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**AN EXAMINATION OF THE MOTIVATIONAL EFFECT OF ANXIETY ON
PERSUASIVE MESSAGE PROCESSING**

By

Sarah Katherine Foregger

A THESIS

**Submitted to
Michigan State University
in partial fulfillment of the requirements
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ABSTRACT

AN EXAMINATION OF THE MOTIVATIONAL EFFECT OF ANXIETY ON PERSUASIVE MESSAGE PROCESSING

By

Sarah Katherine Foregger

This study examines the effect of anxiety on type of persuasive message processing route. It was predicted that increased levels of anxiety would relate to increased systematic processing. In turn, increased systematic processing was predicted to be related to increased memory performance. Fifty-eight students from communication courses at a large Midwestern university participated voluntarily; they read a persuasive message and in order to determine systematic processing, listed their thoughts about, and completed a memory measure for the message. Their anxiety levels were assessed during different points of the study using the state portion of Spielberger's STAI. Results from this study show that anxiety did not relate significantly to systematic processing. The Pearson correlation between anxiety and systematic thoughts was negative, and non-significant, $r = -.176$, $p = .187$. It was also postulated that as systematic thoughts increased, so too would memory performance as measured by "hits." The Pearson correlation coefficient between hits and systematic thoughts was both negative and non-significant, $r = -.119$, n.s. Although non-significant, results indicate that since anxiety does not function in this study as the Negative State Relief Model suggests, it deserves further study in relation to message processing routes, as well as consideration as to whether it is a negative or positive state.

DEDICATION PAGE

This thesis is dedicated to my parents, Mary P. and Joseph H. Foregger, who instilled in me the value of education and learning, and for whom I continue on this path.

I also remember Oliver, who I never made it home for.

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INTRODUCTION

Many studies have examined the impact of negative and positive affect on the persuasive message-processing route used in the Elaboration Likelihood Model (ELM) or the Heuristic-Systematic Model (HSM). However, in regard to anxiety and processing routes, extensive work has yet to be done. From some previous findings, it would seem that those who are anxious should have diminished cognitive capacity for new information processing as the basic cognitive symptoms of anxiety include difficulty concentrating, narrowed attention, and distorted reasoning (Perez-Lopez & Woody, 2001), which imply impaired cognitive processing. Findings in mood research, however, suggest the opposite - that those in negative moods, such as feeling sad, angry, or guilty (Mitchell, 2000; 2001), tend to process messages more carefully and systematically compared to their positive mood counterparts, who tend to rely on heuristic cues (Bless, Mackie, & Schwarz, 1992; Mackie & Worth, 1989, 1991; Schwarz & Bless, 1991; Wells, 1999). Findings also indicate that negative mood states prompt systematic processing and positive mood states prompt heuristic processing (Mackie & Worth, 1989, 1991; Schwartz & Bless, 1991). As anxiety is a negative affect (Russell & Pratt, 1980; Wells, 1999), it seems contrary to the information presented on cognitive symptoms of anxiety to find that those in an anxious state are more likely to process systematically than those in a happy or joyful mood. As such, a test of the way in which anxiety functions within the tenets of the HSM is necessary.

A variety of research in the area of information processing has touched on the function of anxiety in areas such as message recall, bias, attention, retention, and persuasion (Ruiz-Caballero & Bermudez, 1997; Weary & Edwards, 1994; Wells, 1999).

However, research needs to be done on the effects of anxiety in regard to the predictions of choice of message processing route suggested by the dual process persuasion models of the ELM and the HSM. Therefore, this paper examines how anxiety may effect information processing of persuasive messages. The HSM is used to determine if anxious individuals are more likely to process messages through a systematic route.

Taking the findings on affect and persuasive message processing route into consideration, this paper proposes that anxiety serves as a motivation to process systematically using the rationale from Cialdini's Negative State Relief Model (NSRM) (1973). Cialdini's NSRM is used as an explanation to explain why those who are anxious may cognitively process messages systematically despite research findings that anxiety should impair cognitive functions and ability. The proportion of the persuasive message recalled correctly by anxious respondents as well as the number of systematic thoughts created after exposure to the message will be measured and correlated with anxiety scores. Within the literature review, dual process models of persuasion, the ELM and the HSM will be outlined, previous research regarding affect and persuasion will be reviewed, a brief description of anxiety will be presented and the NSRM will be explained. Finally, the relationship between anxiety, systematic processing in dual-processing models, and the propositions of the NSRM will be discussed.

The main proposition here is that anxiety, as a negative affect serves to motivate individuals to attend to and process messages through a systematic route, based on the predictions of the NSRM. As such, those high in anxiety should be significantly more apt to process positive feeling persuasive messages through systematic routes and elaborate on those messages than their less anxious counterparts.

Anxiety

Anxiety is an unpleasant emotional state characterized by symptoms of muscle tension, worry, restlessness, and uneasiness that often require cognitive effort and energy to manage (Wells, 1999). In past research, anxiety and fear have been used interchangeably, when in reality they are two separate concepts (Eysenck, 1997; Goodwin, 1986). According to Goodwin (1986), fear is an emotion with an identified danger, whereas in anxiety the source of distress is unknown, with individuals feeling a comparatively unjustifiable intensity of emotion.

While the term “anxiety” has come to encompass a vast array of physical and mental symptoms and spans across situations, anxiety remains one of the main reasons people seek psychological help (Oei, Moylan, & Evans, 1991). The prominence of anxiety among members of our society warrants delving into the potential implications for it to affect information processing.

