The Comparative Efficacy of Dosed, Enhanced Dosed, Prolonged Exposure, and Mindfulness in the Reduction of Anxiety

Sophie Rubin
Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/dissertations
Part of the Clinical Psychology Commons, Counseling Psychology Commons, and the Health Psychology Commons

Recommended Citation
https://scholarworks.wmich.edu/dissertations/692

This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
THE COMPARATIVE EFFICACY OF DOSED, ENHANCED DOSED, PROLONGED EXPOSURE, AND MINDFULNESS IN THE REDUCTION OF ANXIETY

by

Sophie Rubin

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology
Advisor: R. Wayne Fuqua, Ph.D.

Western Michigan University
Kalamazoo, Michigan
June 2009
THE COMPARATIVE EFFICACY OF DOSED, ENHANCED DOSED, PROLONGED EXPOSURE, AND MINDFULNESS IN THE REDUCTION OF ANXIETY

Sophie Rubin, Ph.D.
Western Michigan University, 2009

Exposure-based treatments have proven effective in treating a range of fears and phobias and can be accounted for by mechanisms described in behavioral theory. Enhanced dosed and dosed-only exposure are promising new behavioral approaches for treating fears and phobias. Fifty participants with speech anxiety were randomly assigned to a prolonged exposure condition (PE), a dosed-only exposure condition (DE), a positively enhanced dosed exposure condition (PDE), a negatively-supplemented dosed exposure condition (NDE), or a mindfulness enhanced dosed exposure condition (MDE). End of session results for all of the enhanced groups resulted in significantly lower subjective ratings of discomfort than the non-enhanced groups. In addition, results indicated that the MDE condition tended to produce less measured aversive arousal and lower subjective ratings of discomfort relative to the tested alternatives. These techniques may represent an important advancement, in that the treatment gains of traditional exposure therapies might be achieved without the degree of aversive arousal (and possibly high drop out rates) typically seen in exposure therapies.
Copyright by
Sophie Rubin
2009
WE HEREBY APPROVE THE DISSERTATION SUBMITTED BY

Sophie Rubin

ENTITLED The Comparative Efficacy of Dosed, Enhanced Dosed, Prolonged Exposure, and Mindfulness in the Reduction of Anxiety

AS PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF Doctor of Philosophy

Psychology

(Department)

Behavioral Analysis

(Program)

[Signatures of committee members]

APPROVED

[Signature]
Dean of The Graduate College

Date
June 16, 2009
ACKNOWLEDGEMENTS

I would like to thank Richard Spates for his mentorship, for fostering my intellectual growth, and for shaping my repertoire as a psychologist. I would like to thank Wayne Fuqua for his leadership, guidance, and dedication on my path to obtaining a doctorate. I would also like to thank Galen Alessi and Ellen Koch for their valuable suggestions. I would like to thank my research assistants: Leigh Jouppi, Michael Puff, Kalina Miller, Cassie Rankin, Ashleigh Allen, and Jacqueline Peterson. Finally, I would like to thank my husband and family for their continued love and support.

Sophie Rubin
UMI Number: 3364683

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction. In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI®

UMI Microform 3364683
Copyright 2009 by ProQuest LLC
All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vi</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>METHOD</td>
<td>13</td>
</tr>
<tr>
<td>Participant Selection</td>
<td>13</td>
</tr>
<tr>
<td>Informed consent process</td>
<td>14</td>
</tr>
<tr>
<td>Inclusion</td>
<td>14</td>
</tr>
<tr>
<td>Profile of Mood States, pre-exposure</td>
<td>15</td>
</tr>
<tr>
<td>Assignment to experimental condition</td>
<td>16</td>
</tr>
<tr>
<td>Instrumentation and Dependent Variables</td>
<td>16</td>
</tr>
<tr>
<td>Independent Variables</td>
<td>17</td>
</tr>
<tr>
<td>Negatively supplemented dosed exposure (NDE)</td>
<td>18</td>
</tr>
<tr>
<td>Positively enhanced dosed exposure (PDE)</td>
<td>18</td>
</tr>
<tr>
<td>Mindfulness enhanced dosed exposure (MDE)</td>
<td>19</td>
</tr>
<tr>
<td>Dosed-only exposure (DE)</td>
<td>19</td>
</tr>
<tr>
<td>Prolonged exposure (PE)</td>
<td>20</td>
</tr>
<tr>
<td>Post Exposure Session</td>
<td>20</td>
</tr>
<tr>
<td>Extended Exposure</td>
<td>20</td>
</tr>
<tr>
<td>Interobserver Agreement</td>
<td>21</td>
</tr>
</tbody>
</table>
Table of Contents--Continued

Independent Variable Integrity .................................................. 21
Design and Analysis ................................................................. 21
RESULTS ...................................................................................... 23
DISCUSSION .............................................................................. 34
REFERENCES ............................................................................. 39

APPENDICES
A. Recruitment Flier .................................................................. 43
B. Classroom Recruitment Script .............................................. 45
C. Phone Scheduling Script ......................................................... 47
D. Screening Questionnaire ....................................................... 50
E. Consent Form ......................................................................... 53
F. Script for Participants Who Do Not Qualify and List of Agencies .... 57
G. Positive and Negative Sentences ........................................... 59
H. Post Experiment Questionnaire (Prolonged and Dosed Only) .......... 61
I. Post Experiment Questionnaire (Negative, Positive, and Mindfulness) ....... 63
J. HSIRB Research Approval Letter ........................................... 65
K. Pilot Study Data .................................................................... 67
LIST OF TABLES

1. Source Table for Analysis of Covariance: Average SUDs Ratings ............................... 24
2. Source Table for Analysis of Covariance: Average SUDs Ratings for Final Three Trials .......................................................... 24
3. Pearson Correlation between SUDs Ratings and Physiological Measures........... 25
4. Source Table for Analysis of Covariance: Zygomaticus Activity ...................... 26
5. Source Table for Analysis of Covariance: Zygomaticus Activity for 5s Samples .......................................................... 27
6. Source Table for Analysis of Covariance: Corrugator Activity ...................... 28
7. Source Table for Analysis of Covariance: Corrugator Activity for 5s Samples. 29
8. Source Table for Analysis of Variance: POMS – Depression Sub-Scale............. 32
9. Source Table for Analysis of Variance: Post-Exposure Questionnaire – Question 3 ........................................................................ 33
LIST OF FIGURES

1. Average SUDs Ratings Across Trials ................................................................. 23
2. Average Zygomaticus Activity Across Trials ......................................................... 26
3. Average Zygomaticus Activity Across Trials (5s Samples) ..................................... 27
4. Average Corrugator Activity Across Trials ........................................................... 28
5. Average Corrugator Activity Across Trials (5s Samples) ......................................... 29
6. Percentage of Participants Who Reached Extinction in 10 Trials or Less ............... 30
7. Percentage of Participants Who Reached Extinction in 25 Trials of Less ............... 30
8. Number of Trials until Extinction: Extended Exposure Participants ...................... 31
INTRODUCTION

Public speaking anxiety, as a form of social phobia, has been the topic of numerous research investigations (Ayres, 1988a; Ayres, 1988b; Foley & Spates, 1996; Hu, Bostow, Lipman, Bell & Klein, 1992; Hu, Romans-Kroll, & Juong-Min, 1995). The Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM-IV) (American Psychiatric Association, APA, 1994) defines social phobia as a “marked, persistent, and excessive or unreasonable fear when in the presence of, or when anticipating encounter with a specific object or situation” (p. 405). In addition, the individual recognizes the fear is excessive or unreasonable and avoids the phobic situation or endures it with intense anxiety or distress (APA, 1994). The Task Force on Promotion and Dissemination of Efficacious Treatments identifies exposure-based treatments as meeting the classification as a “well established” treatment for anxiety disorders including social phobia (Chambless & Ollendick, 2001).

