AFFECTIVE RESPONSE TO IMAGERY: DIFFERENCES BETWEEN FOCAL AND SOCIAL ANXIETY

By

JERI LOUISE FRITZ

Bachelor of Arts
University of Montana
Missoula, Montana
1984

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1985

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Thesis Approved:

Daniel W. McNeil, Ph.D.

Thesis Advisor

Robert J. Weber

Richard Dolker

William H. Ramb

Norman N. Durham

Dean of the Graduate College

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Abstract

This study examined differences in the processing of imagery among groups of highly anxious subjects. A large group (n = 1,483) of undergraduates was screened with questionnaires for social, snake, and dental anxiety. From this pool, three sex-balanced groups were selected. Each group contained 12 subjects with either: (a) high focal anxiety (i.e., dental or snake), (b) high social anxiety, or (c) both high focal and social anxieties. Subjects imagined various scenes (i.e., social anxiety, focal anxiety, physical action, and a calm, relaxed state). Significant imagery content effects were demonstrated. Anxiety scenes produced greater cardiac response than neutral or action scenes. Anxiety-relevant scripts were rated as more arousing, less pleasant, and produced less dominant feelings than non-anxiety scenes. Findings were discussed with regard to Lang's bioinformational theory of emotion.

Affective Response to Imagery: Differences between Focal and Social Anxiety

In recent years, researchers have explored differences in imagery processing among diagnostic groups within the anxiety disorders, as defined by the Diagnostic and Statistical Manual III-Revised (DSM-III-R; American Psychiatric Association, 1987). Simple phobia, social phobia, and panic disorder with agoraphobia are three classification groups that have been extensively studied (e.g., Cook, Melamed, Cuthbert, McNeil, & Lang, 1988). Individuals in these various diagnostic groups have been found to exhibit differences in general verbal report instruments reflecting anxiety and depression, and in visceral arousal to anxiety imagery. Specifically, Cook et al. (1988) reported that physiological reaction to phobic imagery is strongest, and is related to questionnaire measures of psychopathology and imagery ability, in simple phobia. The next strongest visceral response amplitudes were in social phobia; the agoraphobia diagnosis was associated with the least physiological reactivity to phobic imagery. Neither the social phobia nor the agoraphobia groups showed concordance between visceral response to phobic imagery and verbal report measures of anxiety.

A variety of studies have contrasted subjects with specific (or focal) anxieties (e.g., of snakes, spiders, or dentists) with socially anxious subjects, whose anxieties are manifested across a variety of social situations. In studies comparing public speaking anxiety to small animal anxiety, subject differences have been found in physiological data, but verbal reports to reactions of imagery scenes have been inconsistent within and across experiments (Lang, 1977; Lang, Levin, Miller, & Kozak, 1983; Lang, Melamed, & Hart, 1970).

Specifically, Lang et al. (1983) contrasted individuals anxious about small animals (snakes) with social performance (i.e., speech) anxious persons. Subjects with so-classified simple (focal) snake anxiety demonstrated distinct large amplitude visceral responses when imagining anxiety-relevant stimuli. Moreover, snake anxious subjects tended to manifest physiological patterns during imagery which were similar to reactions when anxious subjects either anticipate or actually confront an anxiety-provoking object. When actually performing a speech, the subjects in the social performance anxiety group showed significantly greater verbal reports of anxiety and arousal than the snake anxiety subjects, but both

groups exhibited similar increases in physiological measures.

In another study in which focal anxiety subjects were contrasted with social performance anxious subjects, the former group reported significantly higher vividness ratings to anxiety-relevant imagery scenes, and significantly higher ratings of arousal to both anxiety-relevant and anxiety-irrelevant scenes (Weerts & Lang, 1978). Social performance anxious subjects reported no differences in vividness ratings between anxiety-relevant and anxiety-irrelevant scenes. While both groups demonstrated increases in heart rate and skin conductance to anxiety-relevant scenes, the mean scores for anxiety-relevant scenes were higher in the focal anxiety group than for the social performance anxiety group.

Less consistent physiological patterns have been shown in socially anxious individuals across various contexts (e.g., in vivo exposure, imagery) of anxiety arousal (Lang et al., 1983). Socially anxious subjects appear less responsive to emotional imagery and seem to have larger discrepancies between reported arousal and actual physiological reactivity than persons with focal anxiety (Lang et al., 1970). Identifying socially anxious subjects on the basis of public speaking

anxiety may account for some of the discrepancies reported in the literature. Research by McNeil and Lewin (1986; 1990) seriously questions the assumption that speech anxious persons are broadly representative of social anxiety.

Anxiety Combinations

While several studies have examined individuals with either social or focal anxiety, few researchers have explored the area of anxiety combinations. One study examined focal (dental) and speech anxiety, and added a third subject group: subjects with both dental and speech anxiety (McNeil, Vrana, Melamed, Cuthbert, & Lang, 1990; McNeil, Vrana, Melamed, & Lang, 1985). Individuals with combinations of high and low dental and speech anxiety constituted the groups. Speech anxious individuals responded with increases in cardiac activity only to imagery of social situations. All subjects rated anxiety scenes that were relevant to their particular anxiety as more unpleasant and arousing. Dental anxious individuals, however, demonstrated heart rate increases on all anxiety and action-oriented scenes. Subjects with both speech and dental anxiety exhibited the highest level of physiological arousal. These results suggested possible additive effects in physiological reactivity

vis-a-vis the number of anxiety-provoking stimuli affecting a person.

Researchers (e.g., Bernstein & Knapp, 1981; Kraft & Al-Issa, 1965; Stevenson & Hain, 1967) have identified individuals with multiple simple phobias. There seem to be two types of multiple phobias. In the first group, subjects have many anxieties which are generalized from a specific set of stimuli around which activating cues are loosely organized. For example, Kraft and Al-Issa (1965) described a man who was involved in a highway accident. He developed phobias to motorcycles, sounds which approximated the squeal of brakes, and being near or on a roadway. In the second group, however, individuals seem to have several independent phobias (Bernstein & Knapp, 1981; Liberman & Smith, 1972; Van Hassett, Hersen, Bellack, Rosenblum, & Lamparski, 1979). Multiple phobias do not seem to be the result of generalization in this case, but seem to represent the existence of several distinct and separate anxieties (e.g., anxieties of blood, heights, and academic examinations).

One study attempted to identify the incidence of nongeneralized, multiple anxieties in a college population. Fritz, Ugarte, and McNeil (1986) defined individuals who scored within the top 10% of their

same-gender distribution on Fear Survey Schedule-III subscales as highly anxious. The subscales used were defined by Wolpe and Lang's (1964) face valid classifications of anxiety (i.e., tissue damage, social, small animals, classical). Approximately 10% of a large undergraduate population were found to be concurrently highly anxious in two or more content areas. The results of this study emphasize the importance of examining a population (i.e., persons with multiple anxieties) which has, until recently, been largely ignored, but may represent a substantial proportion of anxious individuals. Some researchers have furthered this area of study by attempting to develop a standard methodology to determine whether or not specific anxieties summate (Rachman & Lopatka, 1986a, 1986b).

Information Processing

Propositional network theory offers one explanation for the research findings already presented here. According to propositional theories, small, independent units of knowledge (i.e., propositions) are infinitely interconnected in a network pattern. For each individual, specific information is stored pertaining to context, semantic meaning and action. (For additional discussion regarding propositional

network theory, refer to Appendix A.) Different anxiety disorders may vary systematically with respect to the organization of the networks that underlie the psychopathology (Cook et al., 1988; Lang, 1985; Lang & Cuthbert, 1984).

For simple phobics, the anxiety network and its available information is thought to be a highly integrated memory representation that relates to the anxiety-provoking stimuli. Simple phobics typically have little contact with specific anxiety-provoking objects and/or situations; therefore, the anxiety network has little chance to be modified in the natural environment. Socially anxious individuals continually encounter social stimuli, so anxiety memories are modified on an ongoing basis. Consequently, the cues that activate the network are more varied and less coherent. In panic disorder with agoraphobia, the information in the anxiety network is much less specific. The stimuli which provide cues for agoraphobia are varied and vague, leading to a generalized anxiety response to a variety of seemingly unrelated stimuli (Lang, 1985).

Simple phobics seem to utilize avoidance to reduce anxiety from phobic stimuli, social phobics become hypervigilant of the environment, and individuals with

agoraphobia have a less context-bound response (Cook et al., 1988). Moreover, Turner, McCann, Beidel, and Mezzich (1986) reported that the anxieties of simple and social phobics, agoraphobics, generalized anxiety subjects, and obsessive-compulsive disorder clients were quantitatively different. Simple phobics reported the least number of anxieties on the Fear Survey Schedule-I, followed by social phobics, obsessive-compulsives, and agoraphobics. These latter results suggest that differences exist not only in information processing, but also in the content of and/or number of anxieties.

Due to differences in information processing and behavioral symptomatology of various anxieties, a continuum of anxiety disorders with respect to the degree of cognitive organization and reactivity to emotional stimuli has been proposed to exist. Simple phobia represents the highest level of organization and responsiveness, followed by social phobia, with agoraphobia at the other extreme (Lang, 1985; Lang & Cuthbert, 1984); other anxiety disorders are also proposed as falling along this continuum at various points.

Lang and Cuthbert (1984) expounded upon the concept of a continuum of anxiety disorders.

> The continuum is defined by the degree to which arousing, negatively valent responses (and perhaps also disruption of control) are linked associatively to coherent affect networks or, viewed from the other direction, the degree to which these affective response dispositions float in memory and are prompted by many stimuli, transferring their excitation to a great variety of other memory structures (Lang & Cuthbert, 1984, p. 386).

With respect to social phobic and agoraphobic individuals, the stimuli and settings which define and determine levels of distress are variable. Simple phobics, however, have a highly defined set of stimuli which evoke reactions. (For additional discussion of Lang's bioinformational theory of emotion as it relates to diagnostic groups, refer to Appendix A.)

Statement of the Problem

The present study was designed to examine imagery response differences among focal, social and social/focal anxious individuals. This experiment was a replication and extension of work conducted by McNeil et al. (1985, 1990). Focal anxiety subjects were

selected to represent the major categories of simple anxieties, chosen on the basis of reports of common anxieties (Agras, Sylvester, & Oliveau, 1969), and previous factor analytic research (Holmes, Rothstein, Stout, & Rosencrans, 1975; Landy & Gaupp, 1971; Meikle & Mitchell, 1974; Rubin, Katkin, Weiss, & Efran, 1968). The anxieties selected represent factors which repeatedly account for large percentages of variance in factor analytic research (Kaloupek, Peterson, & Lewis, 1981) and which correspond to Wolpe and Lang's (1969) face valid classifications of anxiety contents. Snake and dental anxiety were chosen to represent individuals who have simple (i.e., specific or focal) anxiety.