Despite its continued societal presence, during the past fifty years inconsistency among researchers regarding use of the term “anxiety” has made definition and research difficult. Many social scientists, including Spielberger (1966), Freud (1936), Goodwin (1986), Cattell (1962), Scheier (1962), Neimah (1981), and Eysenck (1997) have attempted to provide conceptual definitions of anxiety. Among the definitions of anxiety, a common thread does exist. Anxiety definitions, despite other differences, either focus directly upon, or contain, one or all three of the following aspects: a behavioral component of anxiety, a subjective component, and/or a physiological component. As such, the following definition of anxiety, which is a mix of previous definitional strengths, is presented: “anxiety is an unpleasant emotion with definite physical

sensations, linked with cognitive system functioning, involving a degree of heightened arousal and or disproportionate mental preparation for some unforeseen future threat or danger.”

Cattell (1962) and Scheier (1962) attempted to further quell confusion regarding the use of anxiety in research through analyses of previously used anxiety variables. They used factor analysis to determine that the roughly 800 variables indeed fell under a single general factor of anxiety, supporting the notion that anxiety is one concept. Cattell and Scheier both also found, however, that two distinct factors can be identified from the variables, and labeled them according to their properties, state anxiety and trait anxiety.

The difference between state anxiety, trait anxiety, and anxiety as a general term is an important, but frequently overlooked distinction in anxiety research. State anxiety is an unpleasant emotion that varies both over time and intensity whereas trait anxiety is an individual difference in anxiety proneness as a personality trait (Scheier, 1962).

Spielberger (1966, 1999) expanded upon Cattell and Scheier’s definitions and discoveries, developing the often-used State-Trait Anxiety Inventory (STAI), a scale for distinguishing between the two, and adding to the existing definitions. State anxiety, as defined by Spielberger (1999) is a “temporal cross-section in the emotional life of a person, consisting of subjective feelings of tension, apprehension, nervousness, worry, and activation (arousal) of the automatic nervous system.” Spielberger discusses trait anxiety in terms of being a relatively stable individual difference as was found in Cattell and Scheier’s definition, but in addition, includes, “a disposition to respond to such situations with more frequent and intense elevations in state anxiety.” The symptoms of anxiety remain the same in both state and trait anxious people, and should both affect

information processing. Additionally, the proposed definition appropriately encompasses anxiety as a general concept, yet can still contain state or trait anxiety.

For the purpose of this study, also it is important to note that anxiety should function as a negative mood state. Russell and Pratt (1980) sought to determine the affective adjectives connected with environmental perceptions and place them on dimensions based on their affective quality. From their research, they determined a two-dimensional affective quality space, with borders of unpleasant to pleasant and sleepy to arousing. Distress was found to be one of the eight primary meanings conceptualized, and was also found to be negatively valenced. Distinguished by adjectives such as “panicky,” “frenzied,” and “tense” and related to the notions of psychological stress, unpleasant, and arousing feeling; distressing affect quality appears extremely similar to the affect of anxiety. Given the previous descriptions of anxiety, the presented definitions, and Russell’s finding of distressing quality, it seems accurate to categorize anxiety as a negative mood state.

Anxious individuals may use the systematic processing of messages as a form of distraction from anxiety. Similar to Cialdini’s predictions in the NSRM, Schwartz and Bless (1991) postulate that a negative state indicates that an action to relieve the negative mood needs to occur and serves as a motivator for the assessment of their environment for potential ways to alleviate their negative state.

Negative State Relief Model (NSRM)

Robert Cialdini (1973) proposed in the NSRM that a negative mood produces a drive to alleviate negative feelings. Originally proposed as theory within the realm of helping and altruistic behavior, Cialdini found that people in a negative mood are

motivated by the mood itself to behave in a way that will realign their mood to a more positive or neutral point. NSRM postulated that people who felt bad upon watching another harmed would engage in a helping action to alleviate their own bad feeling, and the results of his study affirmed this belief. While the original model was created to explain altruism, Cialdini noted that the NSRM could be viewed in a broader sense, explaining actions that occur by those in a negative state as ways in which they are striving to reconcile their negative mood states (1973, 1976).

The negative mood state discussed in the NSRM can be conceptualized very broadly, thus it can contain any negative affect. Therefore according to the NSRM, anxious individuals should be more apt to scrutinize messages for a source of positive affect, because they are motivated to relieve their mood state and as such, search their environment for clues about how to do so. In the NSRM, the mood state functions as the motivator that causes increased attention and focus to environmental stimuli as both a means of distraction and also to determine if the message content would be useful in achieving the anxious subject's goal mood state of relief. From the NSRM it could be inferred that those in a negative mood are more likely to process systematically because they are motivated to act in some way to attempt to relieve their own mood state.

Elaboration Likelihood Model

Petty and Cacioppo's (1986) Elaboration Likelihood Model explains how receivers process persuasive messages. At its core, the ELM is founded on the assumption that people are "cognitive misers," and as such, choose to attend to messages and allocate resources based on their purpose for message attention and processing. In the model, a central and a peripheral route of message processing are proposed. The

central route is defined by effortful cognitions, requiring the receiver to process the incoming knowledge in terms of what may already be known, creating links and elaborating on information presented. In contrast, processing that occurs via the peripheral route relies more on simple heuristic cues given in the message or by the sender and conserves cognitive energy (Petty et al., 1994).

A receiver's tendency towards central or peripheral processing after receiving a message is often determined by two factors: whether they have the motivation to elaborate on the issue and whether they have the ability to elaborate on the issue. Studies have found that ability to elaborate on the issue is often influenced by the presence of distractions in the persuasive setting and the receiver's prior knowledge about the topic (Slater, 2000). Receiver's motivation has been found to be influenced by several elements, including personal need for cognition level and personal relevance of the topic to the receiver (Petty et al., 1994). Low levels of motivation or ability result in a greater likelihood of peripheral processing. The ELM allows for several processing goals, however, none of which contain emotional state relief as a potential motivator to process incoming messages. Similar to the ELM, the Heuristic-Systematic Model concerns receivers' message processing routes.