Behavior theory provides multiple mechanisms that account for the success of these exposure-based procedures. Social phobias may be acquired through a combination of respondent and operant conditioning (Barlow, 2002; Forsythe, Barrios & Acheson, 2007; Mowrer, 1950; McAllister & McAllister, 1995; Todd & Pietrowski, 2007). The principle of higher order respondent conditioning details how a neutral stimulus can acquire evocative properties by being paired with a previously established conditioned stimulus. For example, ridicule and unpleasant comments can serve as conditioned stimuli (CS₁) that will elicit conditioned responses (CR₁) such as a negative emotional reaction. If one experiences ridicule and unpleasant comments (CS₁) while in a speech-giving context (NS), the speech-giving context may acquire similar evocative properties.
The speech-giving context now becomes a conditioned stimulus (CS2) that elicits a similar negative emotional reaction (CR2). Such ridicule and unpleasant comments do not have to be experienced directly. Often the sight of another person ridiculed while in a speech-giving context may function as a CS1 that elicits a CR1 of a negative emotional reaction, with the end result being that a speech-giving context becomes a CS2. It is important to note that covert verbal stimuli (i.e. thoughts) are also likely to be occurring during the speech-giving context. Thus, through a similar process, those verbal stimuli may come to function as conditioned stimuli. Through the process of stimulus generalization, thoughts that hadn’t occurred during the original speech-giving context may also become conditioned stimuli, despite having never been directly paired.

Operant conditioning also plays an important role in the development and maintenance of phobias (McAllister & McAllister, 1995; Mowrer, 1950). For example, the speech-giving context may have stimulus functions beyond that of a conditioned stimulus (Rubin, Spates, Johnson, & Jouppi, in press; Spates & Rubin, 2007). The speech-giving context may also serve as a conditioned establishing operation (CEO). More specifically, the speech-giving context functions as a reflexive CEO which is correlated with a worsening in conditions and whose offset will function as reinforcement (Michael, 2004). Reflexive CEOs will evoke escape and avoidance behaviors that are then reinforced by the relatively immediate reduction or removal of that CEO. That is, any behavior that reduces or removes the speech-giving context or some aspect of this context will be reinforced.

As explained above, a speech-giving context may elicit a conditioned response of a negative emotional reaction. In turn, the negative emotional reaction may generate
physiological stimuli such as increased heart rate, shortness of breath, muscle contractions, sweating, adrenal secretion, galvanic skin response, etc. Since these physiological stimuli are being correlated with a worsening in conditions, they may also come to function as a reflexive CEO. Therefore, any behaviors that result in the reduction of those conditioned aversive physiological stimuli will also be reinforced.

These mechanisms of action suggest multiple therapeutic interventions. Respondent extinction would be one method of weakening the capacity of the speech-giving context (CS₂) to elicit a negative emotional reaction (CR₂). This would involve repeatedly and/or continuously presenting the speech-giving context in the absence of the CS₁ it was originally paired with (shame, ridicule, etc.). Counterconditioning is an alternative approach to weakening the respondent relations involved in speech phobia. Counterconditioning involves presenting a conditioned stimulus that elicits a conditioned response that is incompatible with the response targeted for elimination. For example, while a client is exposed to a speech-giving context, a therapist might present conditioned stimuli that elicit a relaxed state or a positive emotional reaction. Since relaxation and positive emotional reactions are incompatible with negative emotional reactions, a new respondent relation (speech-giving context elicits relaxation/positive emotions; or at least competes with the punishing features of the speech-giving context such that natural or automatic reinforcement can take effect, i.e. via social reinforcement for effective speech-giving) is formed that replaces the previous respondent relation (speech-giving context elicits negative emotions).

Operant unpairing would be suggested to weaken the roles of the speech-giving context and physiological stimuli as reflexive CEOs. One would repeatedly present the
speech-giving context and physiological stimuli in the absence of any other worsening in conditions. This process is analogous to the weakening of a conditioned reinforcer by repeatedly presenting it without ever re-pairing it with another reinforcer.

It may be worthwhile to note that operant extinction of escape and avoidance behavior is typically not feasible in these situations. The process of operant extinction involves two aspects: the occurrence of the behavior and the withholding of reinforcement following that behavior. For operant extinction to take place in the scenarios described above the individual would be allowed to engage in escape or avoidance behavior and then these behaviors would not result in a reduction of physiological stimuli or removal or alteration of the speech-giving context. By the very nature of these escape/avoidance behaviors a reduction in physiological stimuli and the speech-giving context are inherent to the occurrence of behavior. Therefore, the maintaining source of reinforcement cannot be withheld.

One early exposure-based treatment for the elimination of phobias is prolonged exposure (also known as flooding) (Barlow, 2002; Boudewyns & Shipley, 1983; Richard, Lauterbach, & Gloster, 2007). An essential element of all exposure-based treatments is the duration of exposure or confrontation with the real or imagined speech context while sustaining at least modest levels of arousal. Prolonged exposure involves the client being exposed to the fearful stimulus for an extended duration within a safe context. The behavioral principle that accounts for the success of this procedure is respondent extinction. Before treatment, the conditioned stimulus (exposure to a feared stimulus or context) may elicit a conditioned fearful response (such as muscle contractions, sweating, increased heart rate, adrenal secretion, galvanic skin response, etc.). Since this
conditioned stimulus is continuously presented without a fear eliciting unconditioned stimulus (or another conditioned stimulus), the conditioned stimulus loses its fearful properties and becomes a neutral stimulus (McAllister & McAllister, 1995). Another treatment based on respondent extinction is graded exposure (Barlow, 2002; Richard et al., 2007). Although both procedures involve the repeated presentation of a fear eliciting conditioned stimulus, they differ in that graded exposure involves a progression from the least evocative conditioned stimulus to the most evocative conditioned stimulus. A hierarchy of stimuli is constructed based on their evocative properties and progression through the hierarchy occurs when at least partial extinction takes place on the earlier steps. For example, therapists only progress through later steps in the hierarchy if clients demonstrate a reduction in emotional responding.

Systematic desensitization is another exposure-based treatment. Like graded exposure, clients are exposed to a hierarchy of fearful stimuli within a safe context. Systematic desensitization differs in that it requires clients to engage in a relaxation response during exposures (Wolpe, 1958). Thus the underlying behavioral principles involve a combination of respondent extinction (like graded exposure) as well as counterconditioning, in which individuals engage in a response that is incompatible with the response targeted for reduction. For example, the therapist might use words such as "safe" or "relax" which might, after specific training in muscle relaxation, function as conditioned stimuli (CS₁) that elicit a conditioned response (CR₁) such as a slowed physiological rate or positive emotional reaction. Note that such states are incompatible with a negative emotional reaction.
Dosed exposure is another possible treatment for phobias (Pittman, et al., 1996; Rubin et al., in press; Spates & Koch, 2003; Spates & Rubin, 2007; Waller, 2004). Unlike graded exposure and systematic desensitization, there is no progression through a hierarchy of feared stimuli. Like prolonged exposure, the fearful stimulus, either imagined or real, is presented at moderate to maximal strength. Unlike prolonged exposure however, the fearful stimulus is not presented for an extended duration. Instead, clients are repeatedly exposed to the fearful stimulus for very short durations of time. There is a brief time period between exposures called the intertrial interval, after which the feared stimulus is presented again. This cycle continues until respondent extinction is complete. Thus, the unpairing is more gradual and less dense with this procedure. It is hypothesized that such dosed exposure will be more acceptable to clients who are traditionally unwilling to go through a prolonged exposure treatment. Note that in all of the respondent extinction procedures, operant unpairing of the conditioned establishing operation is also likely occurring simultaneously. That is, the speech-giving context is being presented in the absence of both a worsening of conditions (operant unpairing of the reflexive CEO) and the conditioned stimulus it was originally paired with (respondent extinction). All involve repeatedly presenting a stimulus with acquired evocative properties (CEO, CS, CS$_2$) without the original stimulus with evocative properties (UEO, US, CS$_1$ respectively).

Exposure-based treatments have demonstrated considerable efficacy in eliminating phobias in speech anxious individuals (Barlow, 2002; Chambless & Ollendick, 2001; Todd & Pietrowski, 2007). These treatments have been relatively brief, consuming only a few treatment sessions. Exposure-based treatments are listed as
“Evidence Based” or “Efficacious” by the APA Task Force on the Identification and Dissemination of Efficacious Treatments (Chambless & Ollendick, 2001). However, there are attrition rates as high as 40-50% with prolonged exposure treatments (Zayfert & Black, 2000). Although prolonged exposure has been endorsed as “empirically supported,” such a high dropout rate is problematic for practical reasons.