Social anxiety represents one of Wolpe and Lang's (1964) major categories of anxiety content. In this study, generally socially anxious individuals constituted a second group. DSM-III-R (1987) recognizes social phobia as separate and distinct from simple phobia. Several studies have provided evidence to support this distinction (e.g., Marks, 1987).

A third group of subjects with <u>both</u> social and focal anxieties was selected for comparison purposes. The nature of their underlying anxiety structure is as yet undetermined. These individuals may have both a coherent anxiety network organized around a specific

anxiety, as well as a less coherent network organized around social anxiety. The inclusion of this combination anxiety group is imperative in determining additive or interactive effects of various types of anxiety information that may be coded into memory in distinct ways.

An imagery assessment procedure which has been utilized frequently in anxiety research (e.g., Lang et al., 1980; McNeil et al., 1985, 1990) tested differences between groups. Cardiac data were measured before, during, and after imagery trials. Audiorecorded scripts served as imagery prompts. Several scene categories (i.e., neutral, action, social anxiety, and focal anxiety) were employed as stimuli. Script contents were designed to contain both stimulus and response propositions. Research has demonstrated the importance of stimulus information in evoking reactions (Lang et al., 1980), and response data to encourage somatovisceral involvement in imagery (Lang, 1985). With such imagery prompts, subjects can reliably demonstrate affective response, paralleling reaction achieved in actual involvement of stimuli. Individuals with strong coherent affective networks (i.e., focal anxiety) are likely to demonstrate imagery

activation which elicits increased physiological responses (e.g., more rapid heart rate).

Although nonclinical individuals were selected as subjects, researchers (e.g., Borkovec & Rachman, 1979; Kazdin, 1978) have emphasized the continuity between clinical patients and so-called "analogue" populations. Moreover, recent research (McNeil et al., 1990) has provided empirical demonstration of the similarity between highly anxious nonclinic undergraduates and clinic patients with anxiety disorders. There can be differences among clinic and nonclinic populations related to the intensity of anxiety, but neither the content nor the topography of expression of anxiety (e.g., physiological arousal, reports of distress, and avoidance) have been reliably demonstrated to be different between clinical and nonclinical individuals. Therefore, highly anxious, but nonclinical, individuals participated in this study.

Hypotheses

Verbal report. It was predicted that each group would obtain highest scores on their most anxiety-relevant instruments. Therefore, the focal group was expected to obtain highest scores on the SNAQ and DFS; higher scores on the SADS were predicted for the social group. (These instruments were used to select these

subjects.) Because the focal/social group consisted of subjects with combinations of anxieties, this group was expected to report high levels of both focal and social anxiety. Again, these differences would be primarily related to the method of subject selection. As public speaking appears to be a distinct, but important factor in social anxiety (McNeil & Lewin, 1986, 1990), it was anticipated that the focal/social and social groups would report levels of public speaking anxiety which would be higher than the focal group's scores. Regarding general measures of anxiety, the focal/social anxiety group was expected to report the highest levels of anxiety, followed by the social group and then the focal group. Additionally, the focal group was expected to manifest better self-reported imagery ability than the other groups.

Free recall. It was hypothesized that the focal subjects would demonstrate greatest recall of imagery script information, as their anxiety-provoking stimuli are distinct and well-defined. Social and focal/social anxiety subjects were predicted to recall less script information, due to a less defined network of anxiety cues.

Cardiac response. Due to the hypothesized extensive anxiety networking which contains

propositions regarding both social and focal stimuli, the focal/social group was expected to demonstrate a higher level of physiological reactivity to all anxiety scenes than either the social or focal anxiety groups. Heart rate for all groups was predicted to be greater for anxiety imagery scenes than action or neutral scenes.

Affective judgments. Anxiety-provoking scenes were predicted to be rated as less positive than neutral and action scenes. It was anticipated that subjects would rate anxiety-relevant scenes more unpleasant than nonanxiety-relevant scenes (e.g., socially anxious subjects would rate social scenes more negatively than snake scenes). Anxiety-evoking scenes were expected to produce more reports of arousal than nonanxious scenes. Subjects were also predicted to report highest levels of arousal to their anxiety-relevant scripts (e.g., focal subjects were anticipated to judge snake and dental scenes as more arousing than social scenes). Hypotheses concerning dominance were comparable to those pertaining to valence judgments, in that subjects were predicted to report feeling more in control during action and neutral scenes, and less in control during anxiety scenes. Groups were expected to report least control during their anxiety-relevant

scenes. It was expected that the focal anxiety group would report greater vividness in imagined anxiety scenes, relative to the other two groups, as their cognitive networks regarding anxiety-producing stimuli are presumed to be more coherent and accessible. Neutral scenes were expected to be rated as more vivid than other scenes.

Method

Subjects

Subjects were 36 undergraduate volunteers at Oklahoma State University who received extra class credit for their participation in this study. These subjects were selected from a pool (*n* = 1,483) of introductory psychology students who were screened with anxiety questionnaires. Subjects who scored high on reported anxieties on one or more of these questionnaires (i.e., top 15% of their same-gender distribution) were eligible for participation. Scores on questionnaires that were not relevant to participants' primary anxiety (or anxieties) varied randomly. The three groups, which were balanced by gender and number, were: (a) individuals with high levels of focal (dental or snake) anxiety, (b) individuals with high social anxiety, and (c) individuals with high levels of *both* social and a focal

anxiety. There were equal numbers of dental and snake anxious individuals in the focal anxiety and the focal/social anxiety groups. All subjects were Caucasian with the exception of one Black female. Participants' ages ranged from 18 to 37 years old. Mean ages of groups were as follows: focal anxiety group (M = 18.8, SD = 0.7), social anxiety group (M = 20.4, SD = 5.0), and focal/social anxieties group (M = 20.4, SD = 4.2). The ages of the groups did not differ ($F(2, 33) = .68$, $p > .10$). One individual was excluded from the study and replaced since it was reported that a cardiovascular abnormality was present.

Materials

Dental anxiety was assessed with the Dental Fear Survey (DFS; Kleinknecht, Klepac, & Alexander, 1973). Snake anxiety was evaluated with the Snake Fear Questionnaire (SNAQ; Lang, Melamed, & Hart, 1970). Frequently, in the past, socially anxious individuals have been identified through public speaking anxiety questionnaires (e.g., Weerts & Lang, 1978). However, recent research suggests that circumscribed speech anxious individuals represent a distinct subtype of social anxiety (McNeil & Lewin, 1986, 1990). To ensure identification of generalized social anxiety, the Social Anxiety & Distress Scale (SADS; Watson & Friend,

1969) was utilized. Subjects who participated in a laboratory session subsequent to the screening also completed the following verbal report instruments: a public speaking anxiety questionnaire, the Personal Report of Confidence as a Speaker (PRCS; Paul, 1966); the Fear Survey Schedule-III (FSS-III; Wolpe & Lang, 1964, 1969); and the Fenz-Epstein Anxiety Questionnaire (FEQ; Fenz & Epstein, 1965). The Questionnaire upon Mental Imagery (QMI; Sheehan, 1967; shortened version of Bett's 1909 Questionnaire upon Mental Imagery; reprinted in Richardson, 1969) was also included because it has been found that imagery ability, as an individual difference factor, can influence physiological response, in that good imagers are better able to produce physiological responsivity to prompted imagery than poor imagers (e.g., Miller, Levin, Kozak, Cook, McLean, & Lang, 1987).

Apparatus

Physiological data were collected on-line by an IBM PC/XT with a Scientific Solutions LabMaster interface board. This board includes a programmable clock and was used as a controller for automated laboratory procedures, such as the presentation of rating figures for recording subjects' affective judgments regarding imagery trials. Virtual Processing

Machine (VPM) software (Cook, Atkinson, & Lang, 1987) served to direct stimulus presentation and data acquisition. Physiological activity was monitored using computer-interfaced Coulbourn Instruments (CI) modules; a CI S75-01 High Gain Bioamplifier/Coupler was used for cardiac data. Lead I electrocardiagram (EKG) was obtained from standard Beckman 16mm silver-silver chloride electrodes attached to the ventral surface of the right and left forearms. A Schmitt trigger apparatus (CI Bipolar Comparator, S21-06, and a CI Retriggerable One Shot, S52-12) were used to detect cardiac R waves and then to signal the computer to record interbeat intervals.

The laboratory included a subject room and an adjacent control/equipment room. Prerecorded imagery scripts were presented using an audiocassette player and a small speaker in the subject room. Periodic observation of the subject was possible by a one-way mirror between rooms; an intercom system was also available for communication between experimenter and subject.

The subjects operated a potentiometer with their dominant hand to make ratings regarding the experience of each imagery script. Lang's (1980) computer graphic display of an abstract Self Assessment Mannequin (SAM)

was used to record affective judgments. Subjects assessed three dimensions, chosen on the basis of research on verbal report of emotion. Russell and Mehrabian (1974, 1977) found that verbal report of experience of emotion could be understood using three factors: Valence, Arousal, and Dominance. The three dimensions (rated on 0 to 20 point scales) were: Valence (i.e., happy-sad), Arousal (i.e., aroused-calm), and Dominance (i.e., in control-being controlled). Additionally, a rating of imagery vividness (vivid-not vivid) was included.

Procedure

Laboratory Session. Subjects who met specified criteria on screening instruments were invited to the laboratory to participate in an additional assessment procedure. Following an explanation of the general purpose of the study and the methodology employed, subjects signed a consent form. A tour of the laboratory followed. Then, questionnaire administration was conducted, including readministration of the three screening instruments.

After questionnaires, participants were seated in an overstuffed reclining chair in the subject room for an imagery assessment procedure in which physiological and verbal responses to eleven standard audio scripts

were recorded. Electrodes were attached, and the resulting signal was tested for adequacy. The Self Assessment Mannequin rating procedure (Lang, 1980) was demonstrated once and then practiced once by the subject. Rating figures were presented between imagery trials via a video monitor which faced the participant. The subject's chair was partially reclined, and the lights dimmed. Other than rating affective experiences following each imagery trial, subjects were instructed to keep their eyes closed. Audiotaped relaxation instructions were first presented to subjects. A three minute baseline was then conducted to assess the initial cardiac activity level. The eleven scripts were then presented.

Script contents. The first trial was of neutral content (i.e., waiting at a bus stop) and was used to habituate subjects to the imagery procedure; data from this trial were not analyzed. A total of five different content areas were represented in the scripts: (a) social anxiety, (b) dental (focal) anxiety, (c) snake (focal) anxiety, (d) action, and (e) neutral. All of the anxiety and action scripts contained physiologically-arousing response propositions. Two scenes pertained to social anxiety (i.e., experiencing disapproval and criticism from an

authority figure, presenting a speech). In order to assess focal anxieties, two scripts related to each specific anxiety. There were scripts for both dental anxiety (i.e., sitting in a dental chair experiencing a dental injection, anticipating a dental examination) and snake anxiety (i.e., spotting a snake swimming in front of a boat, seeing a snake while walking in an open field). Action scenes were also presented. These scripts contained response propositions, but lacked affective references (i.e., riding a bicycle, flying a kite). There were two additional neutral scripts that contained neither response propositions nor affective references (i.e., sitting in a lawn chair, sitting in a living room). All subjects were presented with all 11 scripts. The scripts are presented in Appendix B.

Order of script presentation. Initially, a neutral scene (i.e., waiting at a bus stop) was presented to the subject as a practice trial. Then, during the first of two blocks of five trials, one script from each of the five content areas was nonsystematically chosen for presentation in the order ABCDE. The remaining scripts from each content category were then presented in the order DCEBA in the second block of five trials to avoid consecutive presentation of two trials from the same category.

Action and neutral scenes were arranged as to avoid a grouping of anxiety scenes. Within the above specifications the order of presentation was nonsystematic, and unique for all subjects.

Imagery trial stages. Physiological data were collected over four stages: (a) 30 second "Baseline" preceding each script presentation, (b) 30-50 second "Read" period during which the script was presented (only the last 30 seconds of data from this period were collected to minimize variance due to differences in script length), (c) 30 second "Image" period in which subjects imagined the scene, and (d) 30 second "Recover" period in which individuals were instructed to stop imagining the scene and to relax. A one second 1000 Hz tone was presented immediately prior to the "Recovery" period to indicate to the subject to stop imaging, and to relax. At the end of the Recovery period, another similar tone sounded, to cue the subject to open his or her eyes. At this time, subjects evaluated their imagery experience using the SAM figures and vividness scale. Following the ratings, subjects were instructed to close their eyes and prepare for the next trial. Intertrial intervals randomly varied in duration, but were at least 10 seconds long. Subsequent to the imagery trials,

subjects were asked to freely recall information from each script, using a prepared form.

Results

Data Processing and Reduction

For every trial, histograms were constructed for cardiac interbeat intervals across each measurement period (i.e., Baseline, Read, Image, Recover). From each histogram, the median value was selected. Median cardiac periods were converted to beats-per-minute. Change scores were calculated for cardiac data by subtracting the Baseline value from the subsequent Read, Image, and Recover scores for each trial. This procedure reduced between-subjects variance due to initial physiological differences and changes over the course of imagery trials.

Data from the Read and Image periods were combined to simplify analysis. Recovery data were not analyzed, consistent with past research (Cook et al., 1988). Medians from each of the two scenes in each content area were averaged together for analyses. In the imagery free recall task, total number of scripts recalled and number of words reported in recollections constituted the dependent variables.

Statistical Analyses

Separate one-way univariate analyses of variance (ANOVAs) across the three groups were initially calculated for dependent measures. Significant ANOVAs were followed by Duncan Multiple Range Tests at the .05 criterion level to identify specific differences between groups. This process was employed for all dependent measures, including questionnaires, imagery ratings, cardiac data, and free recall data.

Verbal Report Instruments

Table 1 presents group data from questionnaires, along with the results from univariate ANOVAs and Duncan Multiple Range Tests. Selection of subjects on

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Insert Table 1 about here

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the basis of verbal report assessment measures was successful. Group means were highest on anxiety-relevant questionnaires; both focal and focal/social group scores on the DFS and SNAQ were significantly higher than the social subjects' scores. Scores on social anxiety measures (SADS, PRCS) were highest for the social and focal/social groups and differed significantly from the focal group. Hypotheses regarding general measures of anxiety were mostly

supported. On the FEQ-Insecurity and the FEQ-Arousal scales, the social anxiety group and the focal/social anxiety group had significantly higher scores than the focal anxiety group, but did not differ from each other. On the FSS-III, the focal and social anxiety groups had significantly lower scores than the focal/social anxiety group. Differences on the FEQ-Muscle Tension scale were not significant among groups. The hypothesis that focal anxiety subjects would report better imagery ability on the QMI than either the social or focal/social groups was not supported, as no differences were demonstrated among groups.

Free Recall Data

The hypothesis that individuals with one focal anxiety would recall more scenes and particular script words than the social and the focal/social groups was not supported (Total Scripts: $F(2, 33) = .14$, $p > .10$; Total Words recalled: $F(2, 33) = .41$, $p > .10$). Table 2 outlines group means for the free recall data.

Insert Table 2 about here

Baseline Physiology

An ANOVA on data from the initial three minute baseline period revealed no significant differences among groups ($F(2, 33) = .51$, $p > .10$) in heart rate. Means for the three groups were as follows: focal anxiety group ($M = 67.3$, $SD = 8.6$), social anxiety group ($M = 70.5$, $SD = 7.7$), and focal/social anxiety group ($M = 69.7$, $SD = 8.3$).

Cardiac Responsivity

A significant content effect was noted ($F(4, 132) = 6.06$, $p < .001$). Duncan's Tests indicated that two anxiety contents (i.e., social and snake) produced significantly more physiological arousal than either the action or neutral scripts. There were no differences in cardiac response among the anxiety-provoking scenes, nor were there significant differences in heart rate between the action and neutral scene contents. The dental scenes differed only from the neutral content. Figure 1 illustrates cardiac response (i.e., heart rate changes from baseline) to the five scene contents.

Insert Figure 1 about here

An analysis of variance revealed neither significant group by content interaction ($F(8, 132) = 1.35$, $p > .10$), nor group ($F(2, 33) = 1.55$, $p > .10$) effects.

Affective Judgments

Valence. Significant effects were produced from the group by content interaction ($F(8, 132) = 2.5$, $p < .01$) on ratings of valence. Duncans' Tests indicated that the social group rated the snake content more positively than did the focal group. Neutral and action scenes were rated more positively than the three anxiety contents. Of the anxiety-provoking contents, dental and social scenes were rated as significantly less pleasant than the snake scene content. Figure 2 illustrates group valence ratings for each content.

Insert Figure 2 about here

Arousal. The hypothesis regarding differences among ratings of scene contents was supported ($F(4, 132) = 89.01$, $p < .0001$). Anxiety scenes were rated as more arousing than the action and neutral scripts; the action content had a higher arousal rating than the neutral content. The group by content interaction was not significant ($F(8, 132) = 1.79$, $p > .10$). There were no significant differences in ratings of arousal among

the three groups ($F(2, 33) = .74$, $p > .10$). Figure 3 presents group arousal ratings.

Insert Figure 3 about here

Dominance. As with arousal judgments, differences among ratings of contents were significant ($F(4, 132) = 54.41$, $p < .0001$). Further examination with Duncans' tests demonstrated that subjects reported feeling more in control during the neutral and action scenes than during the anxiety-provoking scenes. Among the anxiety scenes, subjects reported highest dominance during the snake scenes, followed by social and dental scripts, the latter two differing significantly from the snake scenes. Group by content interaction effects were not found ($F(8, 132) = .58$, $p > .10$). Differences in reported dominance feelings among groups were not demonstrated ($F(2, 33) = .59$, $p > .10$). Figure 4 illustrates group dominance ratings for all contents.

Insert Figure 4 about here

Vividness. Vividness ratings differed significantly ($F(4, 132) = 5.42$, $p < .005$) with respect to content. Subjects rated dental and neutral scenes

as significantly more vivid than action, snake and social scenes. Figure 5 illustrates these findings. The hypothesis that the focal group would best be able to imagine anxiety-relevant scripts was not supported (Groups: $F(2, 33) = 1.83$, $p > .10$).

Insert Figure 5 about here

Discussion

The goal of this study was to examine possible variations in affective response among three groups of highly anxious subjects, within the context of Lang's (e.g., Lang, 1985) bioinformational theory of emotion. Based on previous research (McNeil et al., 1985, 1990), a possible additive nature of anxiety was suspected, in that individuals with two distinct anxieties were expected to react more strongly to imagery in both verbal reports and physiological reactivity than subjects with only one focal or social anxiety. These results were expected due to hypothesized differences in the extent and level of organization in cognitive networks underlying the subjects' anxieties. However, the data obtained did not demonstrate consistent significant differences among groups on either cardiac responsivity or affective judgments. Nevertheless,

these data replicated previous findings that subjects' cardiac response to anxiety-evoking imagery was greater than that to control imagery (e.g., Lang et al., 1980, 1983).

The lack of support for the major question was surprising in that the paradigm employed has been utilized frequently with success (e.g., Lang et al., 1983; McNeil et al., 1985, 1990). It may be that the more relaxed criteria (i.e., top 15% of the distribution) in this study may have identified less anxious subjects than found using more restrictive criteria (i.e., top 6% of the distribution) in previous research (McNeil et al., 1985, 1990). Other subject selection procedures were also examined. Initially, subjects were sought who reported high levels of anxiety (i.e., top 15%) in one area (e.g., dental) and low levels of anxiety (i.e., bottom 10%) in other examined areas (e.g., snake and social). Subject selection using this criterion was difficult for two reasons.

First, individuals who obtained the highest scores on verbal report measures, and who were within the top percentage of their same gender distribution, were excluded from the study, as these persons demonstrated a multiplicity of anxiety, with all questionnaire

scores elevated. In effect, the most anxious subjects, and potentially those most likely to exhibit strong physiological reactivity, were excluded from participation, as they violated selection criteria of significant (i.e., top 15% of the distribution) anxiety in only one or two of the three areas measured (i.e., dental, snake, social anxieties). As a result of the higher than expected levels of anxiety manifested across verbal report measures, the original criteria were altered, such that subjects were chosen who reported high levels of anxiety in one area, with the other scales allowed to vary randomly. Of the 36 participating subjects, 25 met the original selection criteria.

Secondly, the process of subject selection revealed that of the individuals who met criteria for participation, a small percentage later reported significant levels of anxiety to other measured stimuli on objective measures. For example, during the initial group screening, an individual might score highly on only one questionnaire (e.g., dental) and therefore, be identified as a dental subject. However, during the second administration of verbal report instruments prior to the experimental procedure, a high level of social anxiety, in addition to the original dental

anxiety, might be reported, thus creating a sample of anxious subjects who were actually more similar than distinct. There were five subjects exhibited this pattern.

Consequently, there was difficulty in locating individuals with distinct anxieties, and therefore, the groups may have been more homogeneous than originally intended. This issue presents an interesting paradox in that one of the goals of this research project was to identify and examine subjects with multiple anxieties, yet the results suggest that the presence of individuals with several anxieties is greater than what was expected; that is, subjects with single, well-defined anxieties were less prevalent than anticipated.

Although this study was unable to demonstrate additive effects of multiple simple anxieties, other researchers have explored whether or not anxieties summate (Rachman & Lopatka, 1986a). These researchers chose subjects who were anxious about spiders, snakes, or both spiders and snakes. Behavioral approach tasks were administered; subjects predicted levels of anxiety before exposure, and then rated actual levels of anxiety during exposure. Subjects who were anxious about only one animal reported less anxiety than subjects anxious of both animals. Among the group with

two anxieties, level of anxiety regarding either a spider or snake did not significantly differ. However, in the subjects with two anxieties, when the second stimulus presented was reported to be more anxiety-provoking than the first, an increase in anxiety was recorded over the tasks. When the first stimulus produced greater anxiety than the second, a decrease in anxiety was noted over the tasks. When both stimuli were rated equally anxiety-provoking, a decrease was reported. Rachman and Lopatka (1986a) concluded that anxiety-provoking stimuli with similar attributes produce a summation in experienced anxiety. If the anxiety-provoking stimuli are different with respect to relevant attributes, then additive effects do not occur. Unrelated anxieties should have no summation effects. What may be occurring is a contrast effect, in that the product of two anxiety-producing stimuli is determined by order and intensity of earlier presentations, with a descending order of intensity resulting in a decrease in anxiety, while ascending order of intensity leads to a summation. Therefore, the first stimulus functions as a point of reference for the second stimulus. Perhaps in the present multiple anxiety study, a contrast, rather than a summation effect occurred, due to the difference in

attributes of the anxiety contents. The lack of relatedness between dental and snake anxieties in the focal/social group may have led to such a contrast effect.

It is also possible that the lack of differences in this study may be due to the different method of selecting multiple anxiety subjects (i.e., general social anxiety and dental or snake anxiety) versus that of prior research (McNeil et al., 1985, 1990) in which speech anxiety was selected as a combination with dental anxiety. Finally, these null findings may be due to a lack of statistical power.

Regarding imagery, difficulties may have existed in the ability to access and activate the subjects' cognitive networks, resulting in attenuated physiological responses and subjective judgments of experimental scripts. The elements that constitute a stable anxiety prototype (i.e., stimulus, response, and meaning) may have been differentially and insufficiently activated. Although images are recalled in an inexact, approximal manner, the media prompts used may not have adequately matched the subjects' anxiety prototype in long term memory, and may have been unable to activate the network. A mismatching of anxiety prototypes may have resulted from the use of

standard, rather than personally-relevant scripts. Therefore, subjects whose social anxiety was primarily manifested in encounters with the opposite gender may not have been affected by scenes in which public speaking was described. Additionally, as the breadth of anxiety in the subjects was higher than originally thought (i.e., few subjects reported only one area of distinct anxiety), the affective networks may not have been well-defined. The anxiety-provoking stimuli may have been poorly matched to the anxiety prototype in memory, with many diffuse activating cues, failing to evoke strong physiological responses.

Furthermore, the subjects' ability to process images determines the degree to which the anxiety prototype is accessed. In this study, fatigue may have impeded access to the affective networks. The procedure required two to four continuous hours of the subjects' time, depending on the speed of questionnaire completion. Several subjects remarked during the debriefing they became tired, and were less motivated to imagine or consider each script fully for affective judgments. Many subjects developed a pattern of judging arousal, dominance, and valence in a polarized fashion, so that subtle variations, which might have been meaningful across groups, may have been obscured.

Questionnaire Data

General predictions for group responses to questionnaires were supported. Some of the results from questionnaires supported the notion of a continuum of anxiety, such that greater reports of anxiety were found for those individuals with multiple anxieties. The results of the FSS-III demonstrated higher levels of reported anxiety in the focal/social group than other groups. The FEQ-Insecurity and FEQ-Autonomic Arousal scales demonstrated less anxiety in the focal anxiety group than the other two groups. With respect to the PRCS, the focal group reported less anxiety than the other two groups as well.

Free Recall

The lack of findings supporting the hypothesis of group differences with respect to free recall of script information may have been due to inexact methodology. Total number of scripts recalled, as well as number of words reported in recollections, constituted the data for analysis. Differential recall of anxiety-relevant scripts was expected. For focal subjects, who have distinct anxiety-evoking stimuli on which to focus, greater ability to recall significant details of anxiety-relevant scripts was expected. Some subjects reproduced scripts verbatim; others recollected only

elements perceived to be essential (e.g., nouns, verbs, adjectives). Variations in material recalled reflect not only the ability to access successfully the anxiety network, but also idiosyncratic styles of recall. These two factors created difficulties in differentiating sources of variance.

Cardiac Responsivity

Differences among groups with respect to cardiac reactivity to anxiety-relevant stimuli were not found. This finding is in contrast to general findings in the area of imagery and psychophysiology in which differences in heart rate between groups of anxious subjects have been reported (e.g., Cook et al., 1988; McNeil et al., 1985, 1990). As already noted, the lack of findings may have been due to a variety of factors, such as subject selection.

To accentuate group differences, response training, such as that described by Lang et al. (1983) might be utilized in future research. In this imagery training procedure, subjects are reinforced for the verbal report of somatic responses to imagery. This procedure enhances differentiated visceral response during anxiety imagery. Moreover, subjects who are response trained produce patterns of cardiac responsivity during imagery that parallel the results

for physiological response demonstrated to the actual anxiety-provoking stimuli (e.g., a live snake). Lang et al. (1983) also reported that trained subjects exhibited greater concordance between verbal report and visceral measures than untrained persons.

Affective Judgments

Neutral and action scenes did not differ from each other, but were rated as more positive, less arousing, and produced more of a sense of control in subjects than anxiety scripts. This finding is consistent with previous research (e.g., Marks, Marset, Boulougouris, & Huson, 1971). Within the anxiety contents, the snake content produced unique results. The snake scenes were rated less negatively than the dental and social scenes and subjects reported they felt more control in these scenes. It may be that the snake scenes were less anxiety-provoking in their content. However, these results may also stem from individuals' ability to avoid snakes adequately, while social encounters occur daily and are difficult to avoid or escape entirely. With respect to the dental scenes, although individuals can avoid dental care to some extent, unless they are quite unique, contact with a dentist is periodically required.

Future Directions

Although this study was unable to produce evidence suggesting that multiple anxieties yield additive effects with respect to physiological reactivity and reported distress, the concept of multiple anxieties remains intriguing. As the research paradigm employed is well established (e.g., Lang et al., 1983), future research may require extra caution in subject selection. In order to assess the independence of anxieties more fully, procedures outlined by Rachman and Lopatka (1986b) might be utilized.

Although this study was not able to demonstrate differences in information processing among anxious individuals, the question of group differences remains. Additionally, new questions were raised, in particular, those pertaining to the presence of multiple anxieties in the general population. The results of this study highlight the need for a rigorous subject selection process, like that of McNeil et al. (1985, 1990). Establishing the independence of anxieties, as outlined by Rachman and Lopatka (1986b), might assist in identifying appropriate subjects. Additionally, as to free recall of script information, a more detailed analysis of response and stimulus propositions may reveal group or other differences. Finally, response

training, such as that described by Lang et al. (1983) may accentuate group differences.

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Appendix A

Literature Review

History and Early Philosophy

The study of emotion has intrigued philosophers and scientists for centuries. Aristotle postulated that beliefs, bodily motions, and physiological changes constituted inextricable elements of emotions. Containing a rational and cognitive component, emotions were thought to be controllable reactions to external stimuli (Calhoun & Solomon, 1984). In this manner, Aristotle avoided explaining mind-body dualism, which clouded many arguments about the nature of the "passions."

As technology advanced, scientific theories replaced philosophical suppositions. Given the general zeitgeist towards rationality, it was not surprising that emotion would be a topic for scientification when psychology attempted to identify itself as a science. Wilhem Wundt successfully argued that scientific psychology was a discipline independent of philosophy, and in 1879, he founded the first formal psychology laboratory (Boring, 1957).

Wundt's contribution to the study of emotion is twofold. First, he promulgated a tridimensional theory

of feeling. The three axes which operated simultaneously and independently were: a) pleasantness-unpleasantness, b) strain-relaxation, and c) excitation-calm (Boring, 1957). Secondly, he attempted to objectify the study of emotion, employing natural science paradigms (i.e., observation). Wundt believed that psychological processes could be observed and made the object of rigorous experimentation. He described the utility of introspection as follows:

> The experimental method is of cardinal importance; it and it alone makes a scientific introspection possible. For all accurate observation implies that the object of observation (in this case the psychial process) can be held fast by attention, and any changes that it undergoes attentively followed (Wundt, 1873, p. 249).

While Wundt deserves commendation for promoting psychological experimentation and meticulously collecting tomes of historically interesting data, introspective methods proved insufficient to account for the subjective experience of emotion.

James-Lange Theory of Emotion

Recognizing the importance of scientific methods from German psychology, William James, who had been

directing his own laboratory at Harvard University since 1875, introduced experimentation to American academia. James is widely known for his theory of emotion. In 1884, William James endeavored to apply contemporary principles of neurology to the understanding of emotion. James believed that the central nervous system was a set of "Passions," which existed independently of consciousness. This theory was simultaneously developed by a Danish psychiatrist, C.G. Lange, and was subsequently referred to as the James-Lange theory of emotion. This new theory reduced affect to the perception of physiological disturbances which were caused originally by awareness of external events and objects in our environment. When an individual encountered emotional stimuli, the nervous system reacted automatically, producing adjustments primarily in the viscera and skeletal muscles. James claimed that "the bodily changes follow directly the perception of the exciting fact, and that our feelings of same changes as they occur is the emotion" (James, 1884, p. 291). "We feel sorry because we cry, angry because we strike" (James, 1884, p. 292). The James-Lange theory is essentially a behavior theory of emotion, since awareness (i.e., affect) is dependent upon physiological, reflexive responses.