Heuristic-Systematic Model

The Heuristic-Systematic Model (HSM), like the ELM, is a dual process model with a systematic and heuristic route to persuasion. Receivers may process messages systematically, engaging in more analytical thought, elaboration, and judgment of messages; or they may process heuristically, directing focus to exigent message cues that trigger heuristics to decipher meaning and form attitudes, or they may combine the two,

as they are not seen as mutually exclusive in this model (Todorov et al., 2002). Similar to the ELM, the systematic route requires more cognitive effort, whereas the heuristic route does not.

The HSM and the ELM, dual process cognitive-response models of persuasion often treated in literature as nearly identical, are models that encourage a persuader to take into consideration the mental capacity of the receiver to process the given message. According to the HSM, “people engage in systematic processing of persuasive information only when they are sufficiently motivated...however, if they are not sufficiently motivated or do not have sufficient cognitive resources, they can engage in superficial or heuristic processing” (Todorov, Chaiken, & Henderson, 2002, p. 196). While either route or an additive effect of both routes can lead to attitude change, it is generally accepted that attitudes changed through careful elaboration and systematic analysis of the presented message are stronger than weaker attitudes formed through use of heuristic cues (Mitchell, 2000). As such, many persuaders aim to have their audience process systematically as a way of creating enduring attitudes.

The HSM, like the ELM, also identifies two qualifications, motivation and ability, that determine persuasive message processing route used by the receiver to process incoming messages. Motivation in the HSM is defined slightly differently than in the ELM, encompassing a qualitative and quantitative dimension. It is proposed that the quantitative assumption conceives motivation as a function of the discrepancy between the receiver’s actual confidence and desired confidence for a task. With more discrepancy in the message confidence level comes a greater propensity to engage in systematic processing. Three qualitative motivations for processing information have

been discovered. These qualitative motivations state that receivers may be internally motivated by accuracy, defense, or impression to process information via either a heuristic or systematic route or both (Todorov et al., 2002). If a receiver is sufficiently motivated and possesses the ability, messages will be processed via the systematic route, which, congruent with the central route in the ELM, produces attitudes more resistant to counterargument. What has yet to be studied in depth is whether a mood state can function as a motivating factor for message elaboration, specifically, whether anxiety, a negative state, could function within the ELM or HSM as a motivator for attention and elaboration.

Affect and Dual Process Models

The dual process models have important implications for attitude formation and persuasive argument judgment. As such, discovering the variables that may influence the choice between cognitive processing routes would be valuable knowledge in the field of persuasion. Receiver's mood states are one variable that have been studied to determine their possible influence on processing route. The affective state of the receiver is important to consider, because according to Nabi (2002), affect can stimulate careful information processing and can direct the depth or path of information processing.

Several studies have been conducted to determine the possible mediating effect of emotion on cognitive processing and persuasive messages (Bless et al., 1992; Bless, Schwarz, & Strack, 1990; Mackie & Worth, 1989, 1991; M. Mitchell, 2000, 2001; Petty et al., 1994; Schwarz & Bless, 1991). When presented with either strong or weak persuasive messages, the majority of studies conducted have found receivers in a positive mood to be less likely to elaborate on messages, less likely to process systematically, and

more likely to rely on heuristics for judgment (Bless et al., 1992; Bless et al., 1990; Mackie & Worth, 1989, 1991; Schwarz & Bless, 1991). In contrast, those in negative affective states were found to be more analytical, more likely to use logical reasoning when presented with a message, pay closer attention to the message as judged by message recall (Mackie & Worth, 1991) and be more apt to elaborate on messages as judged by message relevant thoughts (Bless et al., 1992; Schwarz & Bless, 1991). In addition, those in a negative state were found to have a narrowed focus on the message (Schwarz & Bless, 1991) as compared to those in a positive state, creating more message relevant connections, as well as processing the messages more systematically overall (Mackie & Worth, 1989, 1991; Schwarz & Bless, 1991). Mackie and Worth (1989) did find significant use of the systematic route by those in a negative affect state, however they also found that receivers in a positive state, if given longer amounts of processing time, were eventually able to elaborate more on the message.

Mood states have not been found to alter cognitive processing route preferences in all studies. Mitchell (2000, 2001) did not find a significant effect for positive mood versus negative mood regarding systematic or heuristic routes, however she did find that respondents in happy, sad, and angry mood states all processed the persuasive messages differently, indicating that different moods do in fact cause receivers to utilize different processing strategies.

Schwartz and Bless (1991) as well as Weary and Edwards (1994) have both postulated that a negative mood serves to motivate the receiver to assess the environment for cues alerting danger. This heightened sensitivity to emotional cues may cause receivers in a negative state to focus their attention on messages within their

environment. Anxious individuals already have a higher arousal level than their non-anxious counterparts and, according to Weary and Edwards (1994), are focused on environmental cues of impending negative events.

These varied findings in regard to message processing and mood in relation to the HSM model can best be explained if combined with action explanations found in the NSRM. Thus, this study postulated that the negative mood of anxiety is a motivational factor that leads to use of the systematic route of information processing.

Rationale

According to the NSRM, people are motivated by negative mood states to find relief. Perhaps this drive for emotional balance focuses the attention of the receiver on messages in the environment, allowing for more systematic processing. The proposal here, based on Cialdini's NSRM, is that the negative state of anxiety drives the receiver to attend to a message as it may contain potential relief from the negative state. As such, this drive caused by anxiety serves as a sufficient motivator for an individual to allocate cognitive resources toward careful information processing through systematic routes.