In addition to the high levels of attrition that are often seen during exposure-based therapies, there is another challenge that is potentially problematic. During exposure-based treatments, clients may engage in escape or safety behaviors such as leaving or avoiding the situation. Exposure to the situation operates as a reflexive CEO that evokes these behaviors, which in turn are negatively reinforced by the removal of the exposure, thus suggesting the importance of operant conditioning in the maintenance of phobias (Barlow, 2002; McAllister & McAllister, 1995). While therapists can often prevent the overt instances of such behavior, the covert instances are more problematic. For instance, the client may start thinking about distracting thoughts and images to avoid contact with the feared stimuli. Such efforts undermine the therapeutic process by preventing respondent extinction and operant unpairing from taking place, at least at a covert level. Research suggests strongly that such safety behaviors interfere with treatment success (Eun-Jung, 2005; Morgan & Raffle, 1999). One possible strategy for dealing with such escape/safety behaviors is through the use of mindful awareness/observation techniques. Mindfulness strategies involve clients covertly observing and describing their negative thoughts with neutral terminology (Baer, 2003; Bishop et al. 2004; Kabat-Zinn et al. 1992). For example, a client might describe their heart rate as “pounding quickly”, rather than “something is wrong with my heart.” They do this with explicit instructions to not
engage in controlling or judging efforts. One result of this technique is that clients are “forced” into contact with these conditioned aversive stimuli. Since these conditioned aversive stimuli are being repeatedly presented in the absence of other aversive stimuli, unpairing is forced, increasing the probability that respondent extinction will take place. Although more research is warranted, this may suggest that the addition of mindfulness to all exposure based treatments, or when high levels of unauthorized avoidance are observed, may be beneficial.

Another line of research has suggested an alternative treatment approach. It has been demonstrated that an individual’s internal state (report of subjective experience and autonomic arousal) prior to giving a speech may be correlated with speech anxiety (Hu, et al., 1992; Hu, et al., 1995). Specifically, individuals who have negative thoughts just prior to giving a speech experience a higher level of anxiety both during and after the real or imagined speech. In contrast, those individuals who have positive thoughts just prior to a speech seem to encounter lower levels of anxiety at those points in time. It may be worthwhile to delineate the possible respondent conditioning elements of these observations. Note that while negative and positive thoughts are behaviors (i.e. talking to yourself), they also result in response-produced stimuli (i.e. the sound of your own voice). These stimuli can have evocative properties. For example, the sound of negative comments (CS₁) may elicit increased arousal and/or a negative emotional reaction (CR₁). Similarly, the sound of positive comments (CS₁) may elicit positive emotional reactions (CR₁). The implications are that during a course of exposure based treatment, a more rapid diminution of anxiety might occur if episodes of contact with the feared speech context are interspersed with brief periods of positive imagery or positive self-statements,
rather than prolonged contact with the fear arousing speech imagery. A variation of dosed exposure, called enhanced dosed exposure, addresses these implications (Vianna, Cammarota, Coitinho, Medina, & Izquierdo, 2003). The enhanced version differs in that the supplemental stimuli are added during the intertrial interval. For example, clients are asked to imagine a positive scenario such as winning the lottery or playing with their favorite pet. Thus, the enhanced version may involve a counterconditioning component, depending on the nature of the supplemental stimuli.

Hu et al. (1992; 1995) investigated this hypothesis. In one study (1995), participants' heart rate and subjective reports of anxiety were measured while giving a speech. Participants were assigned to one of two groups. Participants were asked to imagine either the contents of a paragraph that contained positive attitudes toward giving a speech or neutral attitudes toward giving a speech prior to actually giving a speech. Results indicated that positive attitude prior to speech delivery resulted in reduced subjective reports of anxiety and cardiovascular response when compared to the neutral attitude group.

In the other study (Hu et al., 1992) individuals were exposed to positive thinking just before imagining giving a speech, while participants' subjective reports of speech-anxiety and heart rate were evaluated. Thirty participants were recruited who reported a fear of public speaking based on a fear survey from a prescreening session. Participants were randomly assigned to one of three groups. The three groups consisted of being presented with 30 seconds of positive, negative, or neutral thinking just prior to 15 seconds of the presentation of the target imagery, which involved imagining giving a speech to an audience (i.e. a dosed exposure arrangement).
The experiment consisted of two sessions on two consecutive days. The first session entailed participants reading a list of 10 sentences into a tape recorder to be used in the subsequent session. The sentences characterized negative attitudes toward public speaking, positive attitudes toward public speaking, or neutral attitudes toward public speaking, depending on the group to which they were assigned. During the second session, electrodes were attached to monitor heart rate. Each participant was asked to read a description of a public speaking scene and to continue reading the scene until they could imagine it the same way every time. The participants were then asked to rate their fear based on a 10-point scale, with zero indicating no anxiety and 9 indicating the highest level of anxiety.

Experimental sessions consisted of presenting a sentence in the participants' own voice played through a tape recorder. The participants were instructed to spend 30s thinking about the sentence. When the 30 s ended, participants were instructed to imagine the public speaking scene for 15 s. After the 15 s had elapsed, participants were asked to rate the target fear image in terms of how much fear they felt. This process continued for 10 iterations. Results indicated that instructions for positive thinking prior to imagining a public speaking scene were related to a statistically significant reduction in both subjective ratings of fear and heart rate. Instructions for negative thinking prior to imagining a public speaking scene were related to increases in subjective reports of fear and heart rate.

In a previous investigation intended as a prelude to the present study and a partial replication of Hu et al. (1992), Rubin et al. (in press) recruited individuals who reported a fear of public speaking. Participants were randomly assigned to one of four groups:
Positive, Negative, Dosed Only, and Prolonged Exposure. The results of participants’ Subjective Units of Discomfort (SUDs) indicated that dosed exposure and enhanced dosed exposure with positive imagery were superior to prolonged exposure and enhanced dosed exposure with negative imagery. Further, the results demonstrated little difference between dosed exposure alone and enhanced dosed exposure with positive imagery.

The current study was designed as an extension of both the Hu et al. study (1992) and the Rubin et al. study (in press). The current study was not intended to be a treatment study given that participants were not treated for the full range of behaviors that typically fall under the label of speech anxiety. Instead, this study focused on the respondent behaviors only and on a narrower range of the stimuli that elicit such responses in order to better isolate and examine variables for use in future treatment packages. In doing so, this study addressed the relative benefits of dosed exposure, enhanced dosed exposure, and mindfulness interventions. Finally, the findings of this study may help researchers assess the underlying behavioral processes that account for the success of treatment packages including these components.

The current study improved upon Hu et al. (1992) and Rubin et al. (in press) by recruiting individuals who were formally diagnosed with public speaking anxiety using a structured interview. It substituted more reliable dependent measures of autonomic arousal than were used in Hu et al. (1992). Further, the target fear imagery was held constant, as well as the temporal parameters of exposure. Instructions for the “positive” and “negative” imagery interspersed between episodes of imagining the target image were altered to achieve hypothesized stronger effects. Further, the putative “positive” and “negative” effects were specifically assessed as measured pre-experimentally by
autonomic arousal in the presence of the referenced instructional and imagined stimuli. The current study retained the positive and negative experimental conditions used in Hu et al. (1992) but also added three additional comparison groups: prolonged exposure, dosed only (indicating that the intertrial interval is left free of any imagery), and a dosed condition enhanced with mindfulness instructions.

Dosed exposure alone or dosed exposure with positive imagery or mindfulness instructions inserted into the intertrial interval may have implications for social validity and attrition. Extinction to the feared image may occur, but without the degree of subject discomfort encountered in prolonged exposure. Dosed exposure might also lead to lower arousal associated with end-state functioning. The present investigation was an analog investigation to test the impact of dosed versus prolonged exposure on subjective and physiological measures as well as to examine the varieties of dosed exposure (positive and negative) and the effects mindfulness instruction may have when interspersed with exposure to the target image.
METHOD

Participant Selection

College students \( n = 50 \) were recruited from college classes and public postings. The participants were primarily white \( n = 33 \), female \( n = 35 \), who suffered from speech anxiety. The mean age of the participants was 20.08. Fliers (Appendix A) were used to recruit participants from the Western Michigan University student population. In addition, research assistants verbally recruited participants in classroom settings (Appendix B) and handed out fliers (Appendix A). The recruitment protocol and fliers instructed prospective participants to contact the researcher via phone and to leave a message stating their interest in learning more about participating in the study along with a phone contact. Upon receipt of such a message, either the student investigator or a research assistant contacted the prospective participant via phone (see Appendix C for phone scheduling script). In the phone conversation, the researcher asked for the name of the person who left the message. The prospective participant was provided with information of what to expect during their participation and the time commitment required. In addition, the phone conversation was used to set up a time to review the consent document.