Several prominent flaws impeded the acceptance of the James-Lange theory. The assumption that the system acted "as a bundle of predispositions to react in particular ways upon the contact of particular features of the environment" (James, 1884, p. 292) was deficient in explaining emotional nuances. Moreover, the theory offered no means as to how to distinguish and identify emotions, which may present no discriminating physiological reactions.

One critic of the James-Lange theory was Walter Cannon. A physiologist, Cannon argued that emotions might be correlated with visceral disturbance, but causality could not be inferred from the perception of these disturbances (Calhoun & Solomon, 1984). Cannon was able to call into question the James-Lange theory by surgically severing vagus nerves in dogs. While the animals were unable to detect bodily sensations, affect was still apparent (i.e., "happy" was inferred from a wagging tail, while "angry" or "fearful" was inferred from growling and ears held back).

To that point, no one had successfully accounted for the experience of emotion; Wundt suggested a tridimensional model, but employed ineffective experimental techniques. James had only focused on physiological vicissitudes, ignoring cognition and

overt behavior. John Dewey proposed a more integrated view of emotion. He suggested that physiological disturbances and overt behaviors characterize emotion and are required to deal purposefully with the environment. The experience of emotion included a "quake" or feeling (e.g., sadness), purposeful behavior, and an object that had an emotional quality (Calhoun & Solomon, 1984).

Recent Theories of Emotion

Modern theories of emotion have borrowed ideas not only from neurology, but also from recently developed theories of information processing. The most widely accepted theory of information processing, and one which has been most readily applied to the study of emotion, is that of the propositional network. The propositional theories developed as an alternative to dual processing models which suggested that information retained in memory was stored as complete and nonreducible verbal memories and visual images. In these conceptualizations, sensory or motor experiences comprised memory. Empirical research, however, did not substantiate an iconic memory model.

In the propositional theory, the smallest meaningful independent unit of knowledge is the proposition. Events are represented in approximal

form; meaning is paramount. Propositions are related in a network fashion, so infinite interconnections between concepts are possible. These connections create meaning, as each conception is defined by its relation with other concepts, or nodes. If an individual frequently encounters a stimulus along with another object or event, the two bits of information are stored together. The strength of the relationship increases with each encounter, even when the stimulus information is stored with more general concepts. The stronger the association, the more rapidly verification occurs. However, when facts about a stimulus are not directly encoded with that concept, information must be inferred each time, requiring processing time and energy. For example, if a child is bitten by a dog, the association that develops is the sensation of pain and anxiety with the perception of a dog. While the child may encounter nondangerous dogs, the child's first reaction is anxiety and the association of pain, since the retrieval of nonfrequently stored information ("all dogs are not dangerous, this may be a friendly dog") requires more time. The consequence of this rapid and selective processing can be behavioral avoidance.

More recently, Peter Lang, in order to objectively study emotion, drew upon Anderson's (1980) work in propositional theory to account for cognition. Lang added a behavioral component, so that the expression and experience of emotion was a combination of verbal report, physiology, and behavioral responses. Lang proposed that emotion is comprised of these three systems and their interaction. Lang's view can be seen as a modification of the ideas James and Dewey originally put forth.

Using anxiety as an example, verbal reports can include complaints of anxiety, dread, panic, and (frequently) concomitant complaints of worry, obsession, and insecurity. Secondly, visceral and somatic activation patterns are included, such as elevation of heart rate, muscle tension and blood pressure. Lastly, behavioral actions can also be present. One might expect to see escape, avoidance, hypervigilance, dysfunctional immobility, compulsive mannerisms, and deficits in attention and performance (Lang & Cuthbert, 1984). Each of these components are represented in an individual's propositional network. An individual may not equally express all three components (verbal report, physiological response, behavioral action) of the affective structure. One may

feel "nervous" inwardly prior to speaking to a group of colleagues, but appear calm. James (1884) earlier noted the discrepancy between verbal reports and overt behavior: "Even when no change of outward attitude is produced their (muscles') inward tension alters to suit each varying mood, and is felt as a difference of tone or strain" (p. 293). In addition to identifying the elements of the affective structure, one must examine how the activation of the structure creates or determines the experience of emotion.

Additionally, the affective memory structure contains information pertaining to the following aspects: (a) stimuli which prompt activation of the network and the context in which the stimuli occur, (b) response action with respect to the context (expressive facial or verbal behaviors, overt approach/avoidance behavior or visceral and somatic activity which support or confirm action and attention), and (c) meaning of the stimulus and the response (Lang & Cuthbert, 1984).

During the processing of sensory information, reactions are evoked, depending upon the number of propositions which are accessed in the memory structure and the extent to which the internal stimuli from storage match external stimuli. A near-perfect match can be achieved between actual exposure and

propositional representation of an event. Degraded or approximal stimuli can elicit partial or full responses, more if other response or meaning propositions are also instigated.

Lang and colleagues (Cook et al., 1988; McNeil et al., 1990) focused on the examination of anxiety as a relatively stable affective state. In terms of propositional representation, the anxiety-provoking object or event exists as a model or prototype in long term memory. Previously, anxiety had been conceptualized as a consistent internal state (a "lump") which preceded and motivated behavior.

Currently, anxiety, as well as other affective states, is understood to be a disposition to approach or avoid. Lang, Bradley, and Cuthbert (1990) have suggested that emotions are "action dispositions" (p. 377); emotional behavior is said to be organized along an appetitive (approach)--aversive (avoidance) dimension. If this type of approach/avoid conflict is common, how then are persons who are anxious different in response from nonanxious individuals? Response to events which include presentation of stimuli which have some nearly-identical characteristics can be differentiated via the semantic meaning encoded with them. Differences in meaning are encoded in memory.

For example, if someone encounters a bear, the physiological and overt behavioral patterns are quite different if the bear is confronted in the open wilderness versus in a zoological park. In the wilderness, the sight of a bear signifies danger; avoidance is appropriate; in captivity, bears do not typically represent eminent harm, but rather are creatures of curiosity.

In addition to differences in semantic encoding, individuals with pathological levels of anxiety seem to have memory structures with an excessive number of response propositions (physiological arousal, avoidance) which are highly resistant to modification (Foa & Kozak, 1986). The anxiety structure remains unmodified because it is coherent; this coherency may be due to distortion in the processing mechanism for anxiety-relevant information. The excessive response propositions encoded into the perceptual-motor memory of anxious subjects are important because they underlie overt behaviors.

Foa and Kozak (1986) outlined several assumptions regarding the accessibility of the anxiety structures in memory. First, they regard the structure of an evoked memory as similar to the actual stimulus that elicits it. Secondly, the anxiety structure is not

always available for conscious processing. Thirdly, given the imperfect awareness of anxiety networks, nonintrospective methods of assessment are necessary. Physiological reactions represent reliable measures since anxiety involves a fight or flight response. Ideally, one would need to observe physiological and overt behavior in the presence of the anxiety-provoking object or event. However, this scenario is sometimes not available due to infeasibility in the laboratory setting. Therefore, the use of imagery is employed as a method of accessing the anxiety networks.

Images

In propositional networks, affective response elements are coded by stimulus, response, and meaning. These elements constitute a stable fear prototype (Lang et al., 1980; Lang et al., 1983). When this network is processed, motor subprograms which define an action set (based on previous behaviors) are activated. The prototype may be activated by nonlinguistic media prompts (e.g., slides, audiorecorded scripts) or by *in vivo* exposure. Lang (1977) proposed that images and actual exposure to a stimulus produce approximately identical neurophysiological responses. Therefore, images can substitute for objective events, not only in the laboratory, but also in therapeutic settings. For

example, systematic desensitization offers a viable therapeutic technique because "a basic assumption underlying this procedure is that the response to the imagined situation resembles that to the real situation" (Lang, 1977, p. 863). Again, this similarity is possible because "affective images are best conceptualized as propositional structures, rather than as raw, reperceived sensory representations" (Lang, 1977, p. 863). Images are not reducible, iconic elements. Moreover, images have attributional properties which cannot be detached from their objective contents.

Propositional models of imagery are logical and parsimonious because images are not recalled exactly, but are recollected in an approximal manner. When a subject experiences an emotionally-laden image, the anxiety prototype stored in long term memory is accessed. The image essentially creates itself from the cognitive constructive process, "through which patterns of efference are regenerated, duplicating the response array of perceptual-motor and action memories" (Cook et al., 1988, p. 38). Therefore, the image is recreated as it is evoked, and propositions are added or subtracted with each evocation. Lang (1977) stated that the emotional image be considered as a cognitive

schema containing a finite set of propositional units, each of which can be represented as a verbal statement or instruction" (p. 867).

If emotional images represent cognitive schema, then images which are pathologically frightening can be therapeutically altered. Inconsistent success reported in research on flooding and desensitization might be due to the variations in the vividness of the images evoked, and the subsequent modification of the cognitive schema. The effect may be dependent upon the completeness of the access to the propositional network. One way to gage the level of access is to measure how vividly the image is recreated. Since large visceral responses may be aversive to the individual, the subject may wish to avoid or discontinue the imagery experience, such that the cognitive schema remain unaltered (e.g., "all dogs are still dangerous"). Vividness, affective intensity, and the balance between stimulus and response elements all help to determine the therapeutic effect of imagery. In terms of images, the anxiety-provoking object exists as a template in long term memory. The subject's capacity to process images will determine the degree to which the memory is accessed (Cook et al., 1988).

As already noted, emotional imagery can be evoked by verbal instructions (e.g., scripts) or memory aids (e.g., slides). Lang et al. (1980) suggest the use of an action set in imagery instructions, since images are a finite information propositional structure in the brain which have the properties of a perceptual motor set. The subject can be instructed to imagine him or herself engaged in the image content "as if" it were really happening. Ideally, the image evokes a response similar to exposure of actual stimuli. Scripts, therefore, provide valid instructional cues to assist subjects in generating images. In this manner, for example, the fear network could be modified in a therapeutic setting, such that subsequent cognition and behavior are altered in an adaptive fashion.