If positive affect decreases the probability of systematic processing, and those who are anxious are likely to process more systematically, anxiety as a negative affect must serve some other function if it allows for systematic processing. Thus, Cialdini's NSRM serves as explanation of the function of anxiety as a motivator in the persuasive message processing paths proposed by the HSM. As such, the following hypotheses are proposed:

Hypotheses

H1: As anxiety increases, individuals will be more apt to process information in messages systematically.

Given that systematic processing has been found to form cognitions that are longer lasting (Petty et al., 1994; Slater, 2002) the following hypothesis is also proposed:

H2: As systematic processing, as assessed through the thought listing task, increases so will “hit” rates on a recognition memory measure.

Method

Overview

In this study, participants were asked to report their anxiety levels using Spielberger’s State-Trait Anxiety Scale. In order to ensure variance on the independent variable, an anxiety induction was used and participants were selected at random for the anxiety induction group. They were then presented with a persuasive message to visit websites where clicking a button would either contribute to saving the rainforest or feeding animals at shelters. The messages were identical in length, inclusion of statistics, and information. Participants were then asked to complete a thought-listing measure, designed to assess systematic/heuristic thought processes; a recognition memory test, and completed the state portion of the STAI as a post-test measure of anxiety.

Sample

Fifty-eight students enrolled in undergraduate communication courses at a large Midwestern university participated in this study. Students received extra credit for their research participation.

Procedure

Participants were randomly selected to either receive the state anxiety induction or participate without the induction. A state anxiety induction was used to ensure that variance in anxiety would exist within the sample. To begin, both groups of participants completed Spielberger's State-Trait Anxiety Inventory (STAI), with the state portion given first. In the anxiety induction group, the lab room also included a video camera set-up, not included in the room for the control group. Participants who were selected to receive the anxiety induction were then given a brief "College Math Skills Test," and told it would be corrected while they read the persuasive message. Immediately after completion of the math test, the group took the state portion of the STAI as an induction check. Both the control and the induction group were given a positive feeling persuasive message, which encouraged them to visit websites where clicking a button would either contribute to saving the rainforest or feeding animals at shelters. Assignment of message topic was random across the control and induction groups. After reading the message, participants completed a thought listing survey and proceeded to the recognition test of memory, designed to determine the extent to which they recalled the positive feeling message. Finally, the state portion of the STAI was given to assess anxiety levels.

Induction

Six groups each with five subjects were randomly selected to participate in an anxiety induction designed to increase state anxiety levels. Research on previously used anxiety inductions led to the creation of the induction used in this study (Blanchette & Richards, 2003; Bright and Freedman, 1998; Hall & Crisp, 2003; Mogg, Kentish, & Bradley, 1993). Subjects selected to receive the induction entered the same laboratory room as used for the control subjects. In the corner of the room was a video camera,

which was not actually used to tape the sessions, but to create the perception of future evaluation by others and increase anxiety. Additionally, a brief math test entitled “College Math Skills Test” (Appendix A) was administered and subjects were told it would be corrected during their time in the lab. After completing the math test, anxiety levels were checked using the state portion of the STAI.

Measures

Anxiety Measure

Spielberger’s State-Trait Anxiety Inventory (STAI) was used to measure anxiety, for later assessment of unexpected differences in state and trait anxiety functions on recall. The STAI is one of the most commonly used inventories to assess anxiety and has been used cross-culturally and in a variety of situations. The reliability (α between .85 and .95) for the STAI has been found to be acceptable for internal consistency (Barnes, Harp, & Jung, 2002). The STAI has forty items, with twenty items comprising each the state and trait portions. “Anxiety absent” items are reverse scored and the twenty items on each scale are summed to compute the scale total. State and trait scale scores are then added to provide overall STAI score. It is advised that the state scale be given prior to the trait scale. Sample items from the state scale include “I feel frightened” and “I feel pleasant,” and sample items from the trait scale include “I wish I could be as happy as others seem to be,” and “I have disturbing thoughts.”

Positive Feeling Message

One of two positive feeling messages¹ were given to participants to read, both encouraging visiting a website where clicking a button supports a charitable cause, either saving the rainforest or giving food to animal shelters. Two messages were used to

eliminate the possibility of involvement with one topic affecting message processing and recall (see Appendix B). Mean anxiety scores for the animal ($M = 38.5$, $SD = 13.42$) and rainforest group ($M = 34.4$, $SD = 12.08$) were subjected to an independent-samples t-test. The results were non-significant, $t(56) = 1.24$, $p = .221$, n.s., indicating that no difference in anxiety level existed between the two groups. In order to determine if messages were perceived, in fact, as equally positive in nature, the means from the positive thought listing for the animal ($M = 3.64$, $SD = 2.3$) and rainforest group ($M = 3.14$, $SD = 2.34$) were subjected to an independent samples t-test. The results were non-significant, $t(56) = .812$, $p = .420$, n.s., indicating that the two messages generated an equal number of positive cognitions from subjects. Therefore message groups were collapsed for further analyses.

Thought Listing

Participants were asked to list thoughts they had when reading the message. This listing was not designed to prime participants into processing the message, but simply to elicit the relative number of relevant thoughts that participants had after reading the positive feeling message.

In this study, systematic processing is of concern. Systematic thoughts were coded as those directly related to information contained in the message (Smith, Morrison, Kopfman, & Ford, 1994). Other thoughts related to message topic but not contained in message information were coded as heuristic thoughts. Thoughts that were not related to the message, such as “I am hungry” or “I feel tired” were coded as irrelevant. Two coders coded all surveys and inter-coder reliabilities were calculated using Cohen’s

Kappa for systematic ($K = .648$), heuristic ($K = .600$) irrelevant ($K = .783$), and total thought ($K = .940$) coding. All inconsistencies were resolved between the coders.