When prospective participants indicated that they were interested in learning more about the study, a date and time was scheduled to review the consent document. When consent was given, a time was scheduled to participate in a screening and testing session. The purpose of the screening questions was to exclude potential participants who had recently used drugs that would interfere with the measurement procedures, and those potential participants who had current active serious mental illness or heart conditions
that might introduce a source of variability in measurement of dependent variables (see Appendix D for screening questionnaire). For this purpose, the prospective participant was asked to come to Wood Hall Room 2523.

**Informed consent process.** Upon arrival at the Anxiety Disorders Lab, either the co-principle investigator or a research assistant greeted the prospective participant. Prospective participants were provided with an oral and written presentation of the informed consent document (Appendix E). The experimenter read this document to the prospective participants and asked them to read the document. The researcher then asked the prospective participant whether they had any questions in regard to the experiment and continued to clarify information until the researcher was assured that the potential participant understood the information. The prospective participant was then asked to sign one copy of the informed consent form, and was provided with a second, unsigned copy for their personal records. The signed copies of the consent document are kept in a locked filing cabinet in the Anxiety Disorders Lab. If any individual wished not to participate in the study they could refuse participation and leave at any time. The informed consent process lasted approximately 10 min. After informed consent was obtained, the experimenter entered the participant’s details in a master list and created an identification number for the participants.

**Inclusion.** In order to be included in the current study, participants were screened with the Anxiety Disorders Interview Schedule (ADIS-IV) and Personal Report of Communication Apprehension (PRCA-24). The ADIS-IV is a structured interview designed to assess for current clinical levels of anxiety, and to permit differential diagnosis among the anxiety disorders according to DSM-IV criteria (Brown, Di Nardo,
& Barlow, 1994). Participants had to achieve a diagnosis of Social Anxiety Disorder -- Public Speaking Subtype on the ADIS-IV. The PRCA-24 is the questionnaire most widely used to measure communication apprehension (McCroskey, 1982). This instrument is composed of twenty-four statements concerning feelings about communicating with others. Participants rated their level of agreement with each statement using a 5-point scale. There are four subscales assessing speaking in groups, speaking in meetings, public speaking, and dyadic communication. Participants must have also obtained a total score of at least 55 and a score of at least 18 on the public speaking subscale of the PRCA-24. These screenings were conducted in the Anxiety Disorders Lab by the co-principal investigator and other trained research assistants. Individuals who did not qualify were given a list of agencies they could contact if they were concerned that they need treatment or intervention services (Appendix F).

Profile of Mood States (POMS), pre-exposure. Prior to experimental sessions, participants in each group were asked to fill out the POMS adjective checklist (McNair, Lorr, & Droppleman, 1992). This took approximately 5 minutes. The POMS is a commonly used measure of psychological distress. The POMS yields 6 subscales, Tension, Depression, Anxiety, Vigor, Fatigue, and Confusion. In addition, a score for Total Mood Disturbance can be calculated. The measure was normed on several populations, including college students. It can be used to assess a person's subjective mood "in the past week", "right now", or in a time frame specified by the assessor. For the purpose of this study, participants were asked to refer to their current mood ("right now") at the time of completing the form. The measure is comprised of 65 adjectives describing mood-related states, which are rated on a Lickert Scale from 1- not at all to 5-
extremely. This measure assisted the experimenters in risk protection for participants inasmuch as it revealed the dominant mood at termination of the experiment and thus permitted appropriate precautions to be implemented where warranted.

Assignment to experimental condition. Participants were randomly assigned to one of the five experimental conditions. Ten participants were assigned to each condition. Based on the previous studies by Rubin et al. (in press) and Hu et al. (1992) this number appeared to be sufficient for detecting a statistically significant difference. The specific conditions are outlined below as Independent Variables.

Instrumentation and Dependent Variables

Facial electro-myography (f-EMG) is a valence-specific measure of affect assessing the electrical activity of the spontaneous or reflexive movements of specific facial muscles (Rotteveel, de Groot, Geutkens & Phaf, 2001). These researchers noted a strong correlation between these physiological measures and the individual’s subjective emotional state. It is able to detect minimal differences in specific muscle activity even in absence of an overtly visible expression. Facial EMG measures of the musculus zygomaticus for smiling and the musculus corrugator supercilii for frowning have been useful in the measurement of valenced states (Rotteveel et al., 2001).

Facial EMG for negative emotions was recorded via small electrode pads placed near participants’ inner left eyebrow. Facial EMG for positive emotions were recorded via small electrode placed between participants’ lower right cheek and mouth area. Facial EMG was substituted in this investigation for the heart rate measure used in the Hu et al. study (1992). It permitted a more discriminating measure of “positive” and “negative” emotion both pre-experimentally as an operational criterion of whether the non-target
imagery achieved its intended effects, and as a dependent measure of arousal once the experiment began. An observer was present for all sessions whose role was to monitor participants' faces for unusual movements such as coughing, sneezing, yawning, and scratching. Any such movements were recorded for the purpose of editing out unintended changes in the f-EMG readings.

SUDs is a widely used measure of current reactivity. It was used at the end of each period of target image confrontation. This consisted of 10 ratings throughout the course of the experiment.

*Independent Variables*

Participants were randomly assigned to one of the five experimental conditions. Ten participants were assigned to each condition for a total of 50 participants. The specific conditions are outlined below.

The public speaking scene participants were asked to imagine for 15s is described as the following:

*Imagine that you are about to present an important speech to a large audience in an auditorium. As you stand at the podium on the stage just before you begin speaking, you look out and see all of the faces in the audience looking at you, waiting for you to begin. As you stand there, you feel your legs are wobbly and your mouth and throat are dry.*

The target or public speaking scene was kept the same throughout all conditions and was presented in a human female voice via a computer recording. The same voice was used in all conditions. After the 15s had elapsed, participants were asked to rate their level of anxiety on the SUDs. This process continued for a total of 10 cycles. Between
episodes of imaging the target scene, participants were exposed to one of the following conditions while continuous physiological measures were taken (f-EMG as described).

In all experimental conditions the delivery of the auditory stimuli/instructions was automated and presented via computer. This ensured that the independent variables were presented in a consistent manner. Experimenters only needed to start the appropriate computer program for each condition. The female voice used was kept constant across all conditions. The computer also presented a “ding” sound to prompt the participant to give a SUDs rating.

**Negatively supplemented dosed exposure (NDE).** Participants assigned to this condition were first exposed to the target public speaking scenario for 15s, after which a SUDs rating was obtained. Following the initial SUDs rating, participants assigned to this condition were exposed to ten sentences containing negative connotations (Appendix G). For each sentence the participant was asked to imagine the situation described. Based on the f-EMG data, the sentence most aversive (as determined by corrugator activity) for each participant was selected for use in subsequent exposures. Participants then began the active treatment component of the condition. They were exposed to the selected negative sentence with 30s of imagined exposure, which was then followed by the public speaking scenario with 15s of imagined exposure. Following this, a SUDs rating was collected again. This negative sentence/public speaking/SUDs rating cycle continued for 10 iterations.

**Positively enhanced dosed exposure (PDE).** Participants assigned to this condition were first exposed to the target public speaking scenario for 15s, after which a SUDs rating was obtained. Following the initial SUDs rating, participants assigned to this
condition were exposed to ten sentences containing positive connotations (Appendix G). For each sentence the participant was asked to imagine the situation described. Based on the f-EMG data, the sentence most pleasant (as determined by elevated zygomaticus activity) for each participant was selected for use in subsequent exposures. Participants then began the active treatment component of the condition. They were exposed to the selected positive sentence with 30s of imagined exposure, which was then followed by the public speaking scenario with 15s of imagined exposure. Following this, a SUDs rating was collected again. This positive sentence/public speaking/SUDs rating cycle continued for 10 iterations.

_Mindfulness enhanced dosed exposure (MDE)._ Participants assigned to this condition were exposed to the target public speaking scenario for 15s, after which a SUDs rating was obtained. Participants then began the active treatment component of the condition. They were exposed to the following mindfulness instructions for 30s: "Just notice how you are feeling. Be aware of your bodily sensations. Do not try to judge, evaluate, or change how you are feeling, just attend to your sensations. Just accept them as reactions, nothing more." Participants then heard the public speaking scenario with 15s of imagined exposure. Following this, a SUDs rating was collected again. This mindfulness instruction/public speaking/SUDs rating cycle continued for 10 iterations.

_Dosed-only exposure (DE)._ In this condition, participants did not hear any of the positive, negative, or mindfulness sentences. Participants were asked to imagine the target public speaking scene for 15s. After the 15s has elapsed, participants were asked to rate their level of anxiety on the SUDs rating scale. During the next 30s, the participants were not asked to imagine any of the positive, negative, or mindfulness sentences. After
the 30s has elapsed, participants were asked to imagine the target scene again for 15s. This cycle continued for a total of 10 iterations.