Conclusions

Questions and speculation regarding the nature and experience of emotion have been addressed by offering alternative theoretical models and newly developed experimental techniques to study affect. Most theorists (e.g., Wundt, Lang) speculated that emotion was comprised of several components. Wundt proposed that emotion had three dimensions (i.e., pleasantness-unpleasantness, strain-relaxation, and excitation-calm). James focused exclusively on the

physiological manifestations of emotion. More recently, Lang outlined a theory which proposed that emotion was a combination of verbal reports, physiology and behavior. The individual experience of emotion is highly idiosyncratic, as affect is determined by elements in cognitive networks. These networks have information about stimuli, response and meaning, such that when an individual encounters relevant stimuli, a network (or networks) is activated, and the resulting combination of elements determines emotion.

As theories of emotion were modified, the methods used to study affect also changed. Wundt employed paradigms of observation which were not adequate. Previous primitive attempts at objectifying emotion were disproven and fell out of favor with the prevailing zeitgeist. Recently, the examination of emotion has merged with cognition research and the burgeoning field of information processing. Researchers (e.g., Foa & Kozak, 1983; Lang, 1977, 1979, 1985; Lang et al., 1983) are currently conceptualizing affect as a complicated cognitive network which has components of stimulus, response and meaning. Affect can be examined through imagery assessment procedures. The degree of network activation, and the concomitant experience of emotion, is inferred. In this manner,

theories are being empirically examined using sophisticated electronic, computerized equipment. The scientific community may have testable theories of emotion which can be disproven or accepted on the basis of research made possible by advances in psychological, physiological and computer science technologies.

Appendix B

Imagery and Relaxation Scripts

Relaxation Script

Position yourself in the chair as comfortably as you can. Uncross your feet or legs if they are crossed and allow your eyes to close. Now, relax the muscles of your left forearm. Let your left forearm be limp, heavy, and calm. Let the relaxation spread to the muscles of your left arm. Let your let arm relax and be calm and warm. Relax the muscles of your right forearm. Let your right forearm be limp, heavy, and calm. Now, relax the muscles of your right arm. Let your right arm feel calm, warm and relaxed. Now relax the muscles of your left leg. Let your left leg feel heavy, calm, and relaxed. And now, also relax your right leg. Let the muscles of your right leg feel calm, warm, and relaxed. Now, relax the muscles near your stomach. Let the muscles near your stomach feel calm, warm, and relaxed. Now relax your forehead. Let your forehead muscles be calm and relaxed. Let this relaxation spread to the muscles of your neck and shoulders. Let your neck and shoulders feel calm, warm heavy, and relaxed. And now relax the muscles around your eyes. Let the muscles around your eyes be heavy, calm, and relaxed. Relax all the muscles of your body. Let your whole body be warm.

Neutral Scripts

1. Bus Stop

You are sitting at a bus stop on the corner of a quiet, tree-lined street. It is a bright summer day and birds are flitting among the tree branches. You feel peacefully at ease under the trees and the white, billowy clouds which drift slowly by in the blue sky. Across the street, a man in a brown shirt dozes on his patio, while a sprinker sprays sparkling droplets of water over his lawn.

2. Living Room

You are in your living room reading on a Sunday afternoon. Leaning back in your chair, relaxed, you look out of your window. It is a sunny autumn day. Red and brown leaves float slowly down from the trees. A yellow Volkswagen goes by in the street, scattering the blanket of leaves. A gentle breeze picks up a little spiral of leaves, which dances for a moment in the middle of the street before settling again on the ground.

3. Lawn Chair

You are sitting in a lawn chair on your porch on a summer afternoon. Leaning back, relaxed, you feel a soft warm breeze blowing across the porch. A green lawn stretches out before you, and scattered trees sway

gently with the wind. Comfortable and content, you are so relaxed your hardly move while you sit in the chair enjoy the pleasant summer day.

Action Scripts

1. Bicycle

On a clear Saturday morning you are riding your bicycle on a quiet country road. You breathe and sweat runs down your face while you pedal rapidly over the road. Ahead of you is a steep hill, and you tense your face and neck muscles, working to climb the hill. Your eyes look to the right at several chickens which scatter when you pass a large red barn. A rooster crows loudly from within the barn. Your heart races as you near the top.

2. Kite

You breathe deeply as you run along the beach flying a kite. Your eyes trace its path as it whips up and down in spirals with the wind. You tense the muscle in your forehead and around your eyes to block out the sunlight. You perspire freely in the warm sun. Your heart races while you run along the sand, leading the kite, whose long white tail dances beneath the soaring red diamond.

Dental Anxiety Scripts

1. Dental Examination

You are in a dentist's chair waiting for an examination. You glance around the room and notice a tray of needle-like instruments before you. You tense up as the piercing whine of a high-speed drill echoes into the room from across the hall. Sweat trickles from your armpits as your dentist comes in, washes, picks up a pointed, hooked probe, and moves it toward your jaw. Your heart races when the cold steel point scrapes against your teeth as the dentist probes for soft spots along the gumline and in the crevices on the tooth crowns.

2. Dental Injection and Drilling

You are fully reclined in a dental chair, head back, preparing to have a cavity filled. All of your muscles feel tight as you clutch the armrest of the chair. The dentist looms in front of you, holding a syringe with a long, chrome needle and brings it toward your mouth. Your heart pounds as the sharp needle is slowly injected into your upper palate. Your eyes dart about the room during the injection and you see the technician preparing the drill. You gasp and then breathe rapidly. Perspiration seems to pour from your body as the needle is withdrawn.

Snake Anxiety Scripts

1. Boat

You are rowing a boat on the lake and your heart begins to pound when you see a long, poisonous-looking snake following closely at your stern. Your eyes follow its undulating motions with your eyes, as it sweeps back and forth in the water. As you row faster to get away from the snake, you breathe deeply, straining all your muscles to pull the boat away from the threatening serpent. You sweat heavily from all the rowing and you cannot move the boat away from the snake.

2. Field

You are walking through a field on a sunny day, when you notice a snake, lying coiled and motionless, on a rock about five feet away. You stop, and your muscles stiffen. Your heart begins to pound. It is a medium sized brown snake, about three feet long. The snake flicks its tongue in an out, and you perspire freely. You take rapid, shallow breaths as the snake begins to move. You follow the movement of the snake as it slithers from the rock.

Social Anxiety Scripts

1. Reprimand from Professor

A few class meetings after turning a required term paper in an important class, your instructor asks you to remain in the lecture hall when the period is over. Anticipating some problem, you notice that your muscles are so tense that your hands are trembling. After your classmates have left, your professor, speaking harshly, expresses a great deal of disappointment in your work on the paper, and you can feel you heart throbbing. You begin to perspire freely when errors in grammar, punctuation, and logic are pointed out. You glance at the clock in the room as the professor continues criticizing the term paper.

2. Speech to Class

You have volunteered to give a presentation to a class in which you badly need to improve your grade. You have never addressed such a large group before. Your palms have become sweaty, and you tense up the muscles of your forehead. The hands of the clock inch forward, and your heart begins to race as the buzzer in the hall signals the start of class. As you walk to the front on the room, you breathe rapidly and glance around at the faces of the audience. The whole group looks at you in silence, shifting restlessly in their seats.

Table 1

Mean assessment scores for verbal report instruments (standard deviations in parentheses)

Instruments	Possible Range	Groups: Focal	Groups: Social	Groups: Focal/ Social	F
Questionnaire Upon Mental Imagery (QMI)	35-245	96.1 (25.9)	93.8 (22.8)	96.2 (13.2)	.45
Personal Report of Confidence as a Speaker (PRCS)	0-30	11.3[a] (7.7)	20.7[b] (5.7)	19.5[b] (8.1)	5.31*
Fenz-Epstein Questionnaire (FEQ)					
FEQ-Insecurity Scale	19-95	40.3[a] (7.0)	51.8[b] (10.7)	58.1[b] (14.9)	7.81*
FEQ-Muscle Tension Scale	18-90	28.5 (7.1)	33.3 (7.0)	35.8 (12.6)	2.14
FEQ-Autonomic Arousal Scale	16-80	26.1[a] (6.9)	33.7[b] (7.0)	36.5[b] (11.2)	5.74*
Fear Survey Schedule (FSS)	0-432	108.9[a] (35.6)	128.8[a] (47.7)	171.7[b] (57.3)	5.79*

(Table continues)

Table 1 (continued)

Instruments	Possible Range	Groups: Focal	Social	Focal/ Social	F
Snake Fear Questionnaire (SNAQ)	0-30	12.2[a] (7.2)	4.5[b] (4.2)	12.3[a] (6.5)	5.94*
Dental Fear Survey (DFS)	20-100	61.8[a] (19.4)	41.8[b] (9.0)	60.5[a] (17.2)	5.32*
Social Avoidance and Distress Scale (SADS)	0-28	4.3[a] (4.6)	16.8[b] (4.8)	17.7[b] (3.5)	45.49*

Note. Higher scores indicate report of greater anxiety, except for the QMI, in which higher scores reflect poorer imagery ability.

Note. Duncan's Multiple Range Tests were conducted subsequently to the ANOVAs. Individual instrument means that do not share a common superscript differ significantly at $p < .05$.

Note. Scores reported are from the second administration of screening instruments (i.e., SNAQ, DFS, SADS).

