood assessment following success than the mood assessment following failure; therefore, if the perception of importance fluctuated across the experiment (but was constrained by a significant short-lag autocorrelation³⁹), perhaps the stronger relationship between importance and relief was due to greater temporal contiguity. The finding that mood immediately following the writing task correlated with rated importance is consistent with this interpretation. Second, perhaps the act of rating the importance of psychological sensitivity clarified subjects' understanding of how much their failure on the test really meant to them. An informal comparison of the data on self-reported mood clarity at failure (Table 19) and success (Table 20) generally supports such an inference. Third, subjects' defensiveness following failure may have prompted them to dismiss or ignore their perception of the importance of psychological sensitivity; however, following success, when the importance of psychological sensitivity was no longer threatening, then subjects could be honest with themselves about its importance.

³⁹ An autocorrelation is a correlation between a DV at several points in time (t) and the same DV at some lag in time (e.g., $t - 1$ or $t - 3$). In many data sets exhibiting some pattern across time, the best predictor of a DV at time t is usually that DV at the nearest point in time (i.e., $t - 1$).

Cardiovascular activity across the experiment did not conform very well to the expected pattern of excitation during threat presence and relaxation during threat removal. In the formal analyses, in which aggregated data from baseline, threat, and threat-removal conditions, the results were quite mixed. While SBP and DBP significantly rose from baseline to threat conditions (i.e., failure and the security check), and they significantly fell after subjects passed the from the security check, they significantly rose from failure to success evaluations. While HR significantly fell from failure to success and significantly rose from baseline to the security check, it did not significantly rise from baseline to failure nor significantly fall after subjects passed the security check. Furthermore, there were no significant differences in cardiovascular activity for repressors and nonrepressors, nor any significant effects during the writing task.

As previously mentioned, the formal analyses involved comparisons of data that were sometimes separated by a considerable amount of time and by stimuli that had artifactual influences on these data; therefore, to minimize the influence of these artifactual influences, I redefined some of the critical comparisons as isolated readings of cardiovascular activity. For example, rather than comparing the cardiovascular activity at success with cardiovascular activity during failure, I compared cardiovascular activity at the end of the success evaluation with cardiovascular activity immediately after the writing task. Such point-to-point comparisons provided some interesting findings. First, SBP, DBP, and HR all significantly fell from immediately after the writing task to the end of the success evaluation. Whereas in the formal analyses, only heart rate significantly fell from the failure evaluation to the success evaluation, in these more liberal analyses, both heart

rate and blood pressure significantly fell. Second, SBP, DBP, and HR significantly fell immediately prior to the success evaluation to the end of the success evaluation. The same pattern of decreased cardiovascular activity was observed from immediately prior to the failure evaluation to the end of the failure evaluation. Interestingly, during the 6-second waiting period immediately prior to both the success and failure evaluations, cardiovascular activity significantly rose. Collectively, these findings suggest that subjects may have been relieved just knowing how they performed on the test, regardless of whether they failed or succeeded on the test. Again, these findings are consistent with the pattern of self-reported “worry” which decreased following both failure and success evaluations. Finally, the point-to-point comparisons of SBP and DBP during the security check manipulations again conformed to predictions, whereas point-to-point comparisons of HR, although nonsignificant, better conformed to predictions than did the aggregate comparisons.

Liberal interpretations of the cardiovascular data in the present study are consistent with a model of relief as a general relaxation response, in which heart rate and blood pressure significantly decline; however, such liberal interpretations are based upon somewhat unreliable point-to-point comparisons in the study and on a reinterpretation of the effects of the failure evaluation on subjects’ mood. Furthermore, when the pattern of cardiovascular activity is weighed against the strong consistent artifactual influences of the Mood Assessment Form on cardiovascular activity, the pattern of activity for emotional relief in this study appears relatively weak.

Catharsis (self-created relief). The experimental writing task was designed to be

an opportunity for subjects to vent their frustrations regarding their test performance and to thus experience catharsis. Repressors were supposed to have a more difficult time experience catharsis because they would maintain their defenses during this task. In reality, the experimental writing task had no appreciable effect on subjects' self-reported moods or their cardiovascular activity. The act of writing (regardless of the content) did appear to exert an influence on heart rate, in which heart rate peaked about half a minute into the task. In pilot experiments, I observed that subjects usually took about half a minute to read the instructions for the writing task; thus, the peak could have corresponded to systematic movement artifact associated with postural changes associated with the writing task.

The finding that nonrepressors, but not repressors, self-assessment of psychological sensitivity improved with writing about failure suggests that the writing task helped nonrepressors to cope with their failure (at least on a cognitive level) with their failure on the Psychological Sensitivity Test. Unfortunately, this unpredicted pattern of results suggests that nonrepressors were better able to restore an unwarranted perception of themselves as psychologically sensitive. Thus, it appears as though the defensiveness of nonrepressors was more effectively manipulated in this study than the defensiveness of repressors.

Repressors v. nonrepressors' relief. I predicted that repressors would report less relief than nonrepressors following success feedback because they would dismiss and never reclaim the importance of psychological sensitivity. In reality, repressors' self-reported relief was stronger than nonrepressors' self-reported relief. Furthermore, rated

importance did not significantly mediate the impact of repressive coping style on relief. The cardiovascular data from failure to success did not differentiate repressors and nonrepressors.

As is apparent in Figure 8, repressors' and nonrepressors' mood reports differed as a function of a near-constant value across the study, starting at baseline. In other words, repressors and nonrepressors exhibited parallel patterns of mood reports across the experiment. Importantly, these baseline differences, as well as the differences between repressors' and nonrepressors' self-reported relief, were significantly accounted for by the trait anxiety component (TMAS scores) of repressive coping and not the defensiveness component (Marlowe-Crowne scores). These findings stand in marked contrast to some previous research that have attributed differences in repressors' behavior to the defensiveness component (e.g., Tomaka et al., 1992). Unfortunately, these findings, coupled with several nonsignificant contrasts between repressors' and nonrepressors' defensive behavior, also call into question the construct validity of Weinberger et al.'s (1979) measure of repressive coping style. I will return to this issue shortly.

Implications of Results

As suggested above, I am reluctant to draw conclusions from the present data because the manipulations had several unpredicted effects on the behavior of repressors and nonrepressors. The data do, however, provide some important clues about the nature of relief and repression and how to further develop an integrative understanding of these processes.

Nature of relief. From previous research and theory related to emotional relief, I

developed a working theory of relief, in which relief was conceived as a re-evaluative process. The person experiences relief as a reaffirmation of the value of something that was once threatened but now secure. The present study lends some support to this theory. People who, following failure, recognized the importance of being psychologically sensitive reported feeling more relief when this failure was disconfirmed. Furthermore, rated importance was more strongly related to relief (pleasantness following success) than to unpleasantness following failure. Although there are other interpretations for this finding, this pattern of correlations, coupled with the meta-mood data, suggest that subjects' became more clear about their feelings about psychological sensitivity during relief.

From Baseline to Failure to Success, positive affect was better represented by a homeostatic model, in which relief represented a return to baseline, whereas negative affect was better represented by a rebound model, in which relief represented an overshoot in negative affect. As previously mentioned, these findings must be interpreted with caution, considering the strength of the linear trend for negative affect during Test Evaluation manipulations. The findings do suggest that changes in positive and negative affect may not contribute equally to the experience of relief: the fall in negative affect may indeed be greater than the rise in positive affect.

As previously mentioned, a liberal interpretation of the data supports a model of relief in which blood pressure and heart rate fall, as in relaxation. The fact that the data are not strongly and consistently supportive of this model may reflect a number of theoretically important qualifications to the model. For instance, it is possible that the

cardiovascular manifestation of relief is quite variable, sometimes exhibiting more of an excitation response -- as in laughter -- and other times exhibiting more of a relaxation response. Also, it is possible that the inconsistencies between blood pressure and heart rate in the test evaluation and security check manipulations reflect different manifestations of relief, stemming from differences in PNS and SNS activity.

Nature of repression and repressive coping. In the introduction to this study, I summarized various conceptualizations of the nature of repression, as well as research on repression and repressive coping style, that converged upon the idea of repression as a mechanism for devaluing ego-threatening information. The results of the present study are not supportive of this model of relief. As already mentioned, repressors in the present study did not behave as predicted. Repressors indicated just as much change in pleasantness following failure as did nonrepressors. Repressors reported more change in pleasantness following success (i.e., more relief) than did nonrepressors. Repressors did not display any of the predicted "defensive behaviors" following the failure evaluation, such as rating psychological sensitivity as less important, their psychological sensitivity as higher, and their effort on the test as less intense than nonrepressors'. Furthermore, repressors did not differ from nonrepressors in the amount of words written about their failure during the experimental writing task.⁴⁰ Compared with nonrepressors, repressors reported being more clear about their emotional states and reported that their feelings

⁴⁰ In addition to coding the number of words written. I also informally (but blindly to personality category) categorized each subjects' experimental writing task in terms of whether or not it suggested defensiveness to me. There were approximately equal percentages of repressors and nonrepressors who wrote what seemed to me to be predominantly defensive remarks. Based upon this informal analysis, I decided to not have judges formally code the written material.

were focused on themselves. Finally, the reliable differences that did occur between repressors and nonrepressors (baseline mood reports and change in mood at success) seemed to be mainly attributable to the trait anxiety component of repressive coping.

There are several possible reasons for these surprising findings. First, because the average subject did not report an increase in "worry" following failure, perhaps repressors had no reason to use repression to deal with the nonthreatening failure on the test. Second, perhaps the nature of the failure evaluation made both repressors and nonrepressors defensive; and so repressors did behave as they were supposed to behave, but nonrepressors also behaved a bit like repressors. Third, because subjects were aware that their self-reported mood would be checked for accuracy (against their blood pressure data), perhaps this social demand created a conflict within repressors -- they wished to perform well on this test of mood-reporting accuracy, but also wanted to not acknowledge their anxiety following failure. Earlier, I suggested that when the situation presents a conflict between social approval and repression that repressors might not cope with ego-threats by using repression. In contrast with previous studies on repressive coping where mood reports were not apparently checked for accuracy against blood pressure readings (e.g., Weinberger et al, 1979; Asendorpf & Scherer, 1983), the present study may have produced such an approval-repression conflict. Finally, the manipulations in the present study may have been more conducive to differentiating anxious from nonanxious persons than to differentiating repressors from nonrepressors, per se. Failure on a test that measures some unfamiliar construct (psychological sensitivity) may have primed anxious subjects to think about other failures in life and thus to be less relieved by the success

evaluation.

Model of repression and relief. I argued that the repression and relief represent two different ways of re-evaluating threatening situations and have two different effects on anxiety. Repression operates by moderating how much one consciously “cares” about a part of the self (or life experience) that is threatened, while relief reaffirms how much that part of the self (or life experience) really matters. While repression does nothing to alleviate the body’s mobilization to deal with a threat, relief does everything to liberate this pent up energy. Unfortunately, the present study did not find much support for this intuitively appealing model. Had cardiovascular activity reliably risen following failure and reliably fallen during both the experimental writing task and subsequent success, and had rated importance of psychological sensitivity reliably distinguished between repressors and nonrepressors, the model would have received some support. An interesting alternative to the proposed diametric relationship between repression and relief model is that relief experiences actually reinforce repressive tendencies. Repressors in the present study reported more relief. Perhaps, the repressor has learned that distancing him/herself from an ego-threat often eventually pays off because the ego-threat often times simply goes away. Such an alternative model would not imply that repressors are better able to create their own relief (through conscious reflection on the threat), but that repressors are more affected by relief that is brought about by the actual removal of the threat.

Problems, Limitations, and Questions

As indicated in the preceding sections, there were several problems with manipulations and measurement in the present study. Most notable among the problems

was the failure of the failure manipulation to produce increases in self-reported “worry.” In fact, while negative affect as a whole increased following failure feedback, self-reported “worry” reliably decreased during this time. Although this finding is unexpected, it is not completely counterintuitive. Perhaps subjects were more worried during baseline because they didn’t know what to expect during the experiment. Their blood pressure was constantly being monitored. They were expected to carefully read and follow instructions presented on the computer. Their progress was to be monitored by another computer, and they were to be watched through a two-way mirror. The accuracy of their mood reports was to be checked. And they had to take a 30-item test where the answers were not immediately apparent. Subjects may have gradually habituated to these stressors from baseline mood assessment to the mood assessment following failure and therefore experienced a decline in anxiety. An alternative explanation is that all subjects may have been a little defensive about their failure on the test, and this defensiveness manifested itself in lower ratings of the item “worry.” Regardless of the explanation, the surprising fall in “worry” is especially problematic because it casts some doubt on the assumption that the pleasant feelings following subjects’ success was relief at all.⁴¹

Another problem in the present study was the failure of the experimental writing task to produce relief (cardiovascular or mood report) in subjects. Subjects who were asked to write about their thoughts and feelings regarding the implications of their performance (failure) on the Psychological Sensitivity Test did not report any reliable

⁴¹ In informal conversations with subjects following the experiment, many subjects did, in fact, report being relieved; however, these conversations followed the debriefing and therefore may have been influenced by approval motive or experimenter demand.

increase in pleasantness following this task, nor did subjects experience reliable decreases in cardiovascular activity. I can think of at least three possibilities for this finding. First, the writing task may have been more ego-threatening than the failure evaluation for all subjects. Rather than seeing this task as an opportunity to come to terms with their failure, many subjects (both repressors and nonrepressors) may have seen it as “rubbing their noses in the failure.” An informal analysis of the content of the writing during the writing tasks suggests to me that a large percentage of persons (with no relationship to repressive coping or Marlowe-Crowne defensiveness) responded to the experimental task with greater defensiveness (e.g., denying the importance of psychological sensitivity or explaining away the results as inconsistent with their perceptions of themselves). Second, in contrast to Pennebaker’s (1997) research where persons typically confide in a confederate or experimenter about some troubling experience with which the experimenter has no prior association, the present writing task had subjects write about a very recent failure on a test which had been monitored by the experimenter. Subjects in the present study could have felt some resentment toward experimenter or some other form of emotional discomfort which prevented them from “opening up” to the experimenter. Third, the writing task took place about two minutes after the failure evaluation, 30 seconds of which the subject simply stared at the failure evaluation screen. Perhaps, subjects took the opportunity during this time to think about their failure and to calm themselves down. The writing task, then, may have served to undermine their initial efforts to put the failure behind them. Such an explanation would also explain why subjects did not report much “worry” during the mood assessment following failure.

Because of these alternative explanations, the failure of the writing task manipulation in this study does not call into question previous findings by Pennebaker (e.g., Pennebaker, 1992) that writing or talking about anxious events helps one to feel some relief.⁴²

A third major problem with the present study is that the experimental situation may have created a conflict between approval motive and repressive coping. Because subjects were told that their moods would be evaluated for accuracy against their blood pressure, repressors' may have been simultaneously motivated to underreport their emotion and to perform well on the "test" of emotion-reporting accuracy. This conflict may have prevented repressors from fully repressing their feelings about failure on the Psychological Sensitivity Test. In the introduction, I suggested that repression is a form of ego-management that only operates in situations in which the benefits of denying, downplaying or ignoring emotional information outweigh the costs or risks to the ego. In experimental situations where repression undermines social approval, repression may not take place. Such an explanation would also explain the lack of construct validation for repressive coping style found in this study.

A fourth major problem in the present study was the assessment of cardiovascular activity. Although the finger-cuff method of assessing blood pressure has been shown to be highly reliable and valid (Wesseling et al., 1986) and it is relatively unobtrusive, it appears to be significantly affected by the age and wear of the finger-cuff transducers. The finger cuffs that I used in the present experiment were relatively old (in storage for a few years) and had been used on several previous subjects, which may have prevented

⁴² Additionally, the writing task may not have given subjects enough time to deal with their failure.

accurate readings of arterial blood pressure. Also, I did not adjust the cardiovascular data for movement or posture artifact. Perhaps systematic changes in body posture or movement (whether related or unrelated to anxiety) may have introduced considerable error in the cardiovascular data. Finally, and perhaps most importantly, the Mood Assessment Forms appear to have significantly affected cardiovascular response. Perhaps, this artifactual effect washed out some important patterns in cardiovascular response for the repressors and nonrepressors.

Future Directions

The present study suggests several future directions for research on relief and repression, many of which concern the refinement of present procedures.

Modifications to the present paradigm. The results of the present study suggest several modifications to how relief has been manipulated in the laboratory. First, peripheral aspects of the experimental situation (e.g., the blood pressure apparatus) should not produce more anxiety in subjects than the formal anxiety induction does; otherwise, subjects' relief may be more dependent upon the reduction of the peripheral aspects of the experiment than on the reductions of the formal anxiety-inducing stimulus. There are two general ways to accomplish this modification. First, one can increase the intensity of the anxiety induction. Perhaps, having subjects perform mental arithmetic or telling them that they will be delivering a short speech to others would produce enough anxiety in subjects that their anxiety concerning the blood pressure assessments or mood reports would be overshadowed. Relatedly, the anxiety manipulation preceding relief should actually elicit anxiety and not simply negative affect. Intuitively, relief should represent a reduction in

anxiety brought about by some threat. If the threat is not threatening, then its removal might not elicit relief. Third, when examining relief due to removal of a threat, the investigator should ensure that relief does not follow too long after the induction of anxiety, unless the person is somehow made continuously aware of the threat and not given the opportunity to reconcile him/herself with the threat, habituate to the threat, or dismiss the threat (unless, of course, the investigator is interested in these adjustments). Fourth, when examining relief that is created by the person's new understanding of the threat, the investigator should try to prevent the subject from feeling threatened by the task designed to produce catharsis.

Extensions to the present paradigm. Perhaps due to various problems with instrumentation and artifact, the present study found no consistent pattern of cardiovascular activity underlying relief. Future studies should use better equipment to re-examine cardiovascular activity following a true anxiety induction and during relief. In addition, future studies should examine various other indices of arousal during relief, including measures of parasympathetic arousal/vagal tone, EMG, and skin conductance. Hopefully, these measures of arousal will demonstrate some convergence in terms of the relationship between arousal during anxiety and arousal during relief.

Some research questions about relief. The present study raises a number of important questions about the nature of relief. For instance, what is the phenomenal experience of relief? The present study did not ask subjects to report how much "relief" they felt following success because this question might have alerted subjects to the bogus nature of the manipulations and thereby contaminated their mood; however, persons could

be asked to recall personal experiences in which they felt emotional relief and to rate these experiences in terms of “relief” and other mood adjectives (e.g., fear, anger, happiness, sadness). The investigator could then perform a multiple regression analysis to determine which mood adjectives were most strongly associated with ratings of relief. Also, the investigator could code accounts of relief experiences in terms of the degree to which the experience represented a reaffirmation of the value of some threatened aspect of the self or one’s experiences.

Because the cardiovascular data was suspect, I could not really address the question of whether the arousal associated with relief conformed more to an excitation-transfer model, an opponent-process model, or a tension-reduction model. Is the intensity of relief more a function of a “relabeling” of unpleasant arousal to pleasant arousal, the persistence of a motivational/physiological process designed to produce habituation to threatening stimuli, or the degree to which pent up tension is released? Future research employing better and alternative measures of arousal, while minimizing artifact due to posture or movement artifact, might be able to examine these models more closely.

A related question is what neural systems are responsible for the relief experience? For instance, one of the most interesting findings of Richard Davidson (e.g., Davidson et al., 1990) is the asymmetrical activation of the prefrontal cortex associated with different emotional states and predispositions to experience different emotional states. Apparently, the left prefrontal activation is associated with active approach-related emotions (e.g., happiness) following rewarding stimuli, while right prefrontal activation is associated with active withdrawal-related emotions (e.g., fear or disgust) following punishing stimuli.

Deficits in left prefrontal activation have been associated with depression in adults and inhibition in children, behavioral patterns which might be described as passive withdrawal. This is merely speculation, but perhaps emotional relief represents the fourth cell of this prefrontal model — a reduction in activation of the right prefrontal cortex, which manifests itself as “passive-approach” behavior (or a potentiality for approach). In addition to examining the prefrontal cortex, researchers could use methods such as functional MRI (e.g., Irwin et al., 1996) to examine the role of structures such as the amygdala and lateral septum in relief. Le Doux (e.g., Le Doux et al., 1990) has suggested that the lateral nucleus of the amygdala (and its projections from the medial prefrontal cortex) underlies the extinction of fear conditioning. Other investigators have provided evidence that the lateral septum is a regulator of the anxiety response (e.g., Drugan et al., 1986; Thomas, 1988). Perhaps the emotional experience of relief is intimately tied to an undoing of conditioned fear, and the activity of the lateral nucleus of the amygdala or the lateral septum is strongly associated with the experience of relief.

One last set of research questions that need to be addressed in future research concerns the evolutionary/functional basis for the relief experience. Does relief provide a survival advantage (such as an undoing of conditioned avoidance) for mammals that are able to experience it or experience it more strongly? Do lower animals experience relief, or does it require conscious reflection on “what could have happened” (if the threat had not been removed)? Does relief serve a social function, such as communicating to others that a general threat is no longer present? Answers to questions such as these would greatly expand our current understanding of relief and suggests additional avenues for

future research.

Some research questions about repression. Although I have mentioned several other possible reasons why repressors in the present study did not behave as repressors have in previous studies (see Weinberger, 1990), there is still reason to question the validity of Weinberger et al.'s (1979) measure of repressive coping. For instance, why did repressors report feeling about as much "shame" as nonrepressors following failure? If my hunch is correct, "repressors," who by definition score higher on approval motive, were simultaneously motivated to repress and accurately report their emotions -- a circumstance that, for the most part, washed out the influence of dispositional repression on self-reported mood. However, it could also be the case that some persons classified as repressors are truly low anxious persons who happen to have a strong motive for social approval. The subset of "repressors" in my study who were simply low anxious impression managers may have behaved quite differently from the true repressors, especially given the social demands of accuracy in the mood reports. Obviously, what investigators really need is a measure of repressive coping that distinguishes the repressors from truly low anxious impression managers. In other words, we need to adequately disentangle defensiveness and approval motive.

Another question that I have raised in this study is whether repressive coping should be considered a form of semi-conscious emotion regulation. In a debriefing, one of the subjects in the study indicated to me that she believed that she was a repressor.⁴³ She reported feeling her heart pound during failure, but she wanted to feel less upset. She told

⁴³ Later examination revealed that, in fact, she was a repressor.

me that to convince herself that she wasn't feeling so bad, she rated her mood as more pleasant than it actually was. She said that she was somewhat aware of this, but didn't want to think about it. If this repressor's experience is typical of repressors experiencing failure, then perhaps repression is not quite an unconscious process, but a process that seeks to be unconscious. Future studies should attempt to examine to what extent repressors are aware of emotion-regulation strategies and how this awareness affects repressors' physiological anxiety.

Conclusion

The present study represents a first attempt to simultaneously examine the physiology and phenomenology of emotional relief that occurs as a result of either the person mentally coping with an ego-threat or the actual removal of the ego-threat. The study also represents a first attempt to determine how well repressors can feel relief in each of these two circumstances. Although the present study has several methodological limitations, it does provide some valuable insights for guiding research on the nature of repression, the nature of relief, and the interface of the two. Chief among these insights is the possibility that repressors may not always repress, especially when repression represents a significant risk to the ego.

REFERENCES

- Abelson, R.P. (1995). Statistics as principled argument. Hillsdale, NJ: Erlbaum.
- Ainsworth, M. D., Blehar, M. C., Waters, E., & Wall, S. (1978). Patterns of attachment: Assessed in the strange situation and at home. Hillsdale, NJ: Erlbaum.
- American Psychiatric Association (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.
- Anderson, M. (1968). Likeableness ratings of personality-trait words. Journal of Personality and Social Psychology, *9*, 272-279.
- Asendorpf, J. B., & Scherer, K. R. (1983). The discrepant repressor: Differentiation between low anxiety, high anxiety, and repression of anxiety by autonomic-facial-verbal patterns of behavior. Journal of Personality and Social Psychology, *45*, 1334-1346.
- Averill, J. (1969). Autonomic response patterns during sadness and mirth. Psychophysiology, *5*, 399-414.
- Ax, A. (1953). The physiological differentiation between fear and anger in humans. Psychosomatic Medicine, *15*, 433-442.
- Balay, J. & Shevrin, H. (1988). The subliminal psychodynamic activation method: A critical review. American Psychologist, *43*, 161-174.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, *51*, 1173-1181.
- Baumeister, R. F. (1982). A self-presentational view of social phenomena. Psychological Bulletin, *91*, 3-26.
- Baumeister, R. F., & Cairns, K. J. (1992). Repression and self-presentation: When audiences interfere with self-deception. Journal of Personality and Social Psychology, *62*, 851-862.
- Baumeister, R. F., & Tice (1997). Statistics in the 21st century. Society for Personality and Social Psychology Dialogue, *12*, 8.
- Bendig, A. W. (1956). The development of a short form of the Manifest Anxiety Scale. Journal of Consulting Psychology, *20*, 384.
- Berenbaum, H., & James, T. (1994). Correlates and retrospectively reported antecedents of alexithymia. Psychosomatic Medicine, *56*, 353-359.

- Berenbaum, H., & Prince, J. D. (1994). Alexithymia and the interpretation of emotion-relevant information. Cognition and Emotion, 8, 231-244.
- Berger, C. (1956). Grouping, number, and spacing of letters as determinants of word recognition. Journal of General Psychology, 55, 215-228.
- Berglas, S., & Jones, E. E. (1978). Drug choice as a self-handicapping strategy in response to noncontingent success. Journal of Personality and Social Psychology, 36, 405-417.
- Berlyne, D. (1969). Laughter, humor, and play. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology (2nd ed.), Vol. 1. Reading, Mass: Addison-Wesley.
- Blascovich, J., & Kelsey, R. M. (1990). Using electrodermal and cardiovascular measures of arousal in social psychological research. In C. Hendrick & M. S. Clark (Eds.), Review of personality and social psychology, Vol 11: Research methods of personality and social psychology, pp. 45-73.
- Bonanno, G. A., Davis, P. J., Singer, J. L., & Schwartz, G. E. (1991). The repressor personality and avoidant information processing: A dichotic listening study. Journal of Research in Personality, 25, 386-401.
- Bowlby, J. (1969). Attachment and loss, Vol. 1: Attachment. New York: BasicBooks.
- Bowlby, J. (1988). A secure base: Parent-child attachment and healthy human development. New York: BasicBooks.
- Bretherton, I. (1985). Attachment theory: Retrospect and prospect. In I. Bretherton & E. Waters (Eds.), Monographs of the Society for Research in Child Development, 50: Growing points of attachment theory and research, pp. 3-35. Chicago: University of Chicago Press.
- Breuer, J., & Freud, S. (1895). Studies in hysteria. Leipzig: Franz Deuticke.
- Brown, L. L., Tomarken, A. J., Orth, D. N., Loosen, P. T., Kalin, N. H., & Davidson, R. J. (1996). Individual differences in repressive-defensiveness predict basal salivary cortisol levels. Journal of Personality and Social Psychology, 70, 362-371.
- Brown, W. P. (1961). Conceptions of perceptual defence. The British Journal of Psychology: Monograph Supplements (Ed: R. H. Thouless). London: Cambridge University Press.
- Bruner & Postman (1947a). Emotional selectivity in perception and reaction. Journal of Personality, 16, 69-77.

Bruner & Postman (1947b). Tension and tension-release as organizing factors in perception. Journal of Personality, 15, 300-308.

Bruner & Postman (1949). Perception, cognition, and behavior. Journal of Personality, 18, 14-31.

Buck, R., Miller, R. E., & Caul, W. F. (1974). Sex, personality, and physiological variables in the communication of affect via facial expression. Journal of Personality and Social Psychology, 30, 587-596.

Buck, R., Savin, V. J., Miller, R. E., Caul, W. F. (1972). Communication of affect through facial expression in humans. Journal of Personality and Social Psychology, 23, 362-371.

Byrne, D. (1961). The Repression-Sensitization Scale: Rationale, reliability, and validity. Journal of Personality, 29, 334-349.

Cacioppo, J. T., Klein, D. J., Berntson, G. G., & Hatfield, E. (1993). The psychophysiology of emotion. In M. Lewis & J. M. Haviland (Eds.), Handbook of emotions, pp. 119-142.

Cacioppo, J. T., Uchino, B. N., Crites, S. L., Snyder-Smith, M. A., Smith, G., Berntson, G. G., & Lang, P. J. (1992). Relationship between facial expressiveness and sympathetic activation in emotion: A critical review, with emphasis on modeling underlying mechanisms and individual differences. Journal of Personality and Social Psychology, 62, 110-128.

Cannon, W. B. (1927). The James-Lange theory of emotions: A critical examination and an alternative theory. American Journal of Psychology, 39, 106-124.

Cannon, W. B. (1932). The wisdom of the body. New York: Norton.

Cantor, J. R., & Zillman, D. (1973). The effect of affective states and emotional arousal on music appreciation. Journal of General Psychology, 89, 97-108.

Cantor, J. R., Zillman, D., & Einsiedel, E. (1978). Female response to provocation after exposure to aggressive and erotic films. Communication Research, 5, 395-412.

Carlson, M., & Miller, N. (1987). Explanation of the relation between negative mood and helping. Psychological Bulletin, 102, 91-108.

Cialdini, R., Darby, B., & Vincent, J. (1973). Transgression and altruism: A case for hedonism. Journal of Experimental Social Psychology, 9, 502-516.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, J., & Cohen, P. (1983). Applied multiple regression/correlational analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Crowne, D., & Marlowe, D. (1960). The approval motive: Studies in evaluative dependence. New York: Wiley.

Damasio, A. (1994). Descartes' error: Emotion, reason, and the human brain. New York: Grosset/Putnam.

Davidson, R. J., Ekman, P., Saron, C. D., Senulis, J. A., & Friesen, W. V. (1990). Approach/withdrawal and cerebral asymmetry: Emotional expression and brain physiology I. Journal of Personality and Social Psychology, 58, 330-341.

Davidson, R. J., & Fox, N. A. (1982). Asymmetrical brain activity discriminates between positive and negative affective stimuli in human infants. Science, 218, 1235-1237.

Davidson, R. J., & Fox, N. A. (1989). Prefrontal brain asymmetry predicts infants' response to maternal separation. Journal of Abnormal Psychology, 98, 127-131.

Davis, P. J. (1987). Repression and the inaccessibility of affective memories. Journal of Personality and Social Psychology, 53, 585-593.

Davis, P. J., Schwartz, G. E. (1987). Repression and the inaccessibility of affective memories. Journal of Personality and Social Psychology, 52, 155-162.

DeLucia, J. J., & Stagner, R. (1953). Emotional vs. frequency factors in word-recognition time and association time. Journal of Personality, 22, 299-309.

Dienstbier (1979). Attraction increases and decreases as a function of emotion-attribution and appropriate social cues. Motivation and Emotion, 3, 201-218.

Dollard, J., & Miller, N. E. (1950). Personality and psychotherapy: An analysis in terms of learning, thinking, and culture. New York: McGraw-Hill.

Donnerstein, E., Donnerstein, M., & Barrett, G. (1976). Where is the facilitation of media violence? The effects of nonexposure and placement of anger arousal. Journal of Research in Personality, 10, 386-398.

Donnerstein, E., & Wilson, D. W. (1976). Effects of noise and perceived control on ongoing and subsequent aggressive behavior. Journal of Personality and Social Psychology, 30, 774-781.

Drugan, R. C., Basile, A. S., Ha, J.-H., & Ferland, R. J. (1994). The protective effects of stress control may be mediated by increased levels of benzodiazepine receptor agonists. Brain Research, 661, 127-136.

Drugan, R. C., Skolnick, P., Paul, S. M., & Crawley, J. N. (1986). Low doses of muscimol produce anticonflict actions in the lateral septum of rats. Neuropharmacology, *25*, 203-205.

Ekman, P., Levenson, R. W., & Friesen, W. V. (1983). Autonomic nervous system activity distinguishes among the emotions. Science, *221*, 1208-1210.

Epstein, S. (1967). Toward a unified theory of anxiety. In B. Maher (Ed.), Progress in experimental personality research, Vol. 4. New York: Academic Press.

Erdelyi, M. H. (1995). Repression: The mechanism of defense. In D. M. Wegner & J. W. Pennebaker (Eds.), Handbook of mental control. Englewood Cliffs, NJ: Prentice Hall.

Eriksen, C. W., & Lazarus, R. S. (1952). Perceptual defense and projective tests. Journal of Abnormal and Social Psychology, *47*, 302-308.

Festinger, L. (1954). A theory of social comparison processes. Psychological Review, *57*, 271-282.

Flavell, J. H. (1955). Repression and the "return of the repressed." Journal of Consulting Psychology, *19*, 441-443.

Fox, N. A., & Davidson, R. J. (1986). Taste-elicited changes in facial signs of emotion and the asymmetry of brain electrical activity in human newborns. Neuropsychologia, *24*, 417-422.

Freud, S. (1900/1965). The interpretation of dreams. In Standard edition, Vol. 4. & 5 London: Hogarth Press. Paperback reprint: New York: Avon Books.

Freud, S. (1911/1963a). Formulations on the two principles of mental functioning. In Standard edition, Vol. 12. London: Hogarth Press. Paperback reprint: General psychological theory. New York: Collier.

Freud, S. (1915/1957a). Instincts and their vicissitudes. In Standard edition, Vol. 14. London: Hogarth Press.

Freud, S. (1915/1957b). Repression. In Standard edition, Vol. 14. London: Hogarth Press.

Freud, S. (1920/1955). Beyond the pleasure principle. In Standard edition, Vol. 18. London: Hogarth Press.

Freud, S. (1926/1963b). Inhibitions, symptoms, and anxiety. In Standard edition, Vol. 12. London: Hogarth Press. Paperback reprint: The problem of anxiety. New York: Norton.

Freud, S. (1930/1961). Civilization and its discontents. In Standard edition, Vol. 21. London: Hogarth Press.

Fry, W. F., & Savin, W. M. (1988). Mirthful laughter and blood pressure. Humor, 1, 49-62.

Glass, G., & Hopkins, K. (1996). Statistical methods in education and psychology (3rd ed.). Boston: Allyn & Bacon.

Gray, J. A. (1987a). The neuropsychology of emotion and personality. In S. M. Stahl, S. D. Oversen, & E. C. Goodman (Eds.), Cognitive neurochemistry. Oxford: Oxford University Press.

Gray, J. A. (1987b). The psychology of fear and stress (2nd ed.). Cambridge: Cambridge University Press.

Hammond, L. (1970). Conditioned emotional states. In P. Black (Ed.), Physiological correlates of emotion. New York: Academic Press.

Hansen, R. D., & Hansen, C. H. (1988). Repression of emotionally tagged memories: The architecture of less complex emotions. Journal of Personality and Social Psychology, 55, 811-818.

Hansen, C. H., Hansen, R. D., & Shantz, D. W. (1992). Repression at encoding: Discrete appraisals of emotional stimuli. Journal of Personality and Social Psychology, 63, 1026-1035.

Hardaway, R. (1985). Facts and fantasies in subliminal psychodynamic activation: A quantitative analysis. Doctoral dissertation, Ohio University.

Hayes, W. (1988). Statistics (4th ed.). Forth Worth: Holt, Rinehart, & Winston, Inc.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. Journal of Personality and Social Psychology, 52, 511-524.

Heider, F. (1958). The psychology of interpersonal relations. New York: John Wiley & Sons.

Hobbes, T. (1994). The elements of law and politic, part I: Human nature. (J. C. A. Gaskin, Ed.). New York: Oxford University Press. (Original work published in 1650 as Human Nature).

Howes, D. H., & Solomon, R. L. (1950). A note on McGinnies' "Emotionality and perceptual defense." Psychological Review, 57, 229-234.

- Hunter, J. E. (1997). Needed: A ban on the significance test. Psychological Science, 8, 3-7.
- Irwin, W., Davidson, R. J., Lowe, M. J., Mock, B. J., Sorenson, J. A., & Turski, P. A. (1996). Human amygdala activation detected with echo-planar functional magnetic resonance imaging. NeuroReport, 7, 1765-1769.
- Johnson, J. (1986). The knowledge of what might have been: Affective consequences of near outcomes. Personality and Social Psychology Bulletin, 12, 51-62.
- Jones, H. E. (1935). The galvanic skin reflex as related to overt emotional expression. American Journal of Psychology, 47, 241-251.
- Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), Judgment under uncertainty: Heuristics and biases. Cambridge: Cambridge University Press.
- Kelly, G. (1955). The psychology of personal constructs (Vols. 1 & 2). New York: Norton.
- Kiecolt-Glaser, J. K., & Greenberg, B. (1983). On the use of physiological measures in assertion research. Journal of Behavioral Assessment, 2, 239-247.
- King, A. C., Albright, C. B., Taylor, W. L., Haskell, W. L., & DeBusk, R. F. (1986). The repressive coping style: A predictor of cardiovascular reactivity and risk. Paper presented at the annual meeting of the Society for Behavioral Medicine, San Francisco, October.
- Larsen, R. & Diener, E. (1987). Affect intensity as an individual difference characteristic: A review. Journal of Research in Personality, 21, 1-39.
- Lazarus, R. S., & Longo, N. (1953). The consistency of psychological defenses against threat. Journal of Abnormal and Social Psychology, 48, 216-218.
- Le Doux, J. E., Cicchetti, P., Xagoraria, A., & Romanski, L. R. (1990). The lateral amygdaloid nucleus: Sensory interface of the amygdala in fear conditioning. Journal of Neuroscience, 10, 1062-1069.
- Levy, L. H. (1958). Perceptual defense in tactual perception. Journal of Personality, 26, 467-478.
- Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood, and adulthood: A move to the level of representation. Monographs of the Society for Research on Child Development, 50, 66-104.
- Main, M. & Goldwyn, R. (1992). Adult attachment scoring and classification systems. Unpublished manuscript. University of California, Berkeley.

Mann, L. S., Wise, T. N., Tinidad, A., Kohanski, R. (1994). Alexithymia, affect recognition, and the five-factor model of personality in normal subjects. Psychological Reports, *74*, 563-567.

Marshall, G., & Zimbardo, P. G. (1979). Affective consequences of inadequately explained physiological arousal. Journal of Personality and Social Psychology, *37*, 970-988.

Martin, J. B., & Pihl, R. O. (1986). Influence of alexithymic characteristics on physiological and subjective stress responses in normal individuals. Psychotherapy and Psychosomatics, *45*, 66-77.

Maslach, C. (1979). Negative emotional biasing of unexplained arousal. Journal of Personality and Social Psychology, *37*, 953-969.

Mayer, J. D., DiPaolo, M., & Salovey, P. (1990). Perceiving affective content in ambiguous visual stimuli: A component of emotional intelligence. Journal of Personality Assessment, *54*, 772-781.

Mayer, J. D., & Gaschke, Y. (1988). The experience and meta-experience of mood. Journal of Personality and Social Psychology, *55*, 102-111.

Mayer, J. D., & Mitchell, D. C. (in press). Intelligence as a subsystem of personality: From Spearman's g to contemporary models of hot processing. In W. Tomic & J. Kingma (Eds.) Reflections on the concept of intelligence. Greenwich, CT: JAI Press.

Mayer, J. D. & Stevens, A. A. (1994). An emerging understanding of the reflective (meta-) experience of mood. Journal of Research in Personality, *28*, 351-373.

McClelland, D. C., & Liberman, A. M. (1949). The effect of need for achievement on recognition of need-related words. Journal of Personality, *18*, 236-251.

McGinnies, E. (1949). Emotionality and perceptual defense. Psychological Review, *56*, 244-251.

McGinnies, E. (1950). Discussion of Howes and Solomon's note on 'Emotionality and perceptual defense.' Psychological Review, *57*, 235-240.

Mendolia, M., Moore, J., & Tesser, A. (1996). Dispositional and situational determinants of repression. Journal of Personality and Social Psychology, *70*, 856-867.

Mettee, D. R. (1971). Rejection of unexpected success as a function of the negative consequences of accepting success. Journal of Personality and Social Psychology, *17*, 332-341.

Mikulincer, M., Florian, V., & Weller, A. (1993). Attachment styles, coping strategies, and posttraumatic psychological distress: The impact of the Gulf War in Israel. Journal of Personality and Social Psychology, *64*, 817-826.

Mikulincer, M., & Nachshon, O. (1991). Attachment styles and patterns of self-disclosure. Journal of Personality and Social Psychology, *61*, 273-280.

Mikulincer, M., & Orbach, I. (1995). Attachment styles and repressive defensiveness: The accessibility and architecture of affective memories. Journal of Personality and Social Psychology, *68*, 917-925.

Millon, T. (1984). On the renaissance of personality assessment and personality theory. Journal of Personality Assessment, *48*, 450-466.

Mischel, W., Ebbesen, E. B., Zeiss, A. R. (1973). Selective attention to the self: Situational and dispositional determinants. Journal of Personality and Social Psychology, *27*, 129-142.

Mitchell, D. C. (1991). Feeling good from feeling bad: Relief as a function of prior disappointment. Unpublished master's thesis.

Mowrer, O. H. (1947). On the dual nature of learning: A reinterpretation of "conditioning" and "problem-solving." Harvard Educational Review, *17*, 102-150.

Mowrer, O. H. (1960). Learning theory and symbolic processes. New York: John Wiley.

Myers, J. L., & Well, A. D. (1991). Research design and statistical analysis. New York: HarperCollins.

Neel, A. F. (1954). Conflict, recognition time, and defensive behavior. American Psychologist, *9*, 437.

Ortony, A., Clore, G. L., & Collins, A. (1988). The cognitive structure of emotions. Cambridge: Cambridge University Press.

Papciak, A. S., Feuerstein, M., & Spiegel, J. A. (1985). Stress reactivity in alexithymia: Decoupling of physiological and cognitive responses. Journal of Human Stress, *11*, 135-142.

Parker, J. D. A., Bagby, R. M., & Taylor, G. J. (1989). Toronto alexithymia scale, EPQ and self-report measures of somatic complaints. Personality and Individual Differences, *10*, 599-604.

Parker, J. D. A., Taylor, G. J. & Bagby, R. M. (1993). Alexithymia and the processing of emotional stimuli: An experimental study. New Trends in Experimental and Clinical Psychiatry, *9*, 9-14.

Patton, C. (1992). Fear of abandonment and binge eating. Journal of Nervous and Mental Disease, 180, 484-490.

Pennebaker, J. W. (1990). Opening up: The healing powers of confiding in others. New York: Morrow.

Pennebaker, J. W. (1992). Putting stress into words: Health, linguistic, and therapeutic implications. Paper presented at the American Psychological Association Convention, Washington, DC.

Pennebaker, J. W. (1997). Writing about emotional experiences as a therapeutic process. Psychological Science, 8, 162-166.