**Prolonged exposure (PE).** In this condition, participants did not hear any of the positive, negative, or mindfulness sentences. Instead, participants were exposed to the target public speaking scene for 15s followed by a SUDs rating. This cycle of public speaking scene/SUDs rating continued for 10 iterations, all occurring consecutively within a 2.5 minute period. This period of time is also the total amount of time that participants in the four other conditions were asked to imagine the speech scene. Participants were then asked to rate their level of anxiety on the SUDs rating scale.

**Post Exposure Session**

Following the administration of the independent variable, participants were given a POMS rating scale (McNair, Lorr, & Droppleman, 1992). Comparison of the pre and post test ratings on the POMS indicated whether or not subjects experienced a change in mood state following exposure to the different sentences, and the nature of that change.

In addition, participants were also asked to fill out a post exposure questionnaire aimed at assessing perceived levels of distress during the intervention, the extent to which participants were able to imagine the sentences presented, and social validity. There were two versions of this questionnaire; one for participants in the Prolonged Exposure and Dosed Only conditions (Appendix H) and one for participants in the Positive, Negative, or Mindfulness conditions (Appendix I).

**Extended Exposure**

Five participants from each condition were invited to continue participating in the study. For these participants the experimental condition was continued until the public
speaking anxiety extinguished. Extinction was considered complete when the participant obtained SUDs ratings of 2 or lower for 3 consecutive data points. If extinction could not be achieved, participants were thanked for their participation and dismissed after the 100th iteration.

*Interobserver Agreement (IOA)*

IOA was collected for 100% of sessions. IOA was assessed by having two separate observers independently record the SUDs ratings verbalized by participants. In addition, two separate observers viewed the f-EMG data from between SUDs ratings and recorded the specific segments that should be calculated and reported as well as edited out due to unusual responses due to coughing, sneezing, etc. IOA was calculated using point-by-point agreement ([agreements / agreements + disagreements] x 100).

*Independent Variable Integrity (IVI)*

IVI was collected for 100% of sessions. Experimenters unobtrusively observed the experimental equipment to ensure that the computer was playing the auditory stimuli in the prescribed fashion. Any observations of equipment failure would have immediately been recorded and corrected.

*Design and Analysis*

An analysis of covariance through linear regression on SUDs ratings were used followed by appropriate post hoc comparisons to evaluate the source of systematic variance. Similar analyses were conducted for measures of corrugator and zygomaticus activity. Corrugator and zygomaticus activity was reported from between SUDs ratings and for a 5s sample immediately following the target public speaking scene. Correlation coefficients were computed to measure the relation between corrugator or zygomaticus
activity with SUDs ratings. For extended exposure sessions, the amount of time to extinction (for those who achieved extinction), and the number who did not achieve extinction for each group were reported. Approval by Western Michigan University's Human Subjects Institutional Review Board (HSIRB) had been obtained prior to any data collection (see Appendix J).
RESULTS

Figure 1 displays the average SUDs ratings for each group across trials. Table 1 shows the source table for the results of the ANCOVA through linear regression based on average SUDs ratings. The obtained differences were statistically significant ($F = 5.39, p = 0.001$). Tukey post hoc comparisons evaluated the source of variance (adjusted $p$ value of .05). The DE condition produced significantly higher SUDs ratings than the PE condition. The MDE condition produced significantly lower SUDs ratings than the DE condition. No other statistically significant differences were found.

![Figure 1. Average SUDs Ratings Across Trials.](image)
Table 1

Source Table for Analysis of Covariance: Average SUDs Ratings

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.T.</td>
<td>3.5908</td>
<td>4</td>
<td>0.8977</td>
<td>5.39</td>
<td>0.001</td>
</tr>
<tr>
<td>ResW</td>
<td>7.3328</td>
<td>44</td>
<td>0.1667</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ResT</td>
<td>10.9236</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 displays the source table for the results of the ANCOVA through linear regression based on average SUDs ratings for the final three trials. The obtained differences were statistically significant ($F = 30.43, p = 0.000$). Tukey pairwise comparisons revealed that the average ratings for the PE condition were higher than the PDE, NDE, and MDE conditions at a $p$ value of 0.05. It was also revealed that the average ratings for the DE condition were higher than the PDE, NDE, and MDE conditions at a $p$ value of 0.05. No other statistically significant differences were found.

Table 2

Source Table for Analysis of Covariance: Average SUDs Ratings for Final Three Trials

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.T.</td>
<td>3.48000</td>
<td>4</td>
<td>0.87000</td>
<td>30.43</td>
<td>0.000</td>
</tr>
<tr>
<td>ResW</td>
<td>0.25733</td>
<td>9</td>
<td>0.02859</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ResT</td>
<td>3.73733</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows the Pearson correlations between SUDs ratings and physiological measures. The correlation between SUDs ratings and zygomaticus activity was
The correlation between SUDs ratings and corrugator activity was not statistically significant.

Table 3

Pearson Correlation between SUDs Ratings and Physiological Measures

<table>
<thead>
<tr>
<th>SUDS Correlated with:</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zygomaticus activity</td>
<td>-0.335</td>
<td>0.018</td>
</tr>
<tr>
<td>Corrugator activity</td>
<td>0.123</td>
<td>0.397</td>
</tr>
</tbody>
</table>

Figure 2 displays the average zygomaticus activity for each group across trials. Table 4 shows the source table for the results of the ANCOVA through linear regression based on average zygomaticus activity. The obtained differences were statistically significant \((F = 24.02, p = 0.000)\). Tukey pairwise comparisons revealed significantly higher zygomaticus activity for the MDE condition compared to all other conditions (adjusted \(p\) value of .05). The PDE condition was also significantly higher than the DE condition and PE condition. The PE condition was significantly lower than the NDE condition. No other statistically significant differences were found.
Figure 2. Average Zygomaticus Activity Across Trials.

Table 4

Source Table for Analysis of Covariance: Zygomaticus Activity

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.T.</td>
<td>0.55148</td>
<td>4</td>
<td>0.13787</td>
<td>24.02</td>
<td>0.000</td>
</tr>
<tr>
<td>ResW</td>
<td>0.25256</td>
<td>44</td>
<td>0.00574</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ResT</td>
<td>0.80404</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3 displays the average zygomaticus activity for 5s samples immediately following exposure to the target scene for each group across trials. Table 5 shows the source table for the results of the ANCOVA through linear regression based on average zygomaticus activity for 5s samples. The obtained differences were statistically significant ($F = 22.16, p = 0.000$). Tukey pairwise comparisons revealed that the PDE
and MDE conditions were significantly higher than the NDE, DE, and PE conditions at the .05 level. No other statistically significant differences were found.

Figure 3. Average Zygomaticus Activity Across Trials (5s Samples).

Table 5

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.T.</td>
<td>0.286938</td>
<td>4</td>
<td>0.071734</td>
<td>22.16</td>
<td>0.000</td>
</tr>
<tr>
<td>ResW</td>
<td>0.142416</td>
<td>44</td>
<td>0.003237</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ResT</td>
<td>0.429354</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4 displays the average corrugator activity for each group across trials.

Table 6 shows the source table for the results of the ANCOVA through linear regression based on average corrugator activity. The obtained differences were statistically significant ($F=19.37, p = 0.000$). Tukey pairwise comparisons revealed that the NDE
condition was significantly lower than all other conditions at the 0.05 level. No other statistically significant differences were found.

Figure 4. Average Corrugator Activity Across Trials.

Table 6

Source Table for Analysis of Covariance: Corrugator Activity

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.T.</td>
<td>72.084</td>
<td>4</td>
<td>18.021</td>
<td>19.37</td>
<td>0.000</td>
</tr>
<tr>
<td>ResW</td>
<td>40.930</td>
<td>44</td>
<td>0.930</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ResT</td>
<td>113.014</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5 displays the average corrugator activity for 5s samples immediately following exposure to the target scene for each group across trials. Table 7 shows the source table for the results of the ANCOVA through linear regression based on average
corrugator activity. The obtained differences were statistically significant ($F = 19.24, p = 0.000$). Tukey pairwise comparisons revealed that the NDE condition was significantly lower than all other conditions at the 0.05 level. The MDE condition was significantly lower than the PDE condition at the 0.05 level. The DE and MDE conditions were also significantly lower than the PE condition at the 0.05 level. No other statistically significant differences were found.