** $p < .0001$ * $p < .01$

Table 2

Mean values for free recall data

(standard deviations in parentheses)

Group	Total Number of Scripts Recalled	Total Number of Words Recalled
Focal	9.0	235.1
	(1.5)	(125.9)
Social	8.8	271.3
	(1.2)	(116.9)
Focal/	8.7	236.3
Social	(1.9)	(85.6)

Figure Captions

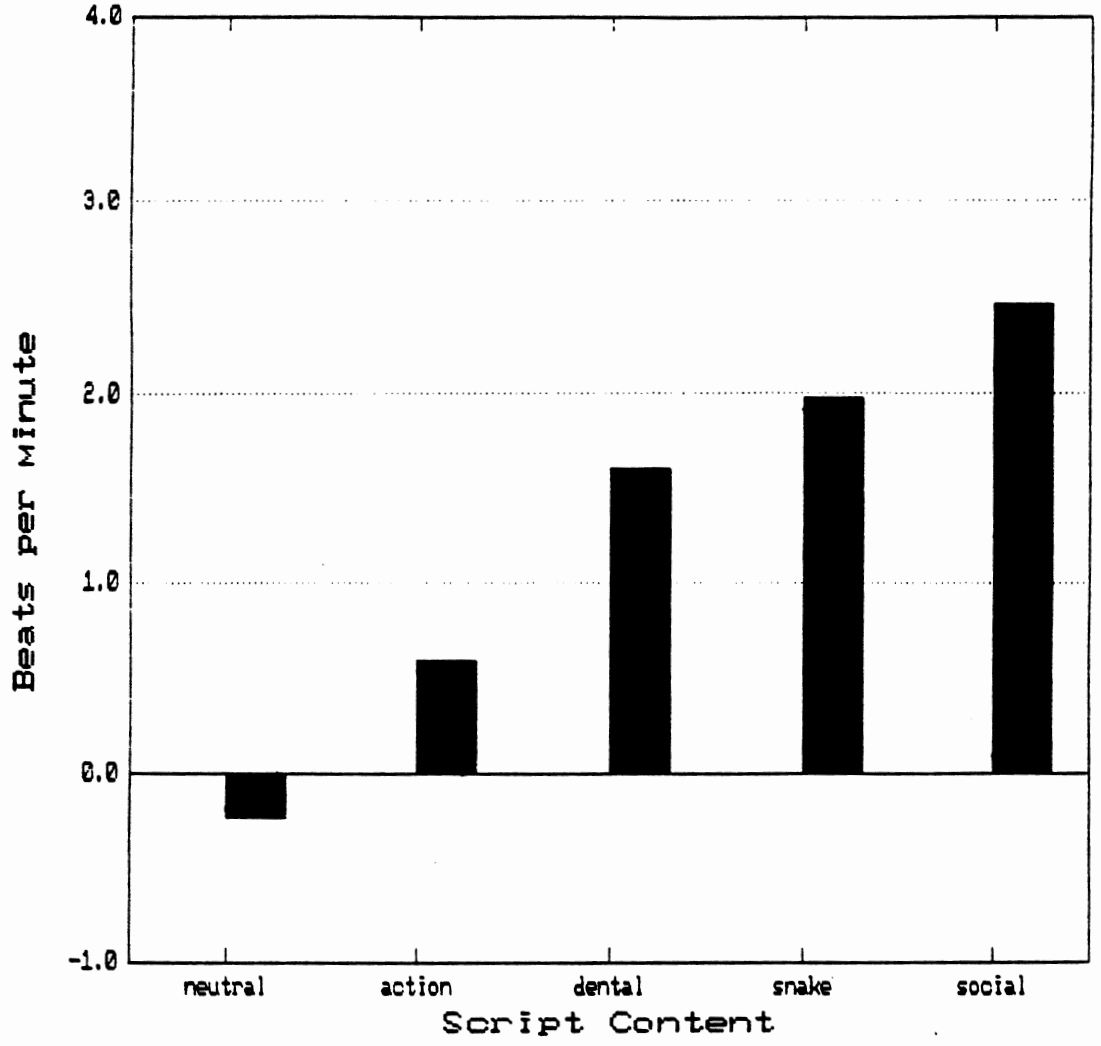
Figure 1. Change in Heart Rate from Baseline in Read/Image Periods

Figure 2. Group Valence Scores

Figure 3. Group Arousal Scores

Figure 4. Group Dominance Scores

Figure 5. Group Vividness Scores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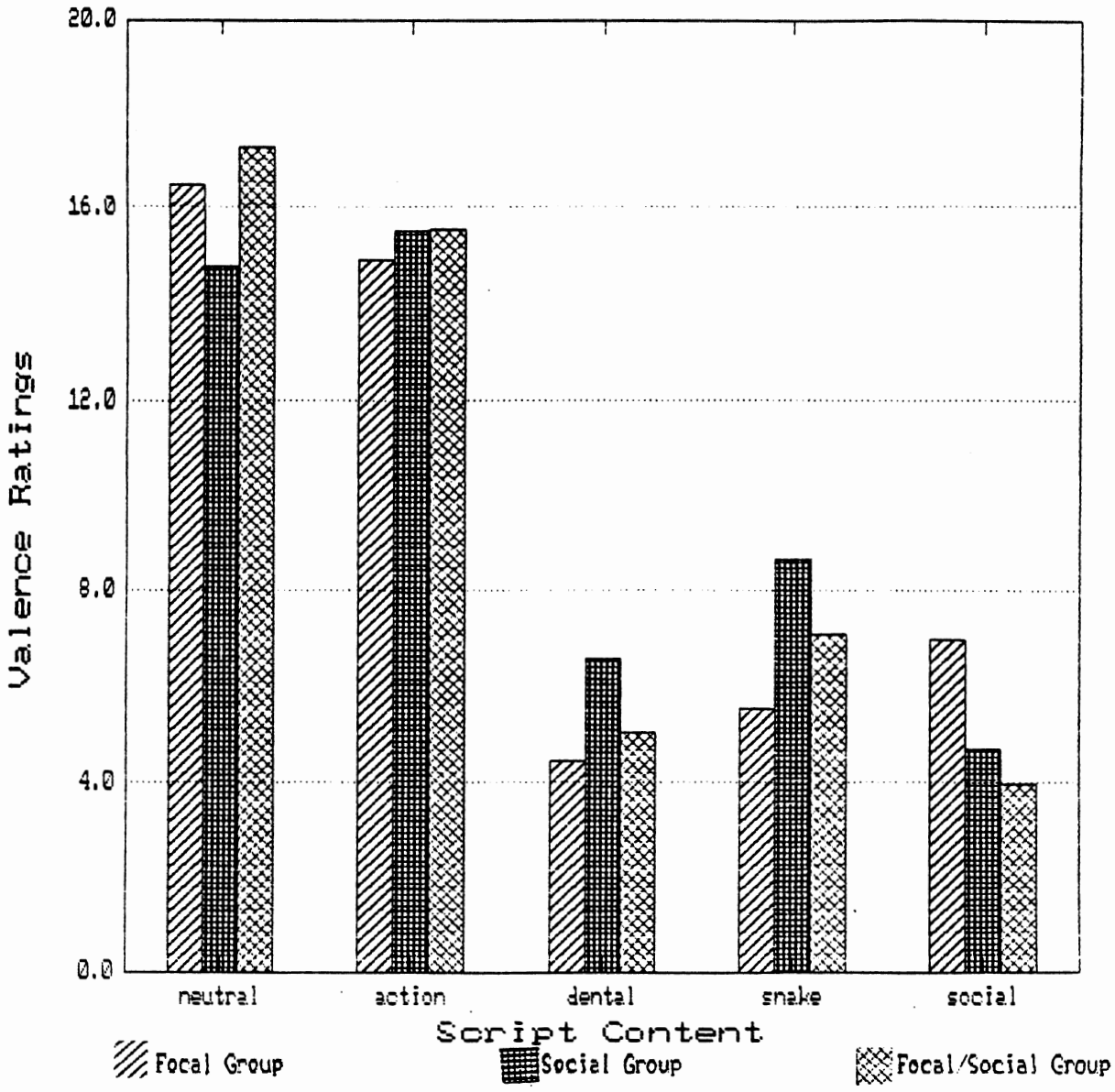
neutral
action
dental
snake
social
Script Content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16.0
12.0
8.0
4.0
0.0
Valence Ratings
neutral
action
dental
snake
social
Script Content
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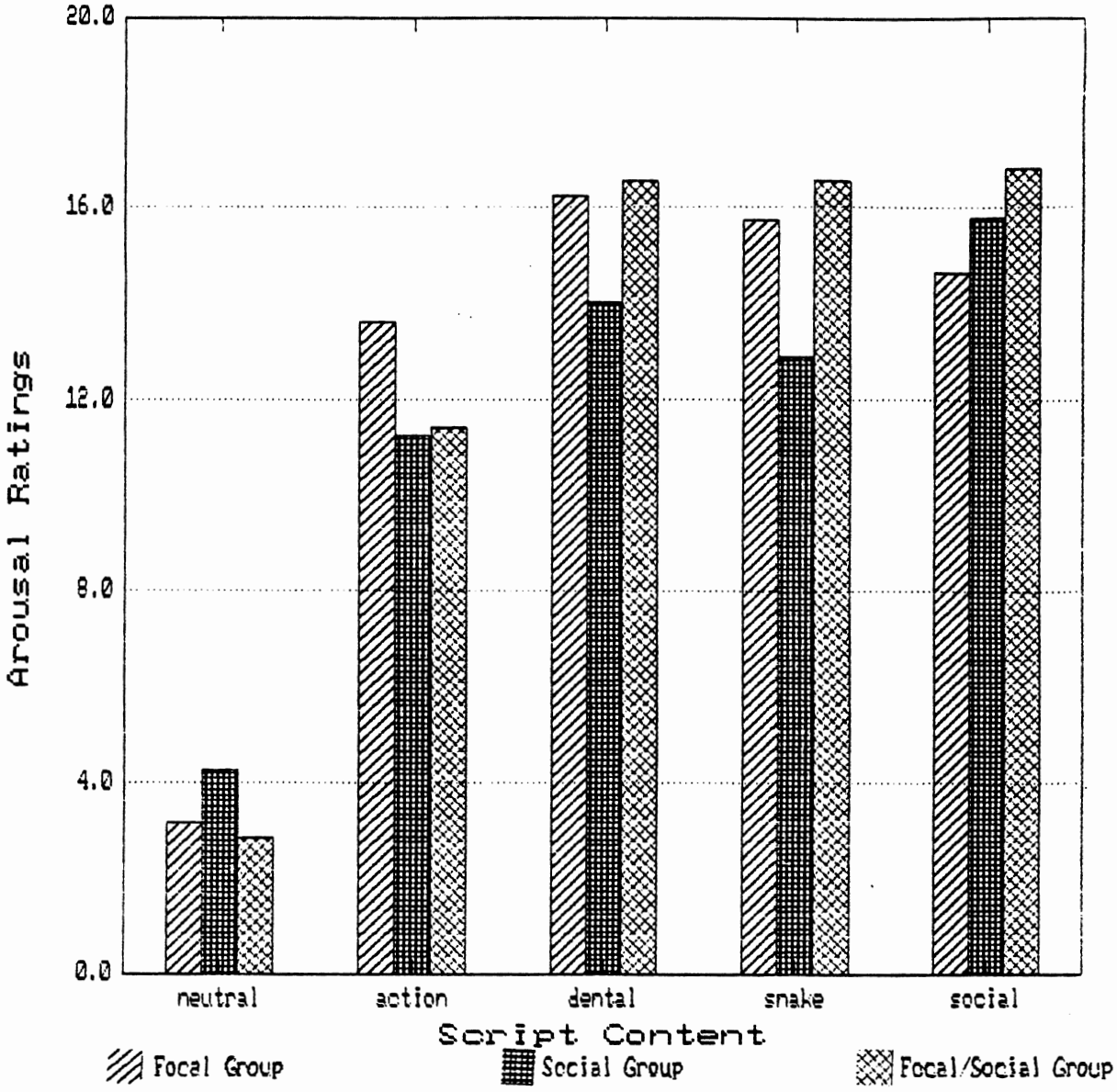
Social Group
Focal/Social Group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12.0
8.0
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0.0
Arousal Ratings
neutral
action
dental
snake
social
Script Content
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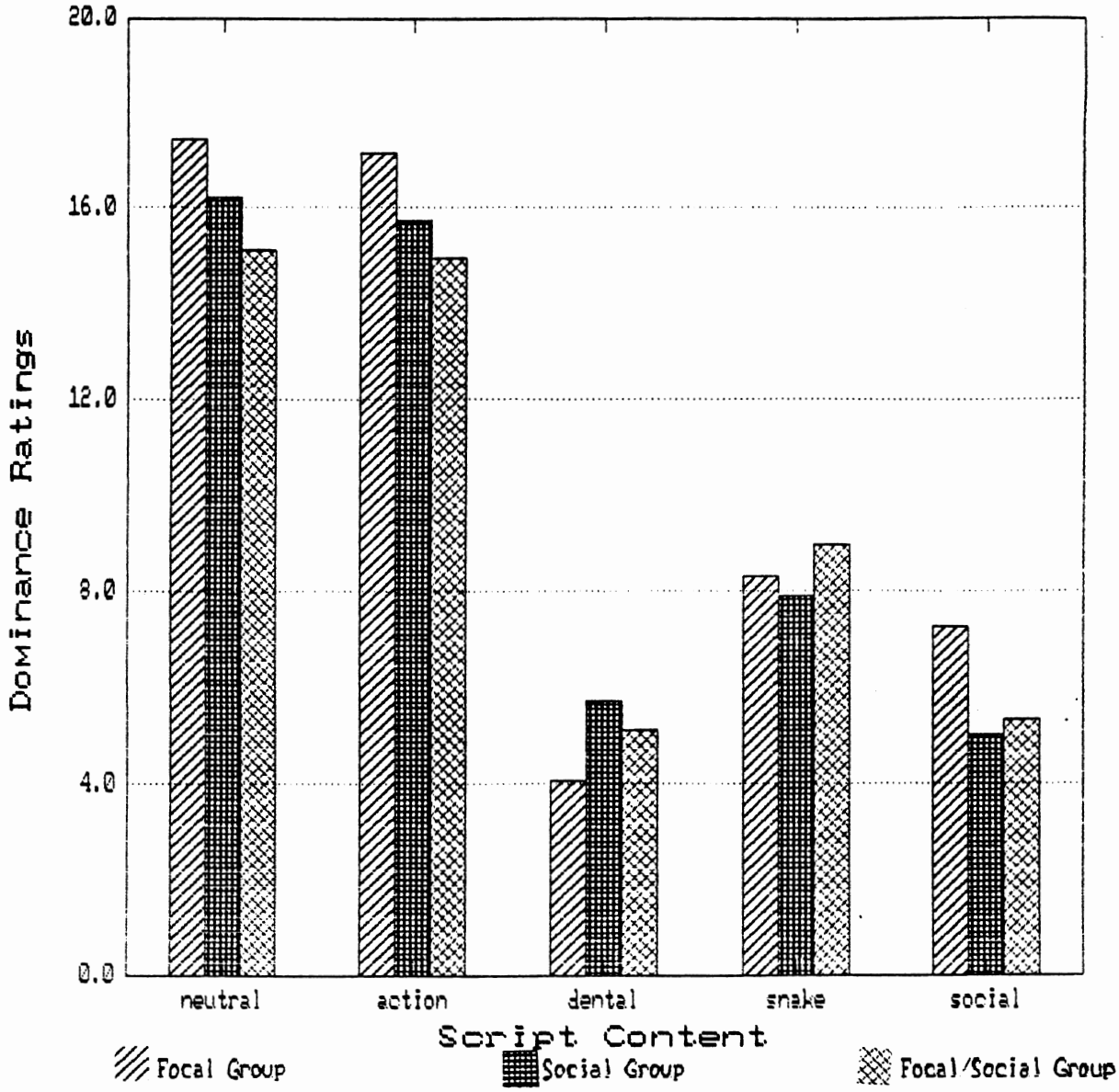
Social Group
Focal/Social Group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12.0
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0.0
Dominance Ratings
neutral
action
dental
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social
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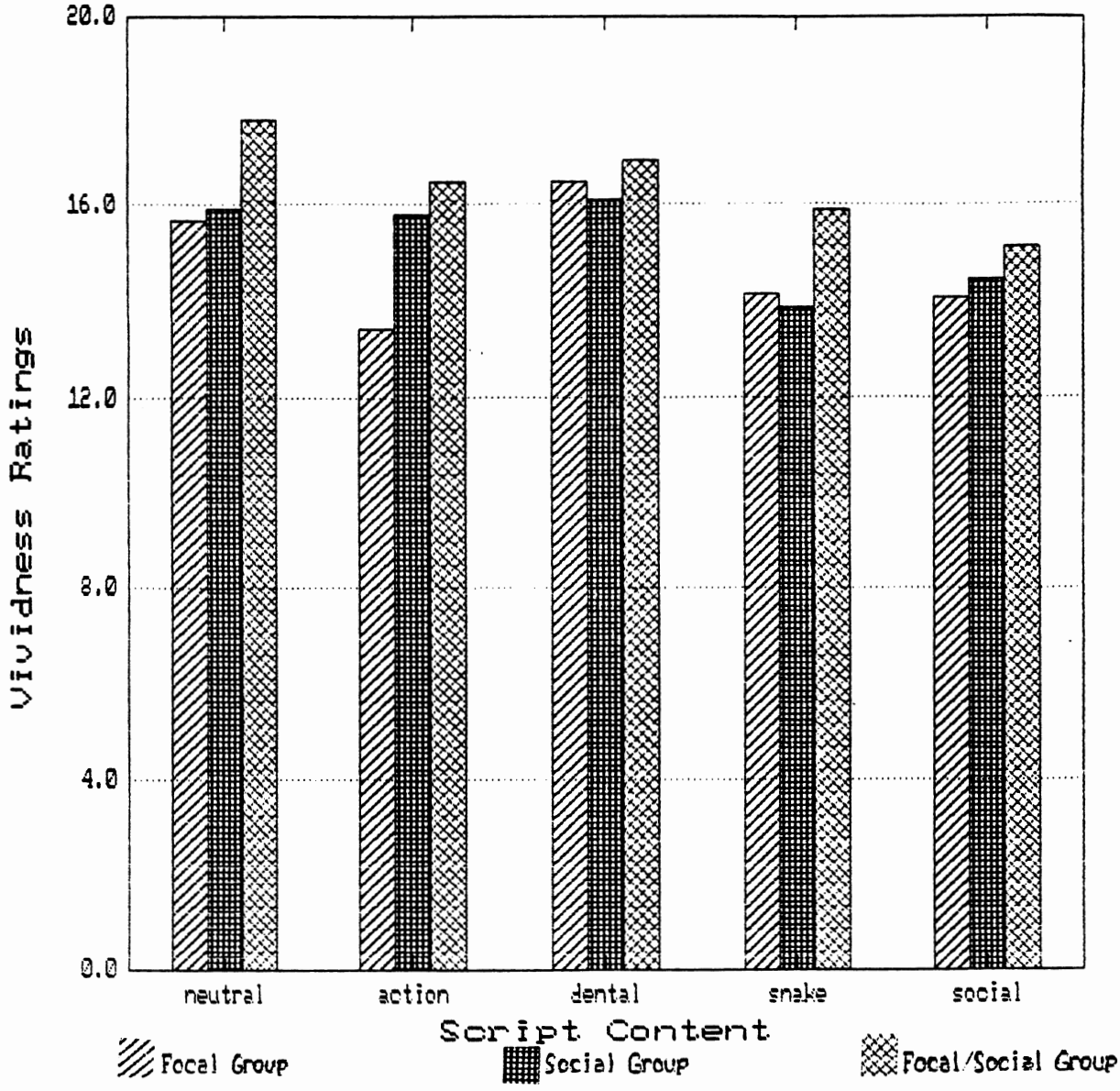
Focal Group
Social Group
Focal/Social Group


20.0
16.0
12.0
8.0
4.0
0.0
Vividness Ratings
neutral
action
dental
snake
social
Script Content
Focal Group
Social Group
Focal/Social Group

VITA

Jeri L. Fritz

Candidate for the Degree of

Doctor of Philosophy

Thesis: AFFECTIVE RESPONSE TO IMAGERY: DIFFERENCES BETWEEN FOCAL AND SOCIAL ANXIETY

Major Field: Psychology

Speciality: Clinical

Biographical:

Personal Data: Born in Billings, Montana, August 1, 1962, the daughter of Gerald and Patricia Fritz.

Education: Graduated from Kelly Walsh High School, Casper, WY, in June 1980; received Associate of Arts Degree in Psychology from Casper Community College in May 1982; received Bachelor of Arts in Psychology from the University of Montana in May 1984; received Master of Science Degree from Oklahoma State University in December 1985; completed requirements for Doctor of Philosophy at Oklahoma State University in December 1990.

Professional Experience: Teaching Assistant, Department of Psychology, Oklahoma State University, August 1984 to May 1986. Practicum Student, Family Mental Health Center, Tulsa, Oklahoma, August 1986 to July 1987. Practicum Student, Payne County Guidance Center, Stillwater, Oklahoma, August 1987 to July 1988. Psychology Intern, Veteran's Administration Medical Center, Gainesville, Florida, September 1988 to August 1989. Employee Assistance Program Coordinator for Walt Disney World, Florida Psychiatric Associates, Orlando, Florida, September 1989 to present.