Pennebaker, J. W., Barger, S. D., & Tiebout, J. (1989). Disclosure of traumas and health among Holocaust survivors. Psychosomatic Medicine, 51, 577-589.

Pennebaker, J. W., Beall, S. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. Journal of Abnormal Psychology, 95, 274-281.

Pennebaker, J. W., Hughes, C. F., & O'Heeron, R. C. (1987). The psychophysiology of confession: Linking inhibitory and psychosomatic processes. Journal of Personality and Social Psychology, 52, 781-793.

Pennebaker, J. W., & Susman, J. R. (1988). Disclosure of traumas and psychosomatic processes. Social Science and Medicine, 26, 327-332.

Piddington, R. (1963). The psychology of laughter: A study in social adaptation. New York: Gamut Press.

Poetzl, O. (1917/1960). The relationship between experimentally induced dream images and indirect vision. Psychological Issues Monograph, 2, 46-106.

Postman, L., Bronson, W. C., & Gropper, G. L. (1953). Is there a mechanism of perceptual defense? Journal of Abnormal and Social Psychology, 47, 215-224.

Postman, L., & Bruner, J. S. (1949). Multiplicity of set as a determinant of perceptual behavior. Journal of Experimental Psychology, 36, 369-377.

Reisenzein, R. (1983). The Schachter theory of emotion: Two decades later. Psychological Bulletin, 94, 239-264.

Rogers, C. R. (1959). A theory of therapy, personality, and interpersonal relationships as developed in a client-centered framework. In S. Koch (Ed.), Psychology: A study of science (Vol. 3). New York: McGraw-Hill.

Roseman, I., Spindel, M., & Jose, P. (1990). Appraisals of emotion-eliciting events: Testing a theory of discrete emotions. Journal of Personality and Social Psychology, *59*, 899-915.

Rosenthal, R. (1984). Meta-analytic procedures for social research. Beverly Hills, CA: Sage.

Rosenthal, R., & Rosnow, R. (1985). Contrast analysis: Focused comparisons in the analysis of variance. Cambridge: Cambridge University Press.

Rosenthal, R., & Rosnow, R. (1991). Essentials of behavioral research: Methods and data analysis. New York: McGraw-Hill.

Rothbart, M. (1973). Laughter in young children. Psychological Bulletin, *80*, 247-256.

Ruch, W. (1993). Exhilaration and humor. In M. Lewis & J. M. Haviland (Eds.), Handbook of emotions, pp. 605-616.

Sackheim, H. A., & Gur, R. C. (1979). Self-deception, other-deception, and self-reported psychopathology. Journal of Consulting and Clinical Psychology, *47*, 213-215.

Schachter, S., & Singer, J. (1962). Cognitive, social, and physiological determinants of emotion state. Psychological Review, *69*, 379-399.

Schopenhauer, A. (1883/1948). The world as will and idea. R. B. Haldane & J. Kemp (Trans.). London: Routledge & Kegan Paul

Schmidt, F. L. (1996). Statistical significance testing and cumulative knowledge in psychology: Implications for training of researchers. Psychological Methods, *1*, 115-129.

Schwartz, G. E., Weinberger, D. A., & Singer, J. A. (1981). Cardiovascular differentiation of happiness, sadness, anger, and fear following imagery and exercise. Psychosomatic Medicine, *43*, 343-364.

Sifneos, P. E. (1973). The prevalence of alexithymic characteristics in psychosomatic patients. Psychotherapy and Psychosomatics, *22*, 255-262.

Silverman, D. K. (1989). Reply to Balay and Shevrin's critique of Silverman's subliminal psychodynamic activation research. American Psychologist, *44*, 422-423.

Silverman, L., Ross, D., Adler, J., & Lustig, D. (1978). Simple research paradigm for demonstrating subliminal psychodynamic activation: Effects of oedipal stimuli on dart-throwing accuracy in college men. Journal of Abnormal Psychology, *87*, 341-357.

Silverman, L., & Weinberger, J. (1985). Mommy and I are one: Implications for psychotherapy. American Psychologist, *40*, 1296-1308.

Sinha, R., Lovallo, W. R., & Parsons, O. A. (1992). Cardiovascular differentiation of emotions. Psychosomatic Medicine, 54, 422-435.

Snyder, M. (1974). Self-monitoring of expressive behavior. Journal of Personality and Social Psychology, 30, 526-537.

Solomon, R. (1980). The opponent-process theory of acquired motivation: The costs of pleasure and the benefits of pain. American Psychologist, 35, 691-719.

Sroufe, L., & Wunsch, J. (1977). The development of laughter in the first year of life. Child Development, 43, 1326-1344.

Stevens, J. (1992). Applied multivariate statistics for the social sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Tabachnick, B., & Fidell, L. (1989). Using multivariate statistics (2nd ed.). New York: HarperCollins.

Taylor, G. J. (1994). The alexithymic construct: Conceptualization, validation, and relationship with basic dimensions of personality. New Trends in Experimental and Clinical Psychiatry, 10, 61-74.

Taylor, J. A. (1953). A personality scale to measure manifest anxiety. Journal of Abnormal and Social Psychology, 48, 285-290.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. Psychological Bulletin, 103, 193-210.

Thomas, E. (1988). Forebrain mechanisms in the relief of fear: The role of the lateral septum. Psychobiology, 16, 36-44.

Tomaka, J., Blascovich, J., & Kelsey, R. M. (1992). Effects of self-deception, social desirability, and repressive coping on psychophysiological reactivity to stress. Personality and Social Psychology Bulletin, 18, 616-624.

Tomarken, A. J., & Davidson, R. J. (1994). Frontal brain activation in repressors and nonrepressors. Journal of Abnormal Psychology, 103, 339-349.

Tomkins, S. (1962). Affect, imagery, consciousness, Vol. 1: The positive affects. New York: Springer.

Tukey, J. W. (1991). The philosophy of multiple comparisons. Statistical Science, 6, 100-116.

Turvey, C., & Salovey, P. (1994). Measures of repression: Converging on the same construct? Imagination, Cognition, & Personality, 13, 279-289.

Uchiyama, I. (1992). Differentiation of fear, anger, and joy. Perceptual and Motor Skills, 74, 663-667.

Uchiyama, I., Hanari, T., Ito, T., Takahashi, K., Okuda, T., Goto, T., & Tsuji, K. (1990). Patterns of psychological and physiological responses for common affects elicited by films. Psychologia, 33, 36-41.

Weinberger, D. A. (1990). The construct validity of the repressive coping style. In J. L. Singer (Ed.), Repression and dissociation: Implications for personality theory, psychopathology, and health. Chicago: University of Chicago Press.

Weinberger, D. A., & Davidson, M. N. (1994). Styles of inhibiting emotional expression: distinguishing repressive coping from impression management. Journal of Personality, 62, 587-613.

Weinberger, D. A., & Schwartz, G. E. (1982). Patterns of emotional responses to affective situations: II. Interactions of anxious and repressive coping styles. Unpublished manuscript.

Weinberger, D. A., Schwartz, G. E., & Davidson, R. J. (1979). Low-anxious, high-anxious, and repressive coping styles: Psychometric patterns and behavioral and physiological responses to stress. Journal of Abnormal Psychology, 88, 369-380.

Weinberger, J. (1989). Response to Balay and Shevrin: Constructive critique or misguided attack? American Psychologist, 44, 1417-1419.

Wesseling, K. H., Settels, J. J., & DeWit, B. (1986). The measurement of continuous finger arterial pressure noninvasively in stationary subjects. In T. H. Schmidt, T. M. Dembroski, & G. Blumchen (Eds.), Biological and psychological factors in cardiovascular disease. NY: Springer-Verlag.

White, G. L., Fishbein, S., & Rutsetin, J. (1981). Passionate love and the misattribution of arousal. Journal of Personality and Social Psychology, 41, 56-62.

Wise, T. N., Mann, L. S., & Shay, L. (1992). Alexithymia and the five-factor model of personality. Comprehensive Psychiatry, 33, 147-151.

Zeller, A. F. (1950a). An experimental analogue of repression I. Historical summary. Psychological Bulletin, 47, 39-51.

Zeller, A. F. (1950b). An experimental analogue of repression II. The effect of failure and success on memory measured by relearning. Journal of Experimental Psychology, 40, 411-422.

Zillman, D. (1978). Attribution and misattribution of excitatory reactions. In J. H. Harvey & W. J. Ickes (Eds.), New directions in attribution research (Vol. 2). Hillsdale, NJ: Erlbaum.

Zillman, D., & Bryant, J. (1974). Effect of residual excitation on the emotional response to provocation and delayed aggressive behavior. Journal of Personality and Social Psychology, 30, 782-791.

Zillman, D., Johnson, R. C., & Day, K. D. (1974). Attribution of apparent arousal and proficiency of recovery from sympathetic activation affecting excitation transfer to aggressive behavior. Journal of Experimental Social Psychology, 10, 503-515.

APPENDIXES

APPENDIX A: PRESCREENING SURVEY

Note: Italicized information did not appear on the administered survey.

IDENTIFICATION

Soc. Security Number: - - Gender: ___ male ___ female

Mother's maiden name (write "7" if you don't know): _____

GENERAL EXPERIENCES INVENTORY

Instructions: Read each statement and decide whether or not the statement is true about you. Circle either "T" (True) or "F" (False) next to each statement. Please pace yourself so that you are finished within 15 minutes.

- T F 1. I regularly (at least 3 times a week) engage in 30 consecutive minutes of intensely aerobic exercise (e.g., long-distance running as training, biking as training, or swimming as training; but not basketball or football practice), which elevates my heart rate to at least 150 beats per minute. (If in doubt, circle "F" here.)
- T F 2. On a daily basis, I consume one or more of the following: medication for blood pressure or mood regulation, epinephrine, antihistamine, more than a pack of cigarettes each day (or equivalent nicotine), more than 2 beers a day (or equivalent alcohol), or other drugs.
- T F 3. I have abnormally high or low blood pressure and/or poor circulation?

Dispositional Anxiety Scale (Bendig, 1956; abbreviated from Taylor, 1953)

- T F 4. I believe I am no more nervous than most others.
- T F 5. I work under a great deal of tension.
- T F 6. I cannot keep my mind on one thing.
- T F 7. I am more sensitive than most other people.
- T F 8. I frequently find myself worrying about something.
- T F 9. I am usually calm and not easily upset.
- T F 10. I feel anxiety about something or someone almost all the time.
- T F 11. I am happy most of the time.
- T F 12. I have periods of such great restlessness that I cannot sit long in a chair.
- T F 13. I have sometimes felt that difficulties were piling up so high that I could not overcome them.
- T F 14. I find it hard to keep my mind on a task or job.
- T F 15. I am not usually self-conscious.
- T F 16. I am inclined to take things hard.
- T F 17. Life is a strain for me much of the time.
- T F 18. At times I think I am no good at all.
- T F 19. I am certainly lacking in self-confidence.
- T F 20. I certainly feel useless at times.
- T F 21. I am a high-strung person.
- T F 22. I sometimes feel that I am about to go to pieces.
- T F 23. I shrink from facing a crisis or difficulty.

Defensiveness Scale (Crowne & Marlowe, 1960)

- T F 4. Before voting, I thoroughly investigate the qualifications of all the candidates.
- T F 5. I never hesitate to go out of my way to help someone in trouble.
- T F 6. It is sometimes hard for me to go on with my work if I am not encouraged.
- T F 7. I have never intensely disliked anyone.
- T F 8. On occasion, I have had doubts about my ability to succeed in life.
- T F 9. I feel resentful if I don't get my way.
- T F 10. I am always careful about my manner of dress.
- T F 11. My table manners at home are as good as when I eat out.
- T F 12. If I could get into a movie without paying and be sure I was not seen, I would probably do it.
- T F 13. On a few occasions, I have given up doing something because I thought too little of my ability.
- T F 14. I like to gossip at times.
- T F 15. There have been times when I felt like rebelling against people in authority even though I knew they were right.
- T F 16. No matter to whom I'm talking, I'm always a good listener.
- T F 17. I can remember "playing sick" to get out of something.
- T F 18. There have been occasions when I took advantage of someone.
- T F 19. I'm always willing to admit it when I make a mistake.
- T F 20. I always try to practice what I preach.
- T F 21. I don't find it particularly difficult to get along with loud-mouthed, obnoxious people.
- T F 22. I sometimes try to get even, rather than forgive and forget.
- T F 23. When I don't know something, I don't at all mind admitting it.
- T F 24. I am always courteous, even to people who are disagreeable.
- T F 25. At times, I have really insisted on having things my own way.
- T F 26. There have been occasions when I felt like smashing things.
- T F 27. I would never think of letting someone else be punished for my wrongdoings.
- T F 28. I never resent being asked to return a favor.
- T F 29. I have never been irked when people expressed ideas very different from my own.
- T F 30. I never make a long trip without checking the safety of my car.
- T F 31. There have been times when I was quite jealous of the good fortune of others.
- T F 32. I have almost never felt the urge to tell someone off.
- T F 33. I am sometimes irritated by people who ask favors of me.
- T F 34. I have never felt that I was punished without cause.
- T F 35. I sometimes think when people have misfortune they only got what they deserved.
- T F 36. I have never deliberately said something that hurt someone's feelings.

APPENDIX B: SELECTED CODE FROM COMPUTER PROGRAM

SELECTED CODE FROM MAIN CLASS MODULE

Code	Comments
Public IDCode As String * 3	<i>Subject ID number</i>
Public FormEntered As Integer	<i>Did S try to change form?</i>
Public Cond As Integer	<i>Writing task condition</i>
Public FileId As String * 15	<i>Data file path</i>
Public MessageIndex As Integer	<i>Which message will be sent to S?</i>
Public Phase As Integer	<i>Stimulus event in study</i>
Public Eval As Integer	<i>Failure or Success evaluation?</i>
Public Const One As Integer = 1	<i>How many beeps are sounded?</i>
Public Const Two As Integer = 2	
Public Const Three As Integer = 3	
Public Const Four As Integer = 4	
Public StartSec As Long	<i>Beginning of experiment</i>
Public DateTime(30) As String * 4	<i>Time at which data is recorded</i>
Public BPIndex As Integer	<i>How many samples so far?</i>
Public Status(30) As String * 1	<i>Finapres data status</i>
Public SBP(30) As String * 3	<i>Systolic Blood Pressure</i>
Public DBP(30) As String * 3	<i>Diastolic Blood Pressure</i>
Public HR(30) As String * 3	<i>Heart Rate</i>
Public DataReceived As Integer	<i>All data received from Finapres?</i>
Public FinapresEnabled As Integer	<i>Finapres enabled?</i>
Public Reply as String	<i>How does S respond to the mix-up?</i>
Public Sub NextForm(a As Object, b As Object)	<i>Procedure that calls next form</i>
b.Hide	<i>(screen) and frees working memory</i>
Unload b	<i>from variables associated with</i>
Set b = Nothing	<i>form.</i>
a.Show	
End Sub	
Sub Main()	<i>Main procedure (in Class Module)</i>
On Error Resume Next	<i>Primitive error-handling</i>
	<i>procedure</i>
Select Case Phase	
Case 0	
frmMain.Show	<i>Main Screen Form"</i>
Case 1	
frmMain.Enabled = False	
frmFinapres.Show	<i>Finapres Communication Form</i>
Case 2	
frmMain.Hide	
Unload frmMain	
Set frmFinapres = Main	
Call NextForm(frmCheck,frmFinapres)	<i>Form for practicing with mouse</i>
Case 3	
Call Nextform(frmCheck,frmMain)	<i>Return to Main Screen Form</i>

Code	Comments
Case 4 frmMain.Enabled = False frmConsent.Show	<i>Informed Consent Form (screen)</i>
Case 5 Call Nextform(frmIDVer,frmConsent)	<i>Subject Identification Form</i>
Case 6 Call Nextform(frmMoodRate,frmIDVer)	<i>1st Mood Assessment Form</i>
Case 7 Call Nextform(frmDemog,frmMoodRate)	<i>Health-Related Behavior Form</i>
Case 8 Call Nextform(frmPSTDescribe,frmDemog)	<i>Description of Psych. Sen.Test</i>
Case 9 MessageIndex = 0 Call Nextform(frmMessage,frmPSTDescribe)	<i>Hello message from experimenter</i>
Case 10 Call Nextform(frmPST,frmMessage)	<i>Psychological Sensitivity Test</i>
Case 11 Call Nextform(frmWait,frmPST)	<i>1st PST Evaluation Progress Form</i>
Case 12 Call Nextform(frmPSTEval,frmWait)	<i>1st PST Evaluation Form</i>
Case 13 Call Nextform(frmMemory,frmPSTEval)	<i>Filler Task Form</i>
Case 14 Call Nextform(frmMoodRate,frmMemory)	<i>2nd Mood Assessment Form</i>
Case 15 Call Nextform(frmWriteTask,frmMoodRate)	<i>Writing Task Form</i>
Case 16 MessageIndex = 1 Call Nextform(frmMessage,frmWriteTask)	<i>Message about form mix-up</i>
Case 17 Call Nextform(frmWait,frmMessage)	<i>2nd PST Evaluation Progress Form</i>
Case 18 Call Nextform(frmPSTEval,frmWait)	<i>2nd PST Evaluation Form</i>
Case 19 Call Nextform(frmMemory,frmPSTEval)	<i>Filler Task Form</i>
Case 20 Call Nextform(frmMoodRate,frmMemory)	<i>3rd Mood Assessment Form</i>
Case 21 Call Nextform(frmAIS,frmMoodRate)	<i>Affect Intensity Form</i>
Case 22 Call Nextform(frmMoodRate,frmAIS)	<i>4th Mood Assessment Form</i>
Case 23 Call Nextform(frmSecurity,frmMoodRate)	<i>Security Check Form</i>
Case 24 frmMain.lblThankYou.Visible = True frmMain.lblBorder.Visible = True Call Nextform(frmMain,frmSecurity) frmMain.Enabled = True Call MultiBeep(Two)	<i>Display "Thank You" message Signal experimenter with beeps</i>
Case 25 Call Nextform(frmLog,frmMain)	<i>Experimenter Log Form</i>

Code	Comments
Case 26 Call Nextform(frmCellCount,frmLog)	<i>Cell Frequency Form</i>
Case 27 End	<i>Terminate experiment</i>
End Select Phase = Phase + 1 End Sub	
Public Sub HelpOptions() response = MsgBox("To select a numbered option button." &_ "position the mouse pointer over the button (circle) and " &_ "click (just once -- not a double-click) the LEFT mouse " &_ "button. The computer immediately registers your answer " &_ "and proceeds to the next task (usually another question " &_ "with option buttons). For additional help, knock lightly on " &_ "mirror/window, and wait.", vbOKOnly + vbInformation, &_ "Help with Option Buttons", 0, 0)	<i>Message for help with option buttons. (Similar help messages were created for check boxes, text boxes, and for help with specific forms).</i>
End Sub	
Public Sub Discontinue() response = MsgBox("Do you really want to quit?", vbYesNo + vbQuestion, "Request to Quit", 0, 0) If response = vbYes Then Call EndExperiment End if	<i>Procedure called if a subject clicked on the "Quit" button on any form.</i>
End Sub	
Public Sub EndExperiment() response = MsgBox("Please knock lightly on the mirror" &_ "window and wait. Do not remove the finger cuff.", &_ vbOKOnly + vbInformation, "Procedure for Ending Lab &_ Experience", 0, 0) If response = vbO &_K Then Call	<i>Message that appears when subject confirms that he/she wishes to quit experiment. The computer signals the experimenter with 5 beeps and then terminates the program.</i>
MultiBeep(5) End End If End Sub	
Public Sub MultiBeep(n As Integer) Dim i As Integer, j As Integer Do Until Second(Now) Mod 2 = 1 j = j + 1 - 1 Loop For i = 1 To n Do Until Second(Now) Mod 2 = 0 Beep Loop Do Until Second(Now) Mod 2 = 1 j = j + 1 - 1 Loop Next I End Sub	<i>Create n beeps of approximately 1-second duration each.</i>

Code	Comments
Public Sub TimeElapsed(a As String) Dim CurrentSec As Long CurrentSec = Timer a = Format((CurrentSec - StartSec), "0000") End Sub	<i>Calculates elapsed time in seconds since the beginning of the experiment and formats result as 4-digit number for output.</i>

SELECTED CODE FROM FINAPRES COMMUNICATION FORM

The following commands establish communication with Ohmeda 2300 Finapres Monitor. The commands require the use of two command button (cmdCOM & cmdEND), a few status objects (lblCOM, txtStatus, txtBPIndex, & txtFinaPres), and two timer objects -- one for the interval between successive recordings of cardiovascular data (tmrGetBP) and one for the interval between successive characters sent to the Finapres machine (tmrSendChar), the latter of which is necessary because the Finapres can only handle input one character at a time.

Code	Comments
Private Sub cmdCOM_Click() lblCOM.Caption = "(attempting link)" cmdCOM.Visible = False StartSec = Timer txtStatus.Text = "-" txtBPIndex.Text = "-" txtFinaPres.Text = "" BPIndex = 0 CharCount = 0 tmrGetBP.Enabled = True End Sub	<i>When the "OK" Button is clicked, the timer that keeps track of the sampling interval (tmrGetBP) is turned on, as is the timer that keeps track of the time elapsed during the experiment.</i>
Private Sub cmdEnd_Click() End End Sub	<i>End the experiment when the "End" button is clicked.</i>
Private Sub tmrGetBP_Timer() If BPIndex < 3 Then tmrSendChar.Enabled = True Else txtBPIndex.Text = "\$" lblCOM.Caption = "Data Received. Retry?" cmdCOM.Visible = True cmdBegin.Visible = True lblBegin.Visible = True cmdEnd.Visible = True lblEnd.Visible = True cmdBegin.SetFocus End If End Sub	<i>Every 5 seconds, this timer activates a second timer (tmrSendChar), which retrieves data from the Finapres. After 3 samples have been taken, the program prompts the person to begin (continue) the experiment.</i>

Code	Comments
Private Sub tmrSendChar_Timer() Static Chars As Integer Dim BPNow As Long Dim BPStart As Long Dim BPElapsed As Integer On Error Resume Next Select Case Chars Case 0 COM2.InBufferCount = 0 COM2.OutBufferCount = 0 COM2.PortOpen = True COM2.Output = Chr(27) Case 1 COM2.Output = "!" Case 2 COM2.Output = Chr(13) BPStart = Timer Do Dummy = DoEvents() BPNow = Timer BPElapsed = BPNow - BPStart Loop Until (COM2.InBufferCount = 4) Or BPElapsed > 3 COM2.PortOpen = False InString\$ = COM2.Input If BPElapsed > 3 Or Mid(InString\$, 4, 1) <> "Y" Then tmrSendChar.Enabled = False tmrGetBP.Enabled = False txtStatus.Text = "N" lblCOM.Caption = "Retry Protocol?" Chars = 0 Exit Sub Else txtStatus.Text = "E" lblCOM.Caption = "(link established)" txtFinaPres.Text = InString\$ End If Case 10 COM2.InBufferCount = 0 COM2.OutBufferCount = 0 COM2.PortOpen = True COM2.Output = Chr(27) Case 11 COM2.Output = "C" Case 12 COM2.Output = "N" Case 13 COM2.Output = "Q" Case 14 COM2.Output = "c" Case 15 COM2.Output = Chr(13) End Select	<p><i>This timer (set at 10msec) sends protocol ASCII characters to the Finapres and then retrieves data from the Finapres.</i></p> <p><i>Cases 0-2 clear the input and output buffers and then send the escape, exclamation-point, and return characters., which enables the Ohmeda Finapres serial communications protocol.</i></p> <p><i>Wait for response from Finapres or quit waiting after approximately 3 seconds.</i></p> <p><i>If the waiting period has reached its limit or a the Finapres has sent a "negative acknowledge response" ("N"), then prompt the experimenter to retry the protocol.</i></p> <p><i>Otherwise, echo the input to the monitor and indicate a COM link.</i></p> <p><i>Cases 10-15 reset the input and output buffers and then switch the Finapres to "slave mode" (which sends data only when asked).</i></p>

Code	Comments
<pre> Do Dummy = DoEvents() Loop Until COM2.InBufferCount = 4 InString\$ = COM2.Input txtFinaPres.Text = InString\$ COM2.PortOpen = False If Mid(InString\$, 4, 1) = "Y" Then txtStatus.Text = "S" lblCOM.Caption = "(mode ready)" ElseIf Mid(InString\$, 4, 1) = "N" Then txtStatus.Text = "N" tmrSendChar.Enabled = False tmrGetBP.Enabled = False lblCOM.Caption = "Retry Protocol?" Chars = 0 Exit Sub End If </pre>	<p><i>Case 15 continued. The program waits for the 4-character protocol response from the Finapres.</i></p> <p><i>With "Y" response, indicate that slave mode has been enabled.</i></p> <p><i>Otherwise, prompt the experimenter to retry the protocol.</i></p>
<pre> Case 25 COM2.InBufferCount = 0 COM2.OutBufferCount = 0 COM2.PortOpen = True COM2.Output = Chr(27) </pre>	<p><i>Cases 25-30 reset the input and output buffers and then request that most recent BP/HR data be sent to the computer.</i></p>
<pre> Case 26 COM2.Output = "C" </pre>	
<pre> Case 27 COM2.Output = "N" </pre>	
<pre> Case 28 COM2.Output = "V" </pre>	
<pre> Case 29 COM2.Output = "c" </pre>	
<pre> Case 30 COM2.Output = Chr(13) tmrSendChar.Enabled = False Do Dummy = DoEvents() Loop Until COM2.InBufferCount = 17 COM2.PortOpen = False InString\$ = COM2.Input txtFinaPres.Text = InString\$ lblCOM.Caption = "(receiving data)" Call TimeElapsed(DataTime(BPIndex)) txtStatus.Text = Mid(InString\$, 4, 1) Status(BPIndex) = Mid(InString\$, 4, 1) SBP(BPIndex) = Mid(InString\$, 5, 3) DBP(BPIndex) = Mid(InString\$, 8, 3) HR(BPIndex) = Mid(InString\$, 14, 3) Chars = 25 BPIndex = BPIndex + 1 Exit Sub </pre>	<p><i>Wait for input buffer to receive all of the data and then echo data to screen.</i></p> <p><i>Get the current time.</i></p> <p><i>Echo data status to screen.</i></p> <p><i>Write current data to array variables with index equal to sample number.</i></p> <p><i>Skip to 25 for subsequent samples.</i></p> <p><i>Increment sample number and exit procedure.</i></p>
<pre> End Select CharCount = CharCount + 1 End Sub </pre>	<p><i>Increment character counter</i></p>

SELECTED CODE FROM SUBJECT IDENTIFICATION FORM

The following commands retrieve a subject's disposition code from a file ("disp.dat"), retrieve the current disposition-X-gender-X-writing-task cell frequencies, and assign the subject to either the experimental or control writing task according to whichever cell frequency is lower or (when the cells are equal) or according to a random process. Finally, a data file is created for the subject, whose name is the name of the subject's ID number (e.g., "001.dat")

Code	Comments
Public HelpType As Integer Public Gender As Integer Public Age As Integer Private Digested As Boolean	<i>Context for help messages</i>
Private Type DispRec Group(15) As String * 2 End Type Private DispCount As DispRec Private Type IDRec ID As String * 3 End Type	<i>Delay variable so that option button shows its selection. User-defined record variable for random access file containing current cell frequencies User-defined record variable for random access file containing next valid subject ID number.</i>
Public Sub Assign(a As Integer, b As Integer) Dim RandomAssign Public LegalSS As Boolean Randomize RandomAssign = Int((2 * Rnd) + 1) If a > b Then Cond = 2 b = b + 1 Elseif b > a Then Cond = 1 a = a + 1 Elseif a = b Then Cond = RandomAssign If Cond = 1 Then a = a + 1 Else b = b + 1 End If End If End Sub	<i>Assigns subject to writing task Initialize random number seed Randomly select "1" or "2" Assign procedure is called with "a" = number of alike subjects (i.e., same personality disposition and same gender as current subject) in experimental condition and b = number of alike subjects in control condition. If one condition has fewer subjects, the current subject is assigned to that condition; otherwise, he/she is randomly assigned to condition.</i>
Private Sub optGender_Click(Index As Integer) tmrNextQuest.Enabled = True Digested = False Do. dummydo = DoEvents() Loop Until Digested = True tmrNextQuest.Enabled = False	<i>This procedure records gender and then prompts the subject to enter his/her age. The timer (set to 200 msec) is used so that subject sees his/her selection of gender.</i>

Code	Comments
<pre> Gender = Index + 1 frmGender.Visible = False lblItem.Visible = True txtAge.Visible = True cmdOK.Visible = True lblDirections.Caption = "2. Now type in your age, and click" & _ "the 'OK' button." HelpType = 1 txtAge.SetFocus End Sub </pre>	<p><i>Gender_Click (continued). Gender is assigned to the value of the option button in the array (+ 1).</i></p> <p><i>A textbox then appears in which age is to be entered.</i></p>
<pre> Private Sub tmrNextQuest_Timer() Digested = True End Sub </pre>	<p><i>This timer (set to 200 msec) delays the resetting of the option button.</i></p>
<pre> Private Sub txtAge_GotFocus() txtAge.SelStart = 0 txtAge.SelLength = Len(txtAge.Text) End Sub </pre>	<p><i>Highlights text box for age entry. Similar code is used for the social security number text box.</i></p>
<pre> Private Sub cmdOK_Click() Static Item As Integer Dim SSInput As String * 9 Dim DispInput As String * 1 Dim ID As String * 9 Dim Disposition As Integer Dim CurrentID As IDRec Dim NextID As IDRec Dim CurrentIDVal As Integer Dim NextIDval As Integer ID = Trim(txtSSNumb.Text) Select Case Item Case 0 Age = txtAge txtAge.Visible = False lblItem.Caption = "SS#:" txtSSNumb.Visible = True lblDirections.Caption = " 3. Now type in your social." & _ "security number (WITHOUT DASHES)." & _ "and click on the 'OK' button." HelpType = 2 txtSSNumb.SetFocus Case 1 Call TimeElapsed(DataTime(6)) LegalSS = txtSSNumb.Text Like "[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]" If LegalSS = False Then response = MsgBox("Enter 9 numbers without dashes or" & _ "spaces.", vbOKOnly + vbExclamation, "Invalid SS & _ "Number!", 0, 0) End If End Select End Sub </pre>	<p><i>The following commands are executed after the subject enters his/her age (Item = 0) and clicks the "OK" button and then when the subject enters his/her social security number (Item = 1) and then clicks the "OK" button.</i></p> <p><i>Case 0 writes the text input to the Age variable and prompts the subject to enter his/her social security number.</i></p> <p><i>Write the time elapsed to 7th member of array.</i></p> <p><i>Checks input against valid SS format.</i></p>

Code	Comments
<pre> If response = vbOK Then txtSSNumb.SetFocus Exit Sub End If End If Open "c:\data\disp.dat" For Input As #1 IDSearch: Do Until (SSInput = ID) Or EOF(1) Input #1, SSInput, DispInput Loop If EOF(1) Then response = MsgBox("Not a valid SS number. Try" & "again?", vbOKCancel + vbExclamation, "Error!", 0, 0) If response = vbOK Then Close #1 txtSSNumb.SetFocus Exit Sub Else: Call Discontinue End If End If Disposition = Val(Trim(DispInput)) Close #1 Static GroupCount(15) As Integer Open "c:\data\cellfreq.dat" For Random As #1 Len = 32 Get #1. 1, DispCount Dim i As Integer For i = 0 To 15 GroupCount(i) = Val(DispCount.Group(i)) Next i If Gender = 1 Then Select Case Disposition Case 1 Call Assign(GroupCount(0), GroupCount(1)) Case 2 Call Assign(GroupCount(2), GroupCount(3)) Case 3 Call Assign(GroupCount(4), GroupCount(5)) Case 4 Call Assign(GroupCount(6), GroupCount(7)) End Select ElseIf Gender = 2 Then Select Case Disposition Case 1 Call Assign(GroupCount(8), GroupCount(9)) Case 2 Call Assign(GroupCount(10), GroupCount(11)) Case 3 Call Assign(GroupCount(12), GroupCount(13)) Case 4 Call Assign(GroupCount(14), GroupCount(15)) End Select End If </pre>	<p><i>cmdOK_Click (continued).</i></p> <p><i>Searches file for subject's social security number. If the number is not found, the subject is prompted to try again.</i></p> <p><i>Retrieves current cell frequencies and then calls the Assign procedure described above.</i></p>

Code	Comments
<pre> For I = 0 To 15 With DispCount .Group(i) = Format(GroupCount(i), "00") End With Next i Put #1, 1, DispCount Close #1 Open "c:\data\id.dat" For Random As #1 Len = 3 Get #1, 1, CurrentID FileId = "c:\data\" & Trim(CurrentID.ID) & ".DAT" NextID.ID = Format((Val(CurrentID.ID) + 1), "000") Put #1, 1, NextID Close #1 IDCode = CurrentID.ID Open FileId For Append As #1 Print #1, "ID " & CurrentID.ID & " " & SSInput & _ " " & Gender & " " & Age & " " & DispInput & _ " " & Cond Print #1, "FINA " & DateTime(0) & " " & Status(0) & _ " " & SBP(0) & " " & DBP(0) & " " & HR(0) & " " & _ DateTime(1) & " " & Status(1) & " " & SBP(1) & " " & _ DBP(1) & " " & HR(1) & " " & DateTime(2) & " " & _ Status(2) & " " & SBP(2) & " " & DBP(2) & " " & HR(2) Print #1, "INFC " & DateTime(3) & " " & DateTime(4) Print #1, "VERF " & DateTime(5) & " " & DateTime(6) Close #1 Call Main End Select Item = Item + 1 End Sub </pre>	<p><i>updates cell-frequencies file.</i></p> <p><i>Gets the next available subject ID, assign the current subject to this ID and update the .ID file.</i></p> <p><i>Writes data from the Subject Identification Form (current form) and the Finapres Communication Form (baseline readings of BP/HR), and writes the begin time and end time for the Informed Consent Form ("INFC") and the Subject Identification Form ("VERF"). (Each line of all subsequent data begins with a 2-4 letter code for the form.)</i></p>

SELECTED CODE FROM EXPERIMENTER MESSAGE FORM

The following procedures present text on the screen one character at a time according to a random process and timer (tmrTypeNow).

Code	Comments
<pre> Private Message As String Const Hello = "Hi. The creators of the test require that I " & _ "monitor your test performance and then give you feedback " & _ "(I'm Dennis, by the way, the guy in the next room.) If you " & _ "have any questions about the test, I'll answer them after " & _ "take th test and do the follow-up tasks. Good Luck!" Const Mixup = "Sorry to interrupt, but was your test labelled " & _ "form 'B' -- as you indicatd - or form 'b' -- little b? " Const Mixup2 = "Sorry to interrupt, but the computer read in " & _ "form as big 'B' -- a different test. It sometimes doesn't let " & _ "you enter little b. Mind if I back up the program and try " & _ "it from here? " Const BackUp = no sweat. Let me back up the program a little " & _ "plug in the right form." </pre>	<p><i>Message "typed" by experimenter</i></p> <p><i>1st Message: 'Hello' from me</i></p> <p><i>2nd Message sent after subject completes the writing task.</i></p> <p><i>Alternative 2nd Message (if subject previously tried to change form letter). This message was not used during this experiment.</i></p> <p><i>3rd Message sent as a reply to the subject's reply to 2nd Message.</i></p>

Code	Comments
<pre> Sub Form_Load() Call MultiBeep(2) Call TimeElapsed(DataTime(0)) txtMessage.Text = "" txtMessage.SetFocus Select Case MessageIndex Case 0 Message = Hello Case 1 If FormEntered = 0 Then Message = Mixup ElseIf FormEntered = 1 Then Message = Mixup2 End If End Select tmrTypeNow.Enabled = True End Sub </pre>	<p><i>When the Experimenter Message Form is loaded, it beeps twice, determines which message to present and then activates the timer that controls the "typing" of the message (tmrTypeNow).</i></p>
<pre> Private Sub tmrTypeNow_Timer() Call PresentMessage End Sub </pre>	<p><i>Timer invoked every 70-90msec.</i></p>
<pre> Private Static Sub PresentMessage() Static CharsTyped As Integer Static Wait As Integer If CharsTyped < Len(Message) Then Randomize TypeNow = CBool(Int(2 * Rnd)) If TypeNow = True Then CharsTyped = CharsTyped + 1 txtMessage.Text = Left(Message, CharsTyped) txtMessage.SelStart = Len(txtMessage.Text) End If ElseIf CharsTyped = Len(Message) Then tmrTypeNow.Enabled = False CharsTyped = 0 If MessageIndex = 1 MessageIndex = 2 txtReply.Enabled = True txtReply.SetFocus Else Wait = Wait + 1 If Wait = 40 Then txtMessage.Text = "" Call WriteData End If End If End If End Sub </pre>	<p><i>While the number of characters displayed in the message box ("txtMessage") is less than the length of the Message to be displayed, this procedure either does or does not type the next character in the message (according to a random process with 50% success rate).</i></p> <p><i>When the whole message has been displayed, the next event depends upon which message was displayed. After the 'Hello' message and the BackUp message, the program waits for about 3 seconds and then calls the next form. After Mixup or Mixup2, the program places the cursor on the reply text box.</i></p>

Code	Comments
<pre> Private Sub WriteData () Call TimeElapsed(DateTime(0)) Open FileId For Append As #1 Print #1, "MESS " & DateTime(0) & " " &_ DateTime(1) Close #1 If Message = 2 then Open "c:\data\replies.dat" For Append As #1 Print #1, IDCode & " " & Reply Close #1 End If Call Main End Sub </pre>	<p><i>Writes the begin time and end time of the Experimenter Message Forms. Also writes the subject's reply to a separate file.</i></p>
<pre> Private Sub txtReply_Change() tmrFlash.Enabled = True End Sub </pre>	<p><i>Activates flash to draw subject's attention to the "Send" button.</i></p>
<pre> Private Sub cmdSend_Click() tmrDelayReply.Enabled = True tmrFlash.Enabled = False cmdSend.Visible = False lblSend.Visible = False End Sub </pre>	<p><i>Subjects were required to click a send button after typing in their replies. The send button began to flash as the subject typed.</i></p>
<pre> Private Sub tmrDelayReply_Timer() tmrDelayReply.Enabled = False tmrTypeNow.Enabled = True End Sub </pre>	<p><i>Timer invoked after 2 seconds, which delays BackUp message.</i></p>
<pre> Private Sub tmrFlash_Timer() Static Flash As Boolean If Flash = True Then lblSend.Visible = True Flash = False ElseIf Flash = False Then lblSend.Visible = False Flash = True End If End Sub </pre>	<p><i>Flashes a label that informs the subject to click a nearby "Send" button to send the reply. This timer is activated when any text in the reply box is typed.</i></p>

SELECTED CODE FROM PST EVALUATION PROGRESS FORM

The following procedures prevent the subject from changing the form letter from a little "b" to big "B" and then carry out this change automatically following the second Experimenter Message Form. This form also displays a bogus progress bar prior to the test evaluation. The code for cardiovascular data collection is not presented here; it is similar to that presented above.

Code	Comments
<pre> Private Sub Form_Load() </pre>	

Code	Comments
<pre> BPIndex = 0 If Phase > 14 Then tmrChangeForm.Enabled = True End If End Sub Private Sub cmdOK_Click() lblForm.Visible = False lblFormInstruct.Visible = False txtForm.Visible = False cmdOK.Visible = False lblPerform.Visible = True lblProgress.Visible = True lblProgress2.Visible = True cmdProgress.Visible = True tmrDelay.Enabled = True End Sub </pre>	<p><i>If the form is loaded after the second message is delivered, a timer is activated that controls the automatic form change.</i></p>
<pre> Private Sub tmrDelay_Timer() tmrDelay.Enabled = False tmrSendChar.Enabled = True End Sub </pre>	<p><i>Invokes a timer that gets data from the Finapres and increments the bogus progress bar.</i></p>
<pre> Private Sub tmrChangeForm_Timer() Static ChangeProgress Select Case ChangeProgress Case 0 txtForm.SetFocus Case 1 txtForm.Text = "" Case 2 txtForm.Text = "b" Case 3 lblForm.Visible = False lblFormInstruct.Visible = False txtForm.Visible = False cmdOK.Visible = False lblPerform.Visible = True lblProgress.Visible = True lblProgress2.Visible = True cmdProgress.Visible = True tmrDelay.Enabled = True End Select ChangeProgress = ChangeProgress + 1 End Sub </pre>	<p><i>The second time that this form is presented, the program automatically changes little 'b' to a big "B" and activates to the progress bar.</i></p>
<pre> Private Sub tmrSendChar_Timer() Static CharCount As Integer Static i As Integer, Static Complete As Boolean Dim BPNow As Long Dim BPStart As Long Dim BPElapsed As Integer On Error Resume Next </pre>	<p><i>The timer (set to 10msec) sends the communication protocol to the Finapres that requests cardiovascular data. Also, after each cycle (CharCount = 25-30), the progress bar increments in length.</i></p>

Code	Comments
<pre> Select Case CharCount Case 25 'delay COM2.InBufferCount = 0 If COM2.PortOpen = False Then COM2.PortOpen = True End If COM2.Output = Chr(27) Case 26 COM2.Output = "C" Case 27 COM2.Output = "N" Case 28 COM2.Output = "V" Case 29 COM2.Output = "c" Case 30 COM2.Output = Chr(13) BPStart = Timer Do Dummy = DoEvents() BPNOW = Timer BPElapsed = BPNOW - BPStart Loop Until (COM2.InBufferCount = 17) &_ Or (BPElapsed > 3) If BPElapsed > 3 Then InString\$ = ":0000000000000000" Else InString\$ = COM2.Input End If Call TimeElapsed(SampTime(BPIndex)) Status(BPIndex) = Mid(InString\$, 4, 1) SBP(BPIndex) = Mid(InString\$, 5, 3) DBP(BPIndex) = Mid(InString\$, 8, 3) HR(BPIndex) = Mid(InString\$, 14, 3) COM2.PortOpen = False Open FileId For Append As #1 If Phase > 14 Then Print #1, "FORM " & FormEntered End If If BPIndex = 0 or BPIndex = 3 then Print #1, "PROG "; End If Print #1, SampTime(BPIndex) &_ " " & Status(BPIndex) & " " & SBP(BPIndex) &_ " " & DBP(BPIndex) & " "; If BPIndex = 2 or BPIndex = 5 then Print #1, HR(BPIndex) Else Print #1, HR(BPIndex); End If Close #1 </pre>	<p><i>The cardiovascular data are written to file after each reading for this form because the sound of the hard drive being accessed contributes the credibility of the test evaluation process. For space considerations, the data are written such that three samples appear on each line in the data file.</i></p>

Code	Comments
<pre> CharCount = 25 BPIndex = BPIndex + 1 If Complete = False Then i = i + 500 If (cmdProgress.Width + 500) <= lblProgress.Width Then cmdProgress.Width = i ElseIf ((cmdProgress.Width + 500) > &_ lblProgress.Width)&_ And (cmdProgress.Width < &_ lblProgress.Width) Then cmdProgress.Width = cmdProgress.Width + &_ (lblProgress.Width - cmdProgress.Width) Complete = True End If Else Call Main End If Exit Sub End Select CharCount = CharCount + 1 End Sub </pre>	<p><i>Each time that cardiovascular data is collected, the progress bar is incremented by 500 units (about 1/6 of the bar length when full). Once the progress bar is full, the Test Evaluation Form is called.</i></p>
<pre> Private Sub txtForm_Change() If Phase < 14 Then If txtForm.Text = "b" Then txtForm.Text = "B" FormEntered = 1 End If End If End Sub </pre>	<p><i>When the subject types a "b" into the form entry box, the box automatically converts it to upper case (In fact, the process is so quick, that it appears as though the capital "B" was entered).</i></p>

SELECTED CODE FROM MOOD ASSESSMENT FORM

The following procedures present mood questionnaire items and write data to the general data file. The code for the cardiovascular data collection is not presented here; it is similar to that presented above.