![Graph](image)

*Figure 5. Average Corrugator Activity Across Trials (5s Samples).*

| Source Table for Analysis of Covariance: Corrugator Activity for 5s Samples |
|-------------------|---|---|---|---|---|
| Source | $SS$ | $df$ | $MS$ | $F$ | $p$ |
| A.T. | 121.006 | 4 | 30.252 | 19.24 | 0.000 |
| Res$_{w}$ | 69.171 | 44 | 1.572 |  |  |
| Res$_{t}$ | 190.177 | 48 |  |  |  |
Figure 6 shows the percentage of participants who reached extinction in 10 trials or less for each condition. Figure 7 shows the percentage of participants who reached extinction in 25 trials or less for each condition. Note that since only half of individuals participated in extended exposure sessions that Figure 7 data is based on groups of 5 individuals rather than 10.

Figure 6. Percentage of Participants Who Reached Extinction in 10 Trials or Less.

Figure 7. Percentage of Participants Who Reached Extinction in 25 Trials or Less.
Figure 8 displays the number of trials it took to reach extinction for the participants who were exposed to extended exposure sessions. Two participants from the PDE condition and one participant from the DE condition terminated their participation between trials 50 and 70 prior to reaching extinction. As such, data for these participants is not included in Figure 8. A number of participants did not reach extinction and that data is represented by a trial number of 100. It is important to note that no participant reached extinction on the 100th trial.

![Figure 8. Number of Trials until Extinction: Extended Exposure Participants.](image)

As mentioned previously, participants were screened with the PRCA-24 and the ADIS. No statistically significant differences were found between groups on either of these measures. Participants also completed the POMS both pre and post exposure. With the exception of the depression sub-scale, there were no statistically significant differences on this measure. Table 8 shows the source table for the one factor ANOVA on gain scores for the depression sub-scale. The obtained differences were statistically significant ($F = 3.21, p = 0.021$). Tukey pairwise comparisons revealed significantly
greater reductions for the DE and MDE condition compared to the NDE condition at the 0.05 level. No other statistically significant differences were obtained.

Table 8

Source Table for Analysis of Variance: POMS - Depression Sub-Scale

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>331.32</td>
<td>4</td>
<td>82.83</td>
<td>3.21</td>
<td>0.021</td>
</tr>
<tr>
<td>Within</td>
<td>1162.30</td>
<td>45</td>
<td>25.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1493.62</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Participants completed a post-exposure questionnaire and with the exception of question 3, there were no statistically significant differences between groups. Question three asked, “If at the beginning of the experiment you knew as much about the experiment as you do now, how inclined would you have been in still participating?” Table 9 displays the ANOVA based on question 3. The obtained differences were statistically significant ($F = 4.20, p = 0.006$). Tukey pairwise comparisons revealed that participants in the MDE condition were significantly more likely to answer the question in the affirmative than the PE, PDE, and NDE conditions at the 0.05 level. No other statistically significant differences were obtained.
Table 9
Source Table for Analysis of Variance: Post-Exposure Questionnaire - Question 3

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>60.88</td>
<td>4</td>
<td>15.22</td>
<td>4.20</td>
<td>0.006</td>
</tr>
<tr>
<td>Within</td>
<td>163.20</td>
<td>45</td>
<td>3.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>224.08</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As indicated earlier, interobserver agreement and independent variable integrity were calculated. IOA was calculated using point-by-point agreement ([agreements / agreements + disagreements] x 100). IOA and IVI were both 100%.
DISCUSSION

As indicated by Figure 1 and Table 1, there were significant differences in SUDs ratings between groups. In general, the DE condition tended to generate the highest SUDs ratings, whereas the MDE condition tended to generate the lowest SUDs ratings. Overall, the MDE condition had the lowest discomfort ratings 60% of the time. Furthermore, during the final 7 trials, MDE had the lowest SUDs ratings 85.7% of the time. The fact that the MDE condition generated lower discomfort ratings more often during the latter half of the study highlights the importance of using a repeated measures design to evaluate therapeutic effectiveness as time progresses.

Another example of changes in effectiveness can be seen in the final three trials. As seen in Figure 1, the data paths begin to separate more clearly towards the end of the session. From a clinical perspective, treatment outcomes are of paramount importance. Table 2 illustrates the nature of these emerging differences between groups. There were no significant difference among the enhanced groups (PDE, NDE, MDE) and there were no significant differences among the non-enhanced groups (PE, DE) for the final three trials. However, there are significantly lower SUDs ratings for all of the enhanced groups compared to the non-enhanced groups. As such, it appears that adding supplemental stimuli to the intertrial interval improves final outcomes.

As indicated by Figures 2 - 3 and Tables 3 - 5, the zygomaticus activity is similar to the findings obtained on the SUDs ratings. There was a negative correlation between SUDs ratings and zygomaticus activity. This is not surprising given that higher scores with zygomaticus activity are used to indicate more pleasant emotional affect and lower SUDs ratings indicate a less distressed emotional affect. Overall, the enhanced groups
tended to produce higher zygomaticus activity with the MDE condition tending to be the most effective of the enhanced groups.

The interpretation of corrugator activity is less clear, as evidenced by Figures 4 - 5 and Tables 6 - 7. Corrugator activity did not correlate with SUDs ratings. However, with the exception of the NDE condition, the MDE condition tended to produce lower corrugator activity than the other conditions.

Given that corrugator activity is used to measure unpleasant affect, the significantly lower ratings seen with the NDE condition appears to be counterintuitive. One possible explanation for this unusual finding relates to the screening criteria employed in the present study. Careful measures were taken to ensure that participants achieved a diagnosis of public speaking phobia and the most negatively valenced sentence was chosen relative to the other sentences. However, it is possible that the negative sentence chosen did not generate sufficient levels of emotional reactions, even though it was considered negative relative to the other sentences. A similar possibility exists with the positive sentences. If participants met a pre-determined threshold, the PDE condition may have been more effective. Future research should establish minimum cut-off scores for emotional reactions in response to positive and negative sentences and screen participants according to this criteria.

Even though steps were not taken to ensure that positive and negative sentences were eliciting a predetermined threshold for emotional reaction, there were still significant improvements with the PDE and NDE conditions with regards to SUDs ratings (Table 2). These improvements cannot be accounted for by simple exposure
alone, as evidenced by the significant differences between the dosed exposure only and
dosed exposure with enhancements conditions (PDE, NDE, and MDE).

One possible explanation for the effects of the PDE and NDE groups is that the
supplemental stimuli functioned as distractors. Such distraction may reduce feelings of
discomfort, thus lowering reported SUDs ratings. This may help explain the
counterintuitive results obtained with the NDE condition in that the negative sentences
may not have been generating negative emotions but instead served as a distraction from
the target imagery.

There were a number of discrepancies between the current study and the pilot
study (Rubin et al., in press) conducted in preparation for this study (see Appendix K for
pilot study data). In the pilot study, the PDE and DE conditions produced lower SUDs
ratings than the PE and NDE conditions for all trials, including the final three trials. This
is in contrast to the current study where there were no differences between DE and PE
conditions, no differences between the PDE and NDE conditions, significant differences
between the PDE and DE conditions, and significant differences between the PE and
NDE conditions for the final three trials. One possible explanation for this discrepancy
relates to stricter screening procedures for the present study. In order to be included in the
present study, participants had to achieve a total score of 55 on the PRCA-24 and a score
of at least 18 on the public speaking sub-scale. In addition, participants were screened
with the ADIS and had to achieve a diagnosis of social phobia - public speaking subtype.
If these criteria had been in place for the pilot study, 23 out of 40 participants would have
been excluded on the basis of the ADIS and 6 out of 40 would have been excluded on the
basis of the PRCA-24. As such, the current study may be more representative of a truly
phobic population than the pilot study. For example, it is possible that supplemental stimuli, regardless of their positive or negative nature, are more likely to serve as sources of distraction for truly phobic individuals than for non-phobic individuals. This might be due to a phobic population having enhanced motivation to escape and the subsequent likelihood to engage in safety behaviors.

Another possible explanation relates to sampling error, in that either the current study or the pilot study did not find a sample representative of the population. Future researchers may wish to incorporate larger sample sizes to reduce the risk of this possibility. Future researchers should also expose more participants to extended exposure sessions so that more information can be gained regarding the duration of time until extinction is reached.

Overall, the MDE condition appears to be the most effective condition, as supported by physiological and self-report measures. Distractions may potentially reduce discomfort (as possibly evidenced by the PDE and NDE data), but mindfulness procedures may reduce discomfort while also maintaining contact with the aversive stimuli. This possibility may explain the tendency for the MDE condition to outperform the other groups. Furthermore, as seen with Figures 6-7, the MDE condition had more participants reach extinction in less time relative to the other conditions. As Table 8 indicates, the MDE condition was the only condition to generate significant differences on the question that asked participants how inclined they would be to participate if they had known about the procedures in advance, with MDE participants being more likely to answer in the affirmative. This finding may have implications for reducing attrition in therapeutic settings.
Enhanced dosed exposure (with mindfulness in particular) may represent an important treatment advancement, but without the degree of aversive arousal generated by traditional treatments and may also be more acceptable to clients unwilling to experience traditional treatments. Furthermore, the lessened aversive arousal may reduce the likelihood that clients will engage in safety behaviors (i.e., when clients feel less threatened, there is a reduced motivation to escape). Future research should examine the most effective ways of implementing these procedures as well as continue to elucidate mechanisms of action.
REFERENCES


Appendix A

Recruitment Flier
RESEARCH PARTICIPANTS WANTED

You may be eligible to participate in a psychological experiment that involves imagining giving a speech and studies physiological responding

If you are:

- afraid to speak in public
- 18 and older
- healthy with no current medical or psychological disorders
- free of any heart problems

Duration: One, 1-hour session that includes screening, experiment, and post-test. Select participants will be invited for extended participation, if willing.

Extra credit for participation: If your course instructor permits, you may receive extra credit.

If interested: Please contact Sophie at 387-4332 or 352-6922 to schedule an appointment.
Appendix B

Classroom Recruitment Script
Hello. My name is (your name), and I am a research assistant in the Anxiety Disorders Lab at Western Michigan University. I’d like to tell you about a project for which we are currently seeking healthy volunteers ages of 18 and older that are afraid of public speaking.

The project is intended to study the pattern of physiological arousal in response to various positive and negative images as well as imagining yourself giving a speech. If you are interested and eligible to participate in this project, you will be presented with various sentences while small movements in the muscles of your face are monitored. You will also be asked to fill out a questionnaire about mood and about the sentences you were read. Your participation will consist of one screening and testing session, which will take approximately one hour. Some participants will be invited for extended participation if willing and interested. If your course instructor permits, you may receive extra credit for participation.

If you are interested in knowing more details, please call the Anxiety Disorders Lab at 387-4332 and leave a message for Sophie or call Sophie’s cell phone. There are also fliers posted on various notice boards, and here is a memo with some contact details if you are interested in participating.

The following will be printed on a 3x3 inch paper and left in the classroom for interested individuals to take:

Investigator: Sophie
Anxiety Disorders Lab
Tel: 387-4332
Project: The Comparative Efficacy of Dosed, Enhanced Dosed, Prolonged Exposure, and Mindfulness in the Reduction of Public Speaking Phobia
Appendix C

Phone Scheduling Script
Phone Scheduling Script

Hello, is ________ available? When the potential participant comes to the phone, say:
Hi, is this ________? If the answer is yes, continue below. If the potential participant is
not available, do not leave a message.

Hello my name is (your name) and I’m calling regarding the research study in the anxiety
disorders lab about which you had called and left a message. I am calling to give you a
little information about the study, to ask you a couple of preliminary questions, and to
schedule a meeting to review the consent document. If you would like to participate, you
will be asked to sign the consent document and then a testing appointment will be
scheduled.

First, to be eligible to participate in this study, you have to be at least 18 and healthy (free
of diagnosed medical or psychological conditions), and not like to speak in public. Do
you fit all of those requirements?
If yes, continue below.
If no, say:
Thank you for your interest in this study. But since you are not 18 or older/ have a
current psychological/ psychiatric/ medical diagnosis for which you are currently
receiving treatment/or don’t mind speaking in public you are not eligible to
participate in this study.

This study is designed to look at physiological responses such as movements in facial
muscles that occur when a person imagines various positive and negative images, as well
as imagining giving a speech. The purpose of the study is to measure autonomic
responses associated with public speaking among speech phobic individuals—not to treat
those with speech phobias. Therefore, if you decide to participate, electrodes will be
placed on your left cheek and above your eyebrow. This will not hurt. You will also be
asked to answer some questions about your age, health, and any substances you currently
use. One thing to keep in mind is that following the screening, you may be told that you
are not eligible to participate. The entire screening and testing session will take
approximately one hour. Are you still interested in participating?
If yes, say:
I would like you to come to the Anxiety Disorders Lab for a 10-minute meeting to give
you more details about the study, so that you can decide whether or not you want to
participate.

Which of these dates and times would be convenient for you to come in?
Give prospective subject a list of available times and schedule appointment.
Thank you for your interest in the study. I will see you on (date) at (time) at the Anxiety Disorder Lab. That is, room 2523 in suite 2505 on the second floor of Wood Hall. Make sure that prospective subject knows where this is.
Appendix D

Screening Questionnaire
Screening Questionnaire

Instructions:
Please read the following statements carefully. If you answer “Yes” to any of the statements, please inform the researcher that you wish to exclude yourself from participation in this study. Please remember that you do not need to inform the researcher as to the specific reason/statement upon which you are excluding yourself.

1. Age: I am younger than 18.

2. There has been a period of time in my life when I had strange/unusual experiences such as:
   a. Seeing or hearing things that other people didn’t notice.
   b. Hearing voices or conversations when no one was around.
   c. Seeing visions that no one else saw.
   d. Had the feeling that something odd was going on around me, that people were trying to test me, or antagonize or hurt me, so that I felt I had to be on guard constantly.

3. I have a current diagnosis of a medical or psychological disorder.

4. I am currently taking medications.

5. I have had a cardiac event, heart problems, an irregular heartbeat, and/or wear a pacemaker.

6. I have used at least one of the following substances in the past 48 hours:

Brand/Generic names

<table>
<thead>
<tr>
<th>Brand/Generic names</th>
<th>Brand/Generic names</th>
<th>Brand/Generic names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bufotenine</td>
<td>Marijuana,</td>
<td>Percodan</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Marinol,</td>
<td>Peyote</td>
</tr>
<tr>
<td>Codeine</td>
<td>MDMA</td>
<td>Phencyclidine: PCP</td>
</tr>
<tr>
<td>Darvon</td>
<td>Methadone</td>
<td>Phencyclidine Hydrochloride,</td>
</tr>
<tr>
<td>Demerol</td>
<td>Meperidine</td>
<td>Phenyl Cyclohexyl Piperidine</td>
</tr>
<tr>
<td>Dilaudid</td>
<td>Morphine</td>
<td>Psilocybin: Magic Mushrooms</td>
</tr>
<tr>
<td>Dolophine</td>
<td>Numorphan</td>
<td>Talwin</td>
</tr>
<tr>
<td>Dranabinol</td>
<td>Heroin</td>
<td>Thai Stick</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>Lysergic acid diethylamide: LSD</td>
<td>Opium</td>
</tr>
<tr>
<td>Hash Oil, Hashish,</td>
<td>Oxycodone</td>
<td>Raw Opium</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>Oxymorphone</td>
<td>Sernylan</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td></td>
<td>Vicodin</td>
</tr>
</tbody>
</table>
### Street Names

<table>
<thead>
<tr>
<th>“A”</th>
<th>LSD</th>
<th>Shrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid</td>
<td>M and M’s</td>
<td>Smack</td>
</tr>
<tr>
<td>Angel Dust</td>
<td>Magic Mushrooms</td>
<td>Trips</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Marijuana</td>
<td>Weed</td>
</tr>
<tr>
<td>Dope</td>
<td>Mescaline</td>
<td>X</td>
</tr>
<tr>
<td>E</td>
<td>PCP</td>
<td>XTC</td>
</tr>
<tr>
<td>Ecstasy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

Consent Form
Western Michigan University
Department of Psychology
Informed Consent to Participate in Research

Principal Investigators: R. Wayne Fuqua, Ph.D. & C. R Spates, Ph.D.
Student Investigator: Sophie Rubin M.A.

You have been invited to participate in a research project entitled “The Comparative Efficacy of Dosed, Enhanced Dosed, Prolonged Exposure, and Mindfulness in the Reduction of Public Speaking Phobia.” This research is intended to study the pattern of physiological arousal in response to imagining various positive and negative images, as well as imagining giving a public speech.