Memory Measure

The most popular, and possibly also the most simplistic, way to describe memory is as a repository for information (Eysenck, 1977; Herrmann, 1996; Kleinmutz, 1966; Koriath & Goldsmith, 1996; Loftus & Loftus, 1976; Morris & Gruneberg, 1994). Part of information processing, memory encompasses the system of interaction between cognitive processing and environmental stimuli involving storage and recall of information. Memory is operationalized here as recognition of the positive feeling message statements. Message recall was determined through scores on the message recognition test (Appendix C).

All participants received a memory measure upon completion of the thought listing. The memory measure contained a list of 10 randomly ordered statements regarding either the rainforest or animal website. Five of the statements had information that appeared in the message, the other five contained information not presented originally in the message. Participants were asked to assess whether each statement appeared in the persuasive message they had just read. The instructions indicated that some statements may not have appeared in the persuasive message. Thus, for respondents in both conditions, five items could serve as “hits” (message statements correctly identified as part of the original message) whereas the other five items could serve as “false alarms” (new items incorrectly identified as part of the original message).

To further understand possible relationships in the data, Shapiro’s A'^2 and B'^3 statistics (Shapiro, 1994) were computed as measures of individual respondent sensitivity

and criterion bias, respectively. Briefly, A' is used for calculating sensitivity, an individual's accuracy in recognizing something that they have seen before. While there is no set range for A', the larger A', the more sensitive the respondent is considered. B' measures criterion bias, which can be considered a measure of a subject's vigilance and prioritization in identification tasks. B' can range from +1 to -1, with a score of 0 indicating that the subject's criterion is equally placed between the false alarm and hit distribution. Higher scores indicate a subject's greater concern for minimizing false alarms at the cost of getting fewer hits. A score of -1 demonstrates the opposite – that the subject was more concerned with maximizing hits than minimizing false alarms.

Results

Induction Check

The initial measures of state anxiety for both groups were submitted to an independent samples t-test. The mean initial state score for the anxiety induction group ($M = 38.65$, $SD = 12.64$) was not significantly greater than the mean state score for the control group ($M = 34.62$, $SD = 13.00$), $t(56) = -1.19$, n.s., demonstrating no difference in control and induction groups' anxiety levels pre-induction, however the video camera was present in the room for the anxiety induction group. Additionally, both the control and induction groups' initial state scale scores were submitted to single-sample t-tests. The two t-tests show that the mean initial state score ($M = 34.62$) and the mean initial induction score ($M = 38.65$) were not significantly greater than the normed mean for state anxiety of 35.45, $t(28) = -.34$, n.s.; and $t(28) = 1.37$, n.s. respectively. This indicates that neither the control group nor the induction group were more anxious than should be expected initially.

In order to determine the effectiveness of the anxiety induction on state anxiety levels the state STAI scores for the induction group pre and post-induction were submitted to a matched pairs t-test. Respondents' scores on the initial state scale ($M = 38.65$, $SD = 12.64$) were not significantly greater than scores on the state scale after completing the math test ($M = 38.58$, $SD = 13.23$, $t(28) = .066$, n.s.), indicating that the induction failed to raise anxiety levels significantly. These results indicate that the anxiety inductions of the math test did not significantly increase state anxiety in the induction group.

To ascertain if post-induction scores were greater than the control groups' state scores, mean post-induction state scores ($M = 38.58$, $SD = 13.23$) and the mean control groups' initial state scores ($M = 34.62$, $SD = 13.0$) were subjected to an independent samples t-test. Results from this test were non-significant, $t(56) = -1.15$, .255, n.s., however, group means were in the predicted direction. Since the expected difference between groups was not significant, the established normed means for the state portion of the STAI were used to split participants into high, moderate, and low levels of anxiety according to their scores. Any score one standard deviation above the normed mean was considered to be high ($n = 15$), any score one standard deviation below the normed mean was considered low ($n = 16$), and scores falling around the mean were considered moderate ($n = 27$). Thus, high low, and medium state anxiety distinctions were used for further analysis.

STAI

Normed mean scores exist for both state and trait anxiety and are as follows: for state anxiety the normed mean is 35.45, $SD = 10.5$; for trait anxiety, the normed mean is

34.8 (SD = 9.22). The ranges for this study were within what would be expected from previous literature.

Confirmatory Factor Analysis was run on the state, trait, and full STAI. For the full STAI, the two factor solution was found to be acceptable, with alpha reliabilities of .926 for the trait factor and .958 for the state factor. Root Mean Square Error was calculated for the two-factor solution and was an acceptable .0985. Internal consistency was acceptable, the residual matrix did not have errors greater than expected. Chi-square global test of fit was consistent with the two-factor solution, as it was statistically significant when tested for a flat correlation matrix, $\chi^2 = 615.5$, $p < .00$.

Cronbach Alpha reliabilities were within the parameters previously found for the STAI and can be considered very good. Reliability for the initial state scale, anxiety induction second state scale, and the final state scale ranged from $\alpha = .95-.96$.

Cronbach's Alpha for the trait scale score was $\alpha = .93$. As the state scale was used for most analyses, Confirmatory Factor Analysis conducted on the state portion of the STAI determined if all items were loading to one factor. Results from the CFA revealed that indeed, all items on the state scale loaded to one factor, with an average in-cluster correlation of .530 and a .958 standard score alpha.