Code	Comments
<pre> Private Digested As Boolean Private Sub Form_Load() BPIndex = 0 End Sub </pre>	<p><i>Dummy variable for option button</i></p> <p><i>Resets Array Index to zero.</i></p>
<pre> Private Sub optMood_Click(PointIndex As Integer) Static MoodArray(16) As Integer Static MoodIndex As Integer MoodArray(MoodIndex) = PointIndex + 1 tmrNewAdj.Enabled = True Digested = False Do dummydo = DoEvents() Loop Until Digested = True tmrNewAdj.Enabled = False End Sub </pre>	<p><i>Presents each mood adjective or phrase and records rating on 1-7 Likert scale (array of option buttons). A gratuitous delay is programmed so that subjects see their selection before the option buttons are reset for the next item.</i></p>

Code	Comments
<pre> optMood(PointIndex).Value = False cmdHelp.SetFocus If MoodIndex < 16 Then Select Case MoodIndex Case 0 lblMoodAdj.Caption = "ashamed" Case 1 lblMoodAdj.Caption = "enthusiastic" Case 2 lblMoodAdj.Caption = "upset" Case 3 lblMoodAdj.Caption = "happy" Case 4 lblMoodAdj.Caption = "angry" Case 5 lblMoodAdj.Caption = "sad" Case 6 lblMoodAdj.Caption = "proud" Case 7 lblMoodAdj.Caption = "worried" Case 8 tmrSendChar.Enabled = True lblMoodAdj.Caption = "" lblMoodAdj.Caption = "excited" Case 9 lblMoodAdj.Caption = "inspired" Case 10 Label3.Top = 2520 lblMoodAdj.Top = 3000 lblMoodAdj.Height = 615 lblAnchor(0).Top = 240 lblAnchor(0).Height = 495 lblAnchor(0).Caption = "strongly disagree" lblAnchor(1).Top = 240 lblAnchor(1).Height = 495 lblAnchor(1).Caption = "neither agree nor disagree" lblAnchor(2).Top = 240 lblAnchor(2).Height = 495 lblAnchor(2).Caption = "strongly agree" lblMoodAdj.Caption = "I am trying to change my" &_ "current feelings." Case 11 lblMoodAdj.Caption = "I am currently feeling " &_ "the way I should feel." Case 12 lblMoodAdj.Caption = "My current feelings " &_ "have changed my thinking." Case 13 lblMoodAdj.Caption = "I know exactly how I am " &_ "currently feeling." </pre>	<p><i>The static variable MoodIndex keeps track of which item is to be displayed.</i></p> <p><i>Prior to the presentation of the item "excited," cardiovascular data is recorded; these data are also recorded when the form is loaded and after the last item is presented.</i></p> <p><i>For the meta-mood items, some adjustments were made to display these longer items and their Likert-scale anchors.</i></p>

Code	Comments
<pre> Case 14 lblMoodAdj.Caption = "My feelings reflect how " & _ "I currently feel about myself." Case 15 lblMoodAdj.Caption = "My current feelings are " & _ "typical for me." End Select MoodIndex = MoodIndex + 1 Else lblMoodAdj.Caption = "" fraOptions.Visible = False lblProcessing.Visible = True DataReceived = 0 tmrSendChar.Enabled = True Do dummywait = DoEvents() Loop Until DataReceived = 1 Open FileId For Append As #1 Dim MoodOutput(16) As String * 1 For i = 0 To 16 MoodOutput(i) = Format(MoodArray(i), "0") Next i Print #1, "MOOD "; For i = 0 To 2 Print #1, DataTime(i) & " " & Status(i) & " " & _ SBP(i) & " " & DBP(i) & " " & HR(i) & " "; Next i For i = 0 To 15 Print #1, MoodOutput(i); Next i Print #1, MoodOutput(16) Close #1 Call Main End If End Sub Private Sub tmrNewAdj_Timer() Digested = True End Sub </pre>	<p><i>Sub optMood_Click (continued).</i></p> <p><i>After the subject responds to the last item on the mood scale, the program collects a final sample of blood pressure and heart rate.</i></p> <p><i>Then the program writes each of the three samples of cardiovascular, as well as the mood ratings, to the data file.</i></p> <p><i>Timer set to 200msec.</i></p>

APPENDIX C: INFORMED CONSENT

- Purpose:** The purpose of the present study is to assess your psychological sensitivity and how accurately you report ongoing fluctuations in your mood.
- Involvement:** During this laboratory experience, you will take the 1996 edition of the Psychological Sensitivity Test, in which you will read a series of statements from standard personality questionnaires and determine whether more people agree or disagree with each statement. Regularly throughout the lab experience, the computer will ask you to report your current mood and the computer will collect blood-pressure and heart-rate data. Your mood reports will be evaluated against the cardiovascular data to determine their accuracy.
- Confidentiality:** Although some personal information will be entered into the computer (your SS#), your data will remain anonymous.
- IRB Approval:** The use of human subjects in the present study has been approved by the UNH Institutional Review Board for the Protections of Human Subjects in Research.
- Discontinuance:** In agreeing to participate in the study, you are not obligated to finish the laboratory experience: if for some reason you need to quit the study, just click the "quit" button and alert the experimenter. Wait for the experimenter to deflate the cuff before removing it; otherwise, it will burst.
- Do you agree to participate? YES NO

APPENDIX D: HEALTH-RELATED BEHAVIORS FORM

Please provide the following information as it is presented.

(The following items were presented sequentially.)

Check all of the following drugs which you have consumed in the last 6 hours, and then click the 'OK' button.

- Blood pressure medication
- Anti-anxiety or antidepressant medication
- Antihistamine or epinephrine
- Diet medication or caffeinated drugs (besides coffee and cola)
- Drugs that produce drowsiness
- Cold medication or recreational drugs

Caffeinated Coffee Consumption (last 2 hours):

- None
- 1-2 cups
- More than 2 cups

Caffeinated Soft Drink Consumption (last 2 hours):

- None
- 1-2 12oz cans (or equivalent)
- More than 1-2 12oz cans (or equivalent)

Alcohol Consumption (last 2 hours):

- None
- 1 beer, 1 glass wine, 1 shot, or equivalent
- 2 beers, 2 glasses wine, 2 shots, or equivalent
- More than 2 beers, 2 glasses wine, 2 shots, or equivalent

Nicotine Consumption (last 2 hours):

- None
- chew tobacco, 1 pipe bowl, 1 cigar or equivalent
- 1-3 cigarettes
- More tobacco than that listed

Physical exercise (last 2 hours):

- None
- light
- moderate (e.g. basketball)
- 30+ minutes of intense aerobic training (e.g., long-distance running, long-distance swimming, or cycling as training)

APPENDIX E: PSYCHOLOGICAL SENSITIVITY TEST QUESTIONS

The Psychological Sensitivity Test, Form b UNITED INTERNATIONAL TESTING CORPORATION

Very important: before you begin, read and understand the instructions for the test presented by the computer. Indicate your answers on the computer. Do not make any marks on this exam form. Good Luck!

1. I think that the "funnies" are the most interesting section of the newspaper.
2. I have a very strong desire to be a success in the world.
3. I always follow the rule: business before pleasure.
4. Several times a week I feel as if something dreadful is about to happen.
5. My daily life is full of things that keep me interested.
6. I always like to keep my things neat and tidy and in good order.
7. I become quite irritated when I see someone spit on the sidewalk.
8. It is hard for me to start a conversation with strangers.
9. I hate to be interrupted when I am working on a task.
10. Sometimes I feel like smashing things.

11. I think I would enjoy having authority over other people.
12. I feel sure that there is one true religion.
13. I often feel as if the world is passing me by.
14. I do not like to see people carelessly dressed.
15. I take a rather serious attitude toward ethical and moral issues.
16. I can be friendly with people who do things I consider wrong.
17. I set a high standard for myself and I feel others should do the same.
18. I fall in and out of love rather easily.
19. I wake up fresh and rested most mornings.

20. I often act on the spur of the moment without stopping to think.
21. My home life was always happy.
22. I would rather go without something than ask for a favor.
23. Before I do something, I try to consider how my friends would react to it.
24. In traveling abroad, I would rather go on a well-conducted tour than plan for myself the places I wish to visit.
25. If I had my life to live over again, I would want it much the same.
26. It often seems that my life has no meaning.
27. I believe in complaining to the waiter or manager if I am served bad food in a restaurant.
28. I solve a problem better by discussing it with others.
29. When I am driving a car, I try to keep others from passing me.
30. I feel uncomfortable when a stranger smiles at me.

APPENDIX F: AFFECT INTENSITY SCALE (LARSEN & DIENER, 1987)

Instructions: The Psychology Department has one more survey for you, after which you will complete a mood assessment, and you will be finished with the experiment.

The following statements refer to reactions to typical life events. Using the scale below, indicate how YOU react to these events. Work quickly through the survey. Do not dwell on any one question.

never			sometimes			always
1	2	3	4	5	6	7

(The following items were presented sequentially.)

1. When I accomplish something difficult, I feel delighted.
2. When I feel happy, it is a strong type of exuberance.
3. I enjoy being with other people very much.
4. I feel pretty bad when I tell a lie.
5. When I solve a personal problem, I feel euphoric.
6. My emotions tend to be more intense than that of most people.
7. My happy moods are so strong that I feel like I'm "in heaven."
8. I get overly enthusiastic.
9. If I complete a task that I thought was impossible, I am ecstatic.
10. My heart races at the anticipation of some exciting event.
11. Sad movies deeply touch me.
12. When I'm happy, it's a feeling of being untroubled and content rather than being zestful and aroused.
13. When I talk in front of a group of people for the first time, my voice gets shaky and my heart races.
14. When something good happens, I am usually much more jubilant than others.
15. My friends might say I'm emotional.
16. The memories I like the most are those of times when I felt content and peaceful rather than zestful and enthusiastic.
17. The sight of someone who is hurt badly affects me strongly.
18. When I'm feeling well, it's easy for me to go from being in a good mood to being really joyful.
19. "Calm and cool" could easily describe me.
20. When I'm happy, I feel like bursting with joy.
21. Seeing a picture of some violent car accident in a newspaper makes me feel sick to my stomach.
22. When I'm happy, I feel energetic.
23. When I receive an award, I feel overjoyed.
24. When I succeed at something, my reaction is calm contentment.
25. When I do something wrong, I have strong feelings of shame and guilt.
26. I can remain calm even on the most trying days.
27. When things are going well, I feel "on top of the world."
28. When I get angry, it's easy for me to still be rational and not overreact.
29. When I know I have done something very well, I feel relaxed and content rather than excited and elated.
30. When I do feel anxiety, it is normally very strong.
31. My negative moods are mild in intensity.
32. When I am excited over something, I want to share my feelings with everyone.
33. When I feel happiness, it is a quiet type of contentment.
34. My friends would probably say I'm a tense or "high-strung" person.
35. When I'm happy, I bubble over with energy.

36. When I feel guilty, this emotion is quite strong.
37. I would characterize my happy moods as closer to contentment than joy.
38. When someone compliments me, I get so happy I could "burst."
39. When I am nervous, I get shaky all over.
40. When I am happy, the feeling is more like contentment and inner calm than one of exhilaration and excitement.

APPENDIX G: DEBRIEFING

Are people who typically repress feelings of anxiety able to experience emotional relief? In the present study, you completed a "Psychological Sensitivity Test" and then learned that your performance on the test was very poor. (Actually this test was completely made up; to our knowledge, there is no such thing as psychological sensitivity.) I assumed that the failure feedback (which was actually bogus) would produce at least a little amount of anxiety in you. After a 2-minute writing task, you then learned that your performance was actually much higher. I assumed that this "corrected feedback" about your performance (which was also bogus) would occasion at least a little amount of relief. This general procedure, involving bogus failure feedback and then bogus corrected feedback, created an emotionally charged setting from which I could examine individual differences in relief experience. (Without the deception, I could not have studied genuine emotional reactions.)

In order to determine whether you typically repress feelings of anxiety, I had you complete a couple questionnaires in your 401 class at the beginning of the semester. Based upon your responses to these questionnaires, you were categorized as a "repressor" or a "nonrepressor."

I measured two aspects of your anxiety and emotional relief: a) cardiovascular changes (heart rate, systolic blood pressure, and diastolic blood pressure) and b) self-reported emotional changes. I predicted that those participants identified as repressors would exhibit physiological signs of relief (e.g., rapid decreases in blood pressure and heart rate) but not report feeling relief on the mood questionnaire.

The two-minute writing task was a manipulation in this experiment. Half of the participants were asked to write about their thoughts and feelings regarding the test and their test performance. This half of the participants comprised the "experimental group." The other half of the participants were asked to write about what they planned to do for the rest of the day. This half of the participants comprised the "control group." Research by James Pennebaker (see Pennebaker, 1993, for a review) has shown that simply writing about an anxiety-provoking event helps people to feel some amount of emotional relief. I believe that the therapeutic benefits of the experimental writing task depend upon whether or not one typically represses feelings of anxiety. Specifically, I predict that repressors in the experimental group will not be able to experience relief simply by writing about the test. As Weinberger (1990) suggests, repressors probably do not acknowledge how threatening situations are; consequently, repressors are not motivated to understand these threatening situations better, and thus they can not "make themselves" feel relief unless the threat goes away (e.g., the "corrected" test evaluation in this study).

My research of the nature of relief (Mitchell, 1991) has lead me to believe that people feel only as much relief as they feel anxiety before the relief; also the amount of anxiety and relief a person feels is a direct function of how important people perceive a situation to be. I believe that repressors have difficulty experiencing relief, in part, because they have difficulty admitting to themselves how important certain things are to them (e.g., being a psychologically sensitive person). Consistent with this understanding of repression, I predict that repressors will rate psychological sensitivity as less important

than will nonrepressors.

This semester, an additional relief manipulation was added to the experiment in which you participated. The “security check” which you underwent (in which “none of the above” was the correct answer for everyone) was designed to elicit some anxiety in you, followed by some relief. This additional experience was added to the experiment because the other relief experience (the “corrected” test evaluation) occurred after a long delay -- the writing task, memory task, and mood ratings -- which may have moderate the intensity of relief felt by you. In the security check, relief followed directly after the anxiety induction; that is, the information that you passed the check came right after the information that you had to pass the security check. As in the other relief manipulation, I expected that repressors would not differ from nonrepressors in the extent to which they manifested cardiovascular relief (decreased heart rate and blood pressure), but they would report feeling less relief after passing the check (as measured by your ratings of pleasantness after the security check) than would nonrepressors.

To aid you in understanding this debriefing, you might consider what the independent and dependent variables are in this study. Recall that the independent variable is that which is manipulated by the experimenter in order to produce some change in subjects’ behavior. The change in subjects’ behavior (broadly defined, including physiological changes and mental state changes), as measured by a particular scale or instrument, is the dependent variable. The experimental hypothesis is a specific, formal statement about the expected influence of the independent variable on the dependent variable. Please note that the group that persons fell into (repressors or nonrepressors) is more formally an organismic variable (because it is not manipulated by the experimenter); however, organismic variables are often treated as independent variables in studies. You should ask your instructor whether or not he/she requires you to differentiate between organismic and independent variables.

Thank you for your participation in this experiment. I believe that this experiment will greatly clarify our understanding of repression and emotional relief and provide invaluable information to therapists who goal it is to help anxious persons experience some degree of relief.

Debriefing References

Mitchell, D.C. (1991). Feeling good from feeling bad: Relief as a function of prior disappointment. Unpublished master’s thesis.

Pennebaker, J.M. (1993). Social mechanisms of constraint. In D.M. Wegner & J.W. Pennebaker (Eds.), Handbook of mental control. Englewood Cliffs, NJ: Prentice Hall.

Weinberger, D.A. (1990). The construct validity of repressive coping style. In J.L. Singer (Ed.), Repression and dissociation: Implications for personality theory, psychopathology, and health. Chicago: University of Chicago Press.

APPENDIX H: CONTRAST ANALYSIS

Contrast analysis is a means of analyzing data among groups by weighting the groups differently. The t -test can be conceived in two different ways -- as a difference between means compared to the expected difference between these means due to random error (i.e., the standard error) or as a sum of these two means, after weighting (multiplying) one mean by -1 and the other by +1. Within the former conceptualization of the t -test, the possibility of comparing more than two groups is immediately ruled out -- how, after all, can a data analyst take the difference among three scores and arrive at one representative value.

Enter the omnibus F -test. The F -test represented a solution to the problem of comparing more than two means because it evaluates the variability among groups rather than differences among groups. Because the F -test evaluates variability, where the signs (positive and negative) of the discrepancies from the grand mean are lost, only the magnitude of the average difference among the means is produced, not the direction.⁴⁴

Another limitation of the F -test is that it uses several degrees of freedom (as opposed to the t -test's single df) to predict scores on a dependent measure and is therefore less powerful and less efficient of a test. At this point, I think it would be worthwhile to briefly consider the nature of degrees of freedom in hypothesis testing -- a topic that I find to be wholly important yet conspicuously underrepresented in statistics texts.

First, the undergraduate explanation. *Degrees of freedom are the number of observations that create variability in a set of scores.* To aid in the conceptualization of this definition, one must imagine that each score can be arbitrarily assigned to an ordinal position, such as the "first score" obtained or the "second score" obtained. From this perspective, the first score (by itself, before the second score is considered) does not create variability in the set of scores (after all, this is just this first score). The second, third, fourth, and latter observations do create variability in the set. Thus, one might say that the variability in a set of observations is due to (the inclusion of) $n - 1$ observations. From this perspective, it makes sense to divide the sum of squared deviations in the set by $n - 1$, rather than n , for one is then taking the average contribution of each variability-contributing observation to the variability of the entire set. NOTE: observations can refer to individual scores or group means.

Second, the graduate explanation. *Degrees of freedom are the number of (nonredundant) numeric predictor variables used to predict a set of observations.* According to this perspective, one can conceive of two types of degrees of freedom. The first type of degrees of freedom might be called "representative degrees of freedom," but is variously termed "error degrees of freedom," "residual degrees of freedom," or " df_{den} " in the literature. These degrees of freedom are the number of numeric predictor variables that are required to guarantee that each observation in a set of observations can be

⁴⁴The omnibus F test is sometimes ill-regarded as a general data-analytic device. For instance, Bob Abelson (1995) writes, "The [omnibus] test result does not specify which means are different from which and therefore is a mere blob. Omnibus testing is like playing the guitar with mittens on." (p. 105)

perfectly predicted, or “represented” -- no error, whatsoever. It can be proven, but not by me, that one can perfectly predict (i.e., reproduce all the values of) a set of n observations by using $n - 1$ nonredundant⁴⁵ variables (e.g., see Cohen & Cohen, 1983). One can, of course, demonstrate this principle empirically by a set of $n - 1$ variables on a DV composed of n observations -- the residuals will be a set of 0s.

The second type of degrees of freedom might be called “predictive degrees of freedom,” but in the literature are variously termed “hypothesis degrees of freedom,” or “ df_{num} .” These degrees of freedom are the number of numeric predictor variables that a data analyst actually uses to predict a set of observations, regardless of whether the observations are perfectly predicted. A bivariate regression or correlation analysis predicts a set of observations from just one numeric variable (often another set of observations). Thus, in bivariate regression the number of predictive degrees of freedom is 1. In an omnibus F test, one uses categorical variables (such as treatment condition) to predict individual observations. For the prediction equations to be mathematically constructed, each categorical variable must be transformed into a set of $k - 1$ dichotomous numeric variables (e.g, 1’s and 0’s), where k equals the number of groups or conditions⁴⁶. In other words, the omnibus F -test transforms categorical variables into sets of degrees of freedom that represent (perfectly predict) category membership but imperfectly (or at least with uncertainty) predict the individual observations.

In general, hypothesis tests examine whether there is a statistically significant advantage of using one or more predictor variables rather than the grand mean of observations to predict individual scores. Stated in terms of degrees of freedom, hypothesis tests evaluate the relative utility of using predictive degrees of freedom rather than representative degrees of freedom to predict individual observations. In fact, the F -ratio can be regarded as the product of the efficiency with which individual observations are predicted by predictive (treatment) degrees of freedom ($df_{error}/df_{treatment}$) and ratio of explained to unexplained variability in the observations ($\eta^2/(1 - \eta^2)$). Obviously, a powerful hypothesis test is one in which relatively few predictive degrees of freedom are required to explain a large percentage of the variability in a set of observations.

To create a more powerful F -test, one could simply examine the individual contributions of the $k - 1$ dichotomous numeric variables (see Cohen & Cohen, 1983). However, the interpretation of these individual dichotomous variables can be a bit awkward. For instance, a researcher might examine the individual contributions of being a freshman (k_1 , one degree of freedom), being a sophomore (k_2), and being a junior (k_3) to

⁴⁵ “Nonredundant” simply means that no two variables in the set are perfectly correlated.

⁴⁶ For example, consider a study in which the investigator examines work productivity on a dissertation after randomly assigning graduate students to one of three conditions -- a) no cups of coffee per day, b) 1 cup of coffee per day, and c) 3 cups of coffee per day. Two dichotomous numeric variables would sufficiently account for the category membership. The first variable could be called “no-cups?” and could carry the dichotomous values of 0 = no and 1 = yes. The second variable could be called “1cup?” and could carry the value of 0 = no and 1 = yes. Membership in the third group is completely determined by the values of “no cups?” and “1 cup.” If both of these variables carried values of zero for a particular graduate student, this student must be riding high in the 3-cup group; likewise, if one of the two variables carried a value of 1, then the student is obviously not in the 3-cup group.

predicting stress among college students. Probably, however, the researcher is more interested in the broader question of the differences among all of the class statuses or the general relationship between class status and stress -- a question that can not be adequately addressed by dummy coded variables.

Enter contrast analysis. In contrast analysis, one transforms each categorical variable into a set of up to $k - 1$ numeric variables, each of which takes on more than two theoretically meaningful values. For instance, a researcher who predicts significant change in stress level from one's freshman to senior year might create a set of 3 numeric variables that each take on four values -- one for each college year. One of these predictive degrees of freedom might be a linear contrast, in which freshmen are assigned the value of -3; sophomores, the value of -1; juniors, the value of 1, and seniors, the value of 3. Such a contrast would test the hypothesis that stress increases (or decreases) as a college student advances in status. Another predictive degree of freedom might be a quadratic contrast, in which the four classes are assigned the values of +1, -1, -1, and +1, respectively. This contrast would test the hypothesis that college students are more stressed during the transition periods. The last degree of freedom could be a cubic contrast (1, -3, 3, -1), which tests the hypothesis that college is a particular kind of emotional roller coaster ride across the years.

Notice two things about the contrasts that I have chosen for my example. First, each contrast by itself represents a meaningful hypothesis test and could therefore be examined independent of the other degrees of freedom. Second, the sum of each of the values for a particular contrast equals 0. This is no accident. Contrast analysis builds from the sum-of-weights model of the t -test, described above in which each individual observation is weighted (multiplied) by a particular weight (contrast value). As in a two-groups t -test, the sum of the weights must equal zero so that when there is either no difference among the groups or random differences among the groups, the sum of weighted scores will also equal zero (the null hypothesis parameter). One final note about the above contrasts is that they happen to be uncorrelated with each other, or "orthogonal," which means that they each explain unique variance in the individual observations. Using orthogonal contrasts is not a necessary condition for contrast analysis to yield meaningful information about individual contrasts, but just so happens to be the usual choice among researchers; this may be because each set of orthogonal contrasts can be conceptualized as a family of complementary hypothesis tests⁴⁷.

As indicated above, as long as a set of $k - 1$ degrees of freedom is nonredundant, it perfectly represents category membership. A consequence of this representativeness is that any set of $k - 1$ (nonredundant) contrasts will always collectively explain the same amount of variance as the set of $k - 1$ dummy coded variables. In other words, a contrast analysis can provide both the more specific information about individual contrasts and the more general information about group differences obtained from an omnibus F -test.

The procedures for calculating both between-groups contrasts and repeated-measures contrasts are discussed in Rosenthal & Rosnow (1985; 1991). In general, the calculation of effect size and significance tests seem to work quite well; however, there are

⁴⁷ For instance, the linear, quadratic, and cubic contrasts represent the first three members of the family of polynomial contrasts.

a couple of problems with the formulas, which I address later.

Not at all a matter of controversy is the heart and soul of the contrast analysis -- the calculation of SS_{contrast} . Essentially, the sum of squares for a contrast is equal to the square of sums of the contrast-weighted scores divided by the sum of squares of the contrast weights themselves. SS_{contrast} is evaluated against the within-group variability, which is the same error term used for the omnibus F -test, with the same degrees of freedom -- $(n-1)*(k-1)$. One very important fact is that SS for a particular contrast will never be greater than $SS_{\text{between-groups}}$. As I mentioned earlier, ANOVA can be regarded as the evaluation of the advantage of using the groups means (or rather $k - 1$ dummy variables that represent the means) over the grand mean to predict the individual scores within groups. This advantage is the omnibus F -ratio for the main effect. In contrast analysis, one evaluates the relative advantage of using each imperfect predictor of the group means (one set of contrast weights) over the grand mean in predicting individual scores within groups. This advantage is a focused F -ratio provided by contrast analysis. This conceptualization of contrast analysis can not, in my opinion, be overstated. One can actually use contrast weights to predict group means, then calculate the sum of squared deviations of each predicted mean from the grand mean. This sum of squares is SS_{contrast} .

Rosenthal and Rosnow (1985) suggest that the effect size estimate of a contrast be the square-root of the ratio of SS_{contrast} to $(SS_{\text{contrast}} + SS_{\text{error}})$, a value interpretable as r . In most instances, I think that this effect size estimate is problematic for two reasons. First, consider the limiting case in which there is no within-groups variability in a set of observations and there is some nonzero value for the SS_{contrast} . In such a case, the effect size estimate for the contrast will equal 1.0, no matter what contrast values have been selected. Second, when one calculates the contrasts involving one or more "0" coefficients (e.g., linear trend), Rosenthal & Rosnow's contrast r is not sensitive to changes in these zero-weighted groups. To avoid these problems, one can calculate the contrast effect as the ratio of the variance explained by the contrast to the total variance that can be explained by the contrast. In the case of the between-groups contrast, this r would equal the square-root of the ratio of SS_{contrast} to $(SS_{\text{between-groups}} + SS_{\text{error}})$, which also corresponds to the value one would obtain by simply calculating the correlation coefficient between the contrasts and the raw scores. Using this alternative contrast effect size estimate, if there is no error variance, then the contrast effect size depends solely upon how adequately it predicts the group means. I must emphasize that my effect size estimate of the contrast has no bearing on the significance test of the contrast. The contrast is still evaluated against the within-group variance to determine statistical significance.

The calculation of effect sizes of contrasts on repeated-measures data is similar to the calculation of contrast effects for between-groups data; however, just as the F -tests for repeated measures excludes the variance due to between-subjects differences, the repeated-measures contrast effect excludes this BS variance as well. Rosenthal & Rosnow again calculate the repeated-measures contrast effect size as the square root of the ratio of SS_{contrast} to $(SS_{\text{contrast}} + SS_{\text{error}})$, where error is the subject-by-treatment interaction term. Again, I prefer to substitute SS_{contrast} with $SS_{\text{treatment}}$ so that the contrast effect size refers to the proportion of predictable variance that it, in fact, predicts.