You will be asked to attend a one and a half hour screening, testing and post-test session with a researcher for this project. You will be asked to meet the researcher at the Anxiety Disorders Laboratory at Room 2523, Suite 2505, Wood Hall. First the researcher will review this informed consent document with you. Next, you will be asked to fill out a screening questionnaire. Then, if you qualify for participation in the study, you will be escorted to either a testing room in suite 2505 or the Clinical Studies Laboratory where you will be hooked up to equipment that records small movements in the muscles of your face, and asked to imagine a series of scenarios. You will also be asked to fill out the Profile of Mood States two times: before and after the testing period. These will take approximately 10 minutes each.

The screening questionnaire will require you to provide some general information about yourself, such as age. You will also be asked to exclude yourself based on a list of medicinal or recreational substances you currently use. Then you will be administered the Profile of Mood States (POMS), which is a checklist questionnaire that assesses your current mood.

Before you begin imagining giving a public speech, you will be required to wear electrodes. In order to measure facial muscle movements, two small electrodes will be placed near your inner eyebrow and in between the lower cheek and mouth area, after those areas have been cleansed with an alcohol swab. Then, you will be asked to sit in a room and listen to sentences describing scenarios that you will then imagine.
Next, you will be escorted back to the Anxiety Disorders Laboratory where you will be administered the POMS for a second time.

You may be invited to continue your participation for a longer period of time. This will be voluntary and you are under no obligation to participate. Extended participation will involve the same conditions as the rest of the experiment.

Other studies that have used a similar method have not reported any adverse effects to participants. However, as in all research, there may be unforeseen risks to the participant.

If an accidental injury occurs, appropriate emergency measures will be taken. It is also possible that some individuals may experience some discomfort as a result of imagining the negative images or imagining giving a public speech. However, no compensation or treatment will be made available to you except as otherwise specified in this consent form. In the event that you may be upset by the content of the interview or the various scenarios you were asked to imagine, you will be provided with referral for counseling at the Psychology Clinic, which you may use if you feel that you require assistance. You will be responsible for the cost of therapy if you choose to pursue it.

There are no direct benefits to you as a result of participation in this study. However, your participation will help us gather information regarding the manner in which the body responds to various imagined scenarios and public speaking scenes, and this information may be helpful in formulating new treatments for psychological disorders.

You may receive extra credit if your course instructor allows it. You will receive a piece of paper signed by one of the researchers verifying your participation that you may give to your instructor.

All of the information collected from you is confidential. That means that your name will not appear on any papers on which this information is recorded. All documents in which your data will appear will have a code number instead of your name. The researcher will keep a separate master list with the names of participants and the corresponding code numbers. The master list will be kept for the duration of the study, and will be destroyed after the data from that project is analyzed. A signed consent document will also be retained for at least three years in a locked file in the principal investigator’s office. You will be given a copy of this consent document for your records.

You may refuse to participate or quit at any time during the study without prejudice or penalty. If you have any questions or concerns about this study, you may contact either Dr. Wayne Fuqua or Dr. C. R. Spates at 387-4332 or Sophie Rubin at 352-6922. You may also contact the Chair of Human Subjects Institutional Review Board at 269-387-8293 or the vice president for research at 269-387-8298 with any concerns that you have.
This consent document has been approved for use for one year by the Human Subjects Institutional Review Board as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is more than one year old.

Your signature below indicates that you have read and/or had explained to you the purpose and requirements of the study and that you agree to participate.

________________________________________________________________________  __________
Signature                                           Date

Consent obtained by: ___________________________  _______________
              Initials of researcher      Date
Appendix F

Script for Participants Who Do Not Qualify and List of Agencies
If you would like to explore treatment or intervention services, below is a list of agencies you can contact.

Family & Children Services (269) 344-0202

Psychology Clinic at Western Michigan University (269) 387-8302

The Center For Counseling and Psychological Services at Western Michigan University (269) 387-5105

The WMU Counseling Center (269) 387-1850
Appendix G

Positive and Negative Sentences
Positive imagery:
1. “You are taking a vacation with a friend to a place you have been before but they are experiencing for the first time and you enjoy showing them the sites and scenes”
2. “You just heard the news that you were accepted into the college of your choice and now sharing that news with someone close to you”
3. “You just found out that you have just received a prestigious award from the university for excellent performance in the previous semester in a class that you really enjoy”
4. “You just won a $1000 from lottery tickets and you are now at your favorite store spending the money”
5. “Your professor returns a paper to you in which you received a 100%”
6. “Someone you’re attracted to comments on how beautiful/handsome you are”
7. “Getting to meet one of your favorite musicians backstage at a concert”
8. “Spending time with your favorite pet”
9. “Receiving your college diploma”
10. “Sitting back relaxing and watching your favorite TV show”

Negative imagery:
1. “You have just learned that you failed a major test in a class that you thought you had done very well in up to the point of that test.”
2. “You are talking to a professor and he refuses to tell you the criterion by which he judged a paper you turned in and on which you received a failing grade”
3. “You just walked in on your boyfriend/girlfriend kissing someone and you thought you were the only romantic involvement in his/her life”
4. “You are in a class and your grade is contingent on group work and none of the other group members are contributing”
5. “You just walked out to the parking lot and your car has been stolen”
6. “You were just fired from a job in which you rely upon for income”
7. “You just received a phone call that someone close to you is very sick and in the hospital”
8. “You just came home and found your window open and your pet is missing”
9. “You just came home and found your door open and your computer stolen”
10. “You are stuck on the side of the road with a flat tire and no cell phone in an area known for its high crime rate”
Appendix H

Post Experiment Questionnaire (Prolonged and Dosed Only)
Participant #: __________
Condition: __________

We would like you to indicate how upsetting you found the procedures that you just received. This is not a judgment about the researchers, but rather a judgment of the actual procedures used.

1. Overall, how intrusive did you find the whole procedure?

1 2 3 4 5 6 7 8 9
not at all somewhat intrusive very intrusive

2. Overall, how exhausting did you find the whole procedure?

1 2 3 4 5 6 7 8 9
not at all somewhat exhausting very exhausting

3. If at the beginning of the experiment you knew as much about the experiment as you do now, how inclined would you have been in still participating?

1 2 3 4 5 6 7 8 9
not at all somewhat inclined very inclined

4. If actual treatment were to include similar procedures, how likely would you be to attend treatment?

1 2 3 4 5 6 7 8 9
not at all somewhat likely very likely

5. How likely are you to recommend this type of procedure to someone with similar problems?

1 2 3 4 5 6 7 8 9
not at all somewhat likely very likely

6. How likely are you to discourage a friend from participating in this procedure?

1 2 3 4 5 6 7 8 9
not at all somewhat likely very likely

7. Overall, to what extent were you able to imagine the public speaking scene presented?

1 2 3 4 5 6 7 8 9
not at all somewhat completely

(PE, ITI)
Appendix I

Post Experiment Questionnaire (Negative, Positive, and Mindfulness)
We would like you to indicate how upsetting you found the procedures that you just received. This is not a judgment about the researchers, but rather a judgment of the actual procedures used.

1. Overall, how intrusive did you find the whole procedure?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat intrusive  very intrusive

2. Overall, how exhausting did you find the whole procedure?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat exhausting  very exhausting

3. If at the beginning of the experiment you knew as much about the experiment as you do now, how inclined would you have been in still participating?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat inclined  very inclined

4. If actual treatment were to include similar procedures, how likely would you be to attend treatment?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat likely  very likely

5. How likely are you to recommend this type of procedure to someone with similar problems?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat likely  very likely

6. How likely are you to discourage a friend from participating in this procedure?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat likely  very likely

7. Overall, to what extent were you able to imagine the public speaking scene presented?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat  completely

8. Overall, to what extent were you able to imagine the alternative sentences (sentences that did not pertain to giving a public speech)?
   1 2 3 4 5 6 7 8 9
   not at all  somewhat  completely

(P, N, M)
Appendix J

HSIRB Research Approval Letter
Date: January 23, 2008

To: C. Richard Spates, Principal Investigator
    R. Wayne Fuqua, Co-Principal Investigator
    Sophie Rubin, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number: 07-09-14

This letter will serve as confirmation that your research project entitled "The Comparative Efficacy of Dosed, Enhanced Dosed, Prolonged Exposure, and Mindfulness in the Treatment of Public Speaking Phobia" has been approved under the full category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: October 17, 2008
Appendix K

Pilot Study Data
SUDS Ratings

![Graph showing SUDS Ratings over iterations]

- Positive
- Negative
- Prolonged
- Dosed Only