Hypothesis One

Hypothesis one predicted that higher anxiety levels should correlate with an increase in systematic processing. The Pearson correlation between anxiety and systematic thoughts was found to be negative, but non-significant, $r(58) = -.176$, $p = .187$. A ratio of systematic to total thoughts for each respondent was then computed. Results from Pearson correlations between state anxiety (using the control groups' initial

scores and the induction groups' post-induction scores) and the ratio of systematic to total thoughts again displayed the opposite of hypothesis one's prediction. A non-significant correlation was also found between these variables, $r(58) = -.209$, $p = .115$, n.s..

ANOVA was used post hoc to assess possible differences in systematic processing according to the levels of anxiety previously mentioned. Group means on the dependent variables of thought ratio and systematic thoughts were contrasted. Contrast procedures indicated that the high anxiety group was significantly lower in the number of systematic thoughts produced than the moderate or low anxiety group, $t(55) = 2.5$, $p < .016$. Additionally, the high anxiety group was significantly lower in their ratio of systematic to total thoughts than the moderate or low group, $t(55) = 2.86$, $p < .009$. Therefore the data does not support hypothesis one, and further, indicates a relationship opposite to the predicted relationship between anxiety level and cognitive performance. Means, standard deviations, and ranges for the three anxiety groups can be seen in Table 1.

Hypothesis Two

Hypothesis two postulated that as systematic thoughts increased, so too would memory performance as measured by "hits." The Pearson correlation coefficient between hits and systematic thoughts was calculated and found to be both negative and nonsignificant, $r(58) = -.119$, n.s. The A' and B' statistics calculated for all subjects were correlated with systematic thoughts. The correlations between sensitivity and systematic processing were non-significant ($r(58) = .057$, $p = .628$). Similarly, the correlations between criterion bias and systematic thoughts were non-significant ($r(58) = -.015$, $p = .91$). Thus, hypothesis two fails to receive support from these data.

Table 1

Means, Standard Deviations, and Ranges for all Variables

Anxiety level	Mean			Standard deviation			Range		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
State anxiety score	22.43	34.85	54.86	2.25	6.12	6.09	20-26	27-45	46-70
Thought Ratio: Relevant to Total	.89	.83	.68	.18	.23	.21	.5-1.00	.25-1.00	.17-1.00
Systematic Thoughts	1.31	1.33	.73	1.07	1.20	.59	0-3.00	0-5.00	0-2.00
Hits	.64	.69	.75	.23	.22	.18	.20-1.00	.20-1.00	.40-1.00
False alarms	.18	.15	.16	.14	.14	.17	0-.40	0-.60	0-.60
Sensitivity (A')	.81	.84	.84	.12	.14	.19	.67-.95	.50-1.0	.25-.95
Criterion Bias (B')	.19	.29	.28	.71	.59	.70	-1.00-1.00	-1.00-1.00	-1.00-1.00

Discussion

The Effect of Anxiety on Systematic Processing

The results of this study fail to demonstrate that anxiety functions as a motivational state to process positive feeling information as postulated by the NSRM. High anxiety, working as a motivator, was predicted to increase systematic processing and memory for positive feeling messages, as one cognitive symptom of anxiety is narrowed attention. As the literature made a strong case for highly anxious individuals to be on heightened alert regarding their environment, perhaps messages in a laboratory setting are not the focus of their supposed narrowed attention. It may be that anxious subjects would be better able to recall details of the laboratory itself and not the study. This could be assessed in a future research. The possibility also exists that anxiety is not a negative mood state, as originally thought. While previous research has not tested the functions of anxiety in the HSM, positive mood has been tested extensively and results show a heuristic processing bias. Therefore, assuming anxiety to be the opposite of a positive mood, systematic processing was predicted to be the preferred pathway for information. Whether anxiety can be accurately categorized as a negative mood state is important to further understanding functioning within the HSM routes. Finally, it is possible that subject's ability to process systematically may have actually been impaired by anxiety. In fact, as previously mentioned, Perez, Lopez & Woody (2001) detailed symptoms of anxiety that implied impaired cognitive functioning, including difficulty concentrating, narrowed attention, and distorted reasoning. As expected differences in anxiety, memory, and processing were not found, post-hoc analysis was conducted to determine if behavioral intention was influenced by subject's memory performance.

Behavioral Intention and Memory Performance

The dual process models imply that attitudes formed through high elaboration processes, such as those thought to occur in systematic processing are more predictive of behavioral intentions (Petty, et.al., 1994; Slater, 2002). Therefore participant's sensitivity and criterion bias, both measures of memory functioning, were analyzed with the behavioral intention measure to determine if a relationship existed.

Sensitivity (A') and criterion bias (B') were submitted to separate independent samples t-tests, grouped by behavioral intention (see Table 2). Those who took the behavioral intention measure, a website address on a bookmark that was stapled to the experimental booklet, were significantly higher in both sensitivity ($M = .88$) and criterion bias ($M = .47$) than those who did not take the behavioral measure (sensitivity and criterion, respectively: $M = .79$, $M = .067$), $t(55) = 2.32$, $p < .03$; $t(55) = 2.48$, $p < .017$.

Table 2

Mean Table of Behavioral Intention, Criterion Bias, and Sensitivity

Behvaioral Intention	Mean		Standard deviation		Range	
	Yes	No	Yes	No	Yes	No
Sensitivity (A')	.88	.79	.09	.18	.67-.95	.25-1.00
Criterion Bias (B')	.47	.07	.62	.62	-1.00-1.00	-1.00-1.00

Further ad hoc analysis of the data revealed that there was a significant difference in message type, animal or rainforest message (see Table 3 for means and standard deviations), and sensitivity (A' statistic), $F(1) = 4.76, p < .035$, but no significant difference was found between message type and criterion bias (B'), $F(1) = .70, n.s.$ That sensitivity and criterion bias were important in determining behavioral intention and that significant differences existed in message type and sensitivity could imply that when information is presented in terms of a persuasive message, involvement with topic may assist in recollection of message information. In fact, Todorov (2002) in discussing the three motivations to process information in the HSM, mentions defense motivation, an important subset of involvement. Motivation to process influences processing route, and perhaps in turn behavioral intention. If messages tap into areas of involvement, subjects may process differently and recall more information. Again, this presents another opportunity for further research to understand the relationship between memory measures and behavioral intention in persuasive messaging.

Table 3

Mean Table of Message Type, Criterion Bias, and Sensitivity

Message Type	<i>Mean</i>		<i>Standard deviation</i>		<i>Range</i>	
	Animal	Rainforest	Animal	Rainforest	Animal	Rainforest
Sensitivity (A')	.80	.88	.18	.09	.25-.95	.67-1.00
Criterion Bias (B')	.19	.33	.58	.73	-1.00-1.00	-1.00-1.00

In the dual process models, motivation is not the only determinant of processing route. Ability also factors into a receiver's choice of route. In this study, it was thought anxious receivers would be motivated by their negative mood to relieve their mood state, and process more systematically, according to the tenets of the NSRM. Since this did not occur, it may be that processing ability of receivers who are anxious decreases. Future research should vary message difficulty among anxiety levels to probe the motivation and ability relationship in determination of message processing route.

Limitations

Finally, limitations of this study are discussed. In regard to the first hypothesis, one possibility could be that relevant thoughts were not the outcome that should have been measured with regard to systematic thoughts, and in fact hits should have possibly been the ultimate outcome of interest. When using ANOVA to contrast the high anxiety subjects ($M = .75$, $SD = .17$) with the low ($M = .64$, $SD = .23$) and moderate ($M = .70$, $SD = .21$) on hits, it can be seen that high anxiety subjects do, in fact, have higher hit rates, but they are not significantly higher than the other two groups.

In regard to participant ability and message difficulty, the messages were analyzed post hoc to determine readability statistics. Microsoft Word (2000) was used to calculate the Flesch Reading Ease (FRE) score and the Flesch-Kincaid Grade Level (FKGL) score, two measures of readability. The FRE has a range of 0-100, with higher numbers indicating easier text. An optimal FRE score for most audiences ranges from 60-70. The FKGL ranges from 1st-12th grades with 7th or 8th grade levels considered best for most audiences. The FRE scores for the animal and rainforest messages were 50.0 and 48.9, respectively. The FKGL scores for the animal and rainforest messages were

11.8 and 10.8, respectively. Both were outside of the range considered optimal for general consumption, and could be considered more difficult reading. Thus, message difficulty in this study serves as a limitation, as it could have hindered participant's ability to process messages. Future studies could address this issue.

Typical of much research conducted in the university setting, the sample size of 58 had a mean age of 21, all college students from the Midwest. The small sample size was a limitation of this study. Additionally, in a study concerned with information processing, using a college sample could possibly hinder ability to generalize from the data, as college students are theoretically, at least, well practiced in focusing their attention, and in the American education system, memorizing information for recall. Indeed the mean A' score ($M = .835$, $SD = .14$) for this sample was found to be significantly different from 0, using a one sample t-test, $t(57) = 42.7$, $p < .001$. This indicates that on the whole, subjects in this study were quite sensitive in their recognition of something they have previously seen. Additionally, subjects were cautious on the memory measure, as a one sample t-test using the mean B' statistic ($M = .26$, $SD = .64$) shows they were significantly concerned with minimizing false alarms, $t(56) = 3.03$, $p < .004$. These results are to be expected from a group of subjects who are experienced test-takers and familiar with performance assessment. Using a sample not as familiar with the concentration required during assessment under high state anxiety conditions should, as is the case here, hinder memory and systematic processing further. Furthermore, the sample size should be larger to increase effect sizes and variance in the distribution of many variables, although fairly equal group sizes were used for analysis.

To further understand the anxiety induction, measurement of other possible variables, such as past performance on math exams and overall unease at completing math tests should occur in future studies. In this study, there was no implication for subjects on their math test performance and evaluation. Perhaps presenting the induction task as having future implications for the participant would heighten anxiety and make the induction more successful. Additionally, the induction should be longer and more intense to heighten anxiety as much as possible. It may also be important to let more time pass between the induction and second measurement of anxiety in order for the induction to fully “sink in” with participants. In this induction, the camera was present in the room from the beginning of the study, eliminating the possible anxiety-heightening element of surprise. That participants were run in groups of five could have also reduced anxiety levels (Schachter, 1959). In the future, inductions should be run individually. Inducing anxiety is within itself, an area for future research.

Summation

In sum, this study found that anxiety and systematic thoughts about a positive feeling message were not significantly correlated as originally predicted, neither through correlation of raw systematic thoughts nor through a ratio of systematic to total thoughts. Additionally, contrasts of group means found that the high anxiety group was significantly lower in the number of systematic thoughts produced than the moderate or low anxiety group, $t(44.49) = 2.5, p < .016$, as well as in their ratio of systematic to total thoughts than the moderate or low group ($t(23.9) = 2.86, p < .009$) which is opposite the original hypothesized relationships. It was also found that systematic thought increase was not related to memory performance as measured by “hits,” or by the A’ or B’

statistics. Correlations between systematic thoughts, hits, A,' and B' statistics were all non-significant, showing that in these data, systematic processing was not related to memory performance, contrary to what was predicted in hypothesis two.

APPENDIX A

COLLEGE MATH SKILLS TEST

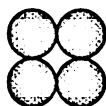
1. If the radius of a wheel is f feet, how many revolutions does the wheel make per mile? (1 mile = 5,280 feet)

- a. $5,280f$ b. $\frac{2,640}{\pi f}$ c. $5,280\pi f^2$
- d. $\frac{\pi f}{2,640}$ e. $\frac{\pi f^2}{5,280}$

2. Base RT of triangle RST is $\frac{4}{3}$ of altitude SV . If SV equals c , which of the following is an expression for the area of triangle RST ?

- a. $\frac{2c}{5}$ b. $\frac{2c^2}{3}$ c. $\frac{c^2}{2}$
- d. $\frac{4c^2}{5}$ e. $\frac{8c^2}{5}$

3. Four equal circles, each with a diameter of 1 ft. touch at four points as shown in the figure below. What is the area in square feet of the white interior portion?



- a. $1 - \frac{\pi}{4}$ b. $1 - \pi$ c. $1 - 4\pi$ d. π e. $\frac{\pi}{4}$

4. A line segment is drawn from point $(8, -2)$ to point $(4, 6)$. The coordinates of the midpoint of this line segment are:

- a. $(12, 4)$ b. $(12, 8)$ c. $(6, 4)$ d. $(6, 2)$ e. $(6, -2)$

APPENDIX B

PERSUASIVE MESSAGES

DIRECTIONS:

Please read the following message. When you are done reading, you may move on to the next page.

ANIMAL MESSAGE:

Over 10 million animals are put to death every year in the U.S. alone because they are unwanted, abandoned, or abused. Many millions more are neglected or treated cruelly. 27 million unwanted animals are given to shelters in the US every year. Last year, visitors' clicks at The Animal Rescue Site funded 23,968,850 bowls of food for animals in these shelters.

You can improve the lives of these animals for free -- the site's sponsors fund the purchase of a bowl of food to feed an animal awaiting adoption or living in an animal sanctuary. You can feel good knowing you have contributed to helping this cause through a simple click of your mouse. Depending on the speed of your modem, it might take you only a few seconds each day to help provide care and food for an abandoned pet or other animal by clicking the "Feed an Animal in Need" button. Each click on the purple "Feed an Animal in Need" button at The Animal Rescue Site provides a bowl of food for an animal at the world's largest pet adoption center, North Shore Animal League America, or at one of the Fund for Animals' world-renowned animal sanctuaries. The Animal Rescue Site relies on its passionate supporters. Click every day to help and encourage friends and family members to do so as well.

RAINFOREST MESSAGE :

Originally, 6 million square miles of tropical rainforest existed worldwide. As a result of deforestation, only 2.6 million square miles remain today. The race is on to save our rainforests and the incredible biodiversity they hold. A typical four square mile patch of rainforest contains up to 750 species of trees, 125 mammal species, 400 species of birds, and 150 types of butterflies. Last year, visitors' clicks at The Rainforest Site funded a total of 246,852,687 square feet of rainforest.

You can help to save rainforest land for free -- the site's sponsors fund preservation of rainforest land. You can feel good knowing you have contributed to helping this cause through a simple click of your mouse. Depending on the speed of your modem, it might take you only a few seconds each day to help preserve precious rainforest land by clicking on the "Save Our Rainforests" button. Each click on the green "Save Our Rainforests" button at The Save Our Rainforests Site helps preserve 11.4 square feet of rainforest land. Funds generated by your daily click go to the site's land trust partners: The Nature Conservancy and The Rainforest Conservation Fund. The Rainforest Site relies on its passionate supporters. Click every day to help and encourage friends and family members to do so as well.

APPENDIX C

MEMORY MEASURE

Below are statements regarding the message you just read about The Animal Site (The Rainforest Site). Please indicate which statements were presented in the message you read previously by placing an "X" on the line next to the appropriate statements. Some statements were in the message and some were not. Only mark an "X" for the ones you think were included in the message.

- _____ The Animal Site helps people adopt animals.
- _____ Ten million animals were put to death last year.
- _____ Clicking on the button is free.
- _____ The Site's button is purple.
- _____ Each click funds a bowl of food.
- _____ Each click helps adopt an animal.
- _____ 23 million bowls of food were given last year.
- _____ 27 million bowls of food were given last year.
- _____ Each click funds food at a local animal shelter.
- _____ 23 million animals were saved last year.

RAINFOREST MEMORY MEASURE ITEMS:

- _____ The Rainforest Site helps companies sell land.
- _____ 2.6 million acres of land exist today.
- _____ Clicking on the button is free.
- _____ The Site's button is green.
- _____ Each click funds the preservation of land.
- _____ Each click helps care for rainforest animals.
- _____ 11.4 square feet are saved with each click.
- _____ One acre is donated for each click.
- _____ Land is preserved by four government agencies.
- _____ The site's button is red.

Footnotes

¹In past research, whether a subject could distinguish weak from strong messages was used as an indicator of which message-processing route occurred (Mackie and Worth, 1989, 1991; Schwartz and Bless, 1991). Since the definition of “weak” and “strong” messages is not adequately fleshed out and falls prey to tautological reasoning (Mitchell, 2000, 2001), whether a subject can distinguish the two message types will not be used as a primary form of measurement to determine if systematic or heuristic processing occurred in this study.

²Formula for non-parametric measure of sensitivity (A'):

$$A' = 1 - \frac{1}{4} \left[\frac{p(FA)}{p(h)} + \frac{|1-p(h)|}{|1-p(FA)|} \right]$$

³Formula for non-parametric measure of criterion bias (B'):

$$B' = \frac{p(h)|1-p(h)|-p(FA)|1-p(FA)|}{p(h)|1-p(h)|+p(FA)|1-p(FA)|}$$

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