THE EFFECTS OF VISUAL AND AUDITORY AFFECTIVE STIMULI UPON EYE BLINK RATE AND SUBJECTIVE ANXIETY

By

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Peace.

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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

The purpose of this study was one, to investigate the physiological responses to affective visual and auditory stimuli using eye blink rate (EBR) as the physiological indicator; and two, to examine the relationship between these physiological responses and subjective anxiety level ratings using Zuckerman and Lubin's Multiple Affect Adjective Checklist (1965).

The use of the EBR as a physiological indicator of affective responses is still at an early stage of development in spite of the fact that research on the idea dates back to the work of Ponder and Kennedy in 1927. Ponder and Kennedy conducted studies on the frequency and causes of blinking, examining eye blinks as a defensive mechanism in man. An investigation of variation in the rate of blinking showed that changing a person's degree of attention caused a change in blink rate, as did making the person excited or angry. Ponder and Kennedy induced anger in their subjects and compared the blink rate for pre- and post-anger to the rate during the anger period, finding that the Ss' blink rate increased during the period of excitement. They also observed witnesses under examination in court trials and found that EBR increased when cross-examination began. Ponder and Kennedy suggest that blinking provides a way for dissipating nervous energy that builds up in the person, much like finger tapping or foot shaking while sitting.

Interest in eye blinks and emotionality diminished after Ponder and Kennedy's initial work. Research turned more to studying eye blinks in terms of different visual tasks, and to conditioning of the eye blink response. It was not until very recently that researchers took a renewed interest in the eye blink response and its connection to emotional arousal.

The few studies in this area have obtained results which, for the most part, tend to agree with Ponder and Kennedy's (1927) findings that eye blink rate increases when an individual is in a state of arousal. Kanfer (1960) examined psychiatric interviews in order to investigate the relationship between verbal rate, eye blink rate, and content of interview. Kanfer hypothesized that topics of great emotional importance to the person would lead to increased momentary anxiety; and this increased anxiety would lead to increased verbal rate as suggested by an earlier study by Kanfer (1959). Kanfer predicted that EBR also would increase for the topics with emotional impact. Kanfer used routine admission interviews of a psychiatric hospital for his experimental condition. Verbal rate and eye blink rates were measured within four content areas: (1) present home, (2) family, (3) sexual attitudes, and (4) reasons for hospitalization. Highest rates were expected for topic four, which was selected a priori as the most anxiety arousing for the Ss. Results supported the hypothesis that verbal rate varies according to topic, but eye blink rate was not found to differ significantly over topics for all subjects. The topics, however, did significantly affect individual subjects' blink rates differentially--that is, while blink rates varied between topics for a subject, not all subjects varied consistently.

Kanfer suggests that perhaps EBR is more sensitive than verbal rate to momentary anxiety, "so that the special pertinence of unique events recalled during discussion of a topic may result in less uniformity over topics for all Ss" (p. 346).

Kanfer also obtained data from the MMPI, Taylor Manifest Anxiety Scale (MAS), Cornell Index, and psychiatrists' ratings of their patients' degree of conflict in relationships with family, the opposite sex, and attitudes toward current illness. Some significant correlations were found between verbal rate and MMPI scale scores (Hs, D, Po, Pt, Si), as well as between EBR and psychiatrist ratings of conflict. Kanfer notes that clinical ratings are probably often based on observations of somatic behaviors (which would include eye blinks), hence the correlation. This notion could be extended to include everyday ratings or judgments made in interpersonal interactions in general. It is not uncommon to intuitively make judgments about another person's emotional state. However, there is usually a large degree of qualitative and quantitative uncertainty about what it is that is being judged, even in professional clinical ratings. Terms such as "upset," "uptight," "tense," "anxious" and "moody" are often used interchangeably as catchalls for describing and making judgments about affectual states. EBR may be found to be a physiological criterion which can add some quantifiable information for making these affectual judgments.

Another study which lends some support to the use of EBR as a physiological criterion was that of Appel, McCarron, and Manning (1968). They investigated the possibility of using EBR as a behavioral index of threat. Thirty counselors at a counseling and guidance institute were subjected to a high threat and a low threat situation, and EBR's were

determined. A comparison was then made between the ten highest eye blink (HEB) Ss and the ten lowest eye blink (LEB) Ss. It was found that the HEB group showed a greater decrement in blink rate for the low threat situation that the LEB group which showed no change in blink rate. Ss were also given Taylor's MAS with resultant correlation of scores on the scale to eye blinks being nonsignificant. Appel et al (1968) offer the following interpretations: Lacy's (1950) findings indicate that Ss demonstrate organized and consistent individual patterns of somatic reactions to stress; perhaps the LEB Ss are persons that are no less aroused than the HEB group, but they do not use eye blinks as a modality for expressing tension. A second interpretation offered is that the HEB group is much more sensitive to conditions of threat, implying that perhaps there are different thresholds of arousal. With regard to the nonsignificant correlation between eye blinks and MAS scores, Appel et al (1968) suggest that EBR may be the result of an unconscious component of reactivity to threat. There is also the possibility that the MAS is not sensitive to the more situational, momentary reactivity to which the EBR may be sensitive. Further support for EBR varying with arousal comes from the work of Felipe and Mahl (1969). They examined the relationship between blinking and arousal by manipulating the arousal variable in a conditioning task. Sexual pictures and landscape pictures were used as the two unconditioned stimuli. The conditioned stimuli were an auditory stimulus and a visual stimulus. The sexual pictures elicited significantly more blinks than the landscape pictures. After conditioning, both CS's elicited more blinks when conditioned to the sexual pictures than when conditioned to the landscape pictures. There was no difference in EBR

between the two CS modalities.

More recently, Hare, Wood, Britain, and Shadman (1971), and Hare, Wood, Britain, and Frazelle (1971), obtained EBR results which are to some extent inconsistent with those of the above studies. Ss were shown slides of homicide victims, nude females, and neutral objects. EBR (plus several other physiological measures--skin conductance, heart rate, and respiration rate) was recorded. EBR was recorded for periods preceeding, during, and after presentation of each slide. A significant decrease in blink rate was obtained for the three slide types during presentation. This was followed by an increase in the post-period to a rate equal to or greater than the pre-period rate. In addition, the decrease during presentation tended to be greater for the homicide and nude slides than for the object slides. However, when the decrease and subsequent increase in EBR's were averaged for each slide type, it was found that the mean "ocular responses" for the homicide and nude slides were significantly greater than for the object slides. This was true for both male and female Ss (the effect due to sex was not significant). Hare, Wood, Britain, and Frazelle (1971) make an important note in their discussion of the results:

> Although viewing the slides was generally associated with a decrease in both heart rate and blink rate, the warning that a slide series of nude, homicide, and object slides was about to be presented produced an increase in the activity of both systems. The large increase in blink rate is especially noteworthy. What this suggests is that blink rate, like heart rate, may increase with increased emotional arousal and decrease with attentiveness to environmental stimulation (p. 22).

Attention to a task is definitely a factor that may influence blink rate: studies of EBR and fixation or attention-like tasks (e.g. Walter,

1941; Drew, 1951; Hall, 1941; Poulton and Gregory, 1952) have obtained results which lend support to this position. However, this still does not explain the inconsistency with results such as those of the Felipe and Mahl (1969) study, nor the Appel et al (1968) study with threat, where attending to the environment could be considered important if not crucial to the individual.

There may have been a methodological artifact involved in the Hare et al studies. They measured EBR by electrodes attached to the eyes, giving the Ss a clear indication that eye measurements of some kind were probably being taken. Since the Ss were shown material of a strongly affective and socially sensitive nature, perhaps Ss tended to be more aware of their responses as soon as the presentation of the slides began in order to hide any indications of being aroused by the stimuli. The data do not refute the idea of a connection between EBR and emotional arousal.

A study by Thomas (1972) lends additional support to the use of EBR as a physiological indicator of arousal. Thomas recorded blink rates for a group of critically ill hospital patients, a group of non-critically ill patients, and a control group, while Ss listened to a tape with a neutral content and a tape with a medically related content. He found a significant difference in blink rates for the critically ill group between the two taped passages, but no differences for the other two groups. Presumably, the critically ill patients were sufficiently sensitive about their illness that they became aroused in listening to the medically related passage, resulting in an increased EBR.

A few other studies have obtained results which indirectly lend

support to the use of eye blinks as a measure of arousal. Antrobus, Antrobus, and Singer (1964), investigated eye movements and blinking during various cognitive "episodes." These episodes included (1) generating and suppressing a wish; (2) relaxed (passive) and active thinking; and (3) moving and static visual imagery with eyes opened and closed. The results were rather intriguing. There were significantly more eye blinks (and eye movements) for wish suppressing, active thinking, and visualizing moving imagery. In light of the literature on the association of blinking and emotional arousal, Antrobus et al consider interpreting their results in terms of a "general activation effect." They suggest that this high level of activation may involve, or be indistinguishable from a high rate of cognitive change (as in the tasks of the study); or that the ocular activity is related to an emotional response to instructions to carry out a difficult task. They cite a speculative implication of interest: the "shifty eyes of the neurotic," a psychiatric sign of distress, may in fact be the result of attempts to break up and suppress unpleasant or anxiety provoking thoughts.

Weitzenhoffer (1969) investigated EBR with regard to hypnosis. He found a significant decrement in EBR for Ss demonstrating hypnotic or hypnotic-like behaviors. This reduced EBR may be related to some unique aspect of the hypnotic state. However, the results could adequately be explained by an arousal or activation level mechanism as described above. Relaxation is an integral part of the hypnotic procedures, and it includes what Antrobus et al (1964) called passive thinking. If arousal from a base level tends to increase EBR, perhaps reduction of activation below the base level tends to decrease EBR.

Schwartz and Stern (1968) found an association between eyelid tremulousness or flutter and depression. They also indicate that "eyelid flutter can readily be demonstrated in normal Ss under conditions of fatigue, anxiety, and sleep deprivation" (p. 500).

The data point in a direction of arousal leading to increased EBR, but there is still some question as to the nature of the arousal and what it means. Ponder and Kennedy (1927) talked about arousal in terms of excitement, anger, tension, and anxiety. Blinking was seen as a behavioral means for dissipation of nervous energy that builds up with tension. Meyer (1953) proposed a theory along this line based on the interaction of neural activity between pathways in close proximity. He indicates that the pathway for ocular activity is surrounded by high activity pathways including the face and hands. Hence, any muscular tension in these areas can be reflected in ocular blink responses. Meyer, Bahrick, and Fitts (1953) found that the use of a monetary incentive for performance in a visual pursuit task brought about an increased frequency of blinking during the intertrial intervals. Meyer proposes that this is due to a general increase in muscular tension; (incentive leads to sustained high level performance, resulting in increased tension).

Meyer et al (1953) also looked at anxiety and blink rate, and hypothesized that EBR should be higher for anxious Ss since anxiety is accompanied by higher levels of muscular tension and activity. Ss were given the MAS and the Rotter Sentence Completion Test. They found no significant correlation between scores on the MAS and blink rates, but did find a significant correlation between EBR and a maladjustment index based on the Rotter test. These results disagree with Taylor's

(1951) results using the MAS. She found that Ss demonstrating high manifest anxiety on her scale showed a greater frequency of conditioned eyelid responses than did a low anxious scoring group. Taylor used the extreme scores for her Ss which may explain part of the discrepancy. However, Hilgard, Jones, and Kaplan (1951) in a similar study used extreme scores on the Taylor inventory in an eyelid conditioning task and found no significant correlation between anxiety level and conditioned blink response. But Hilgard et al (1951) did find a significant correlation between anxiety level and performance on a discrimination learning task. Presumably the high anxious persons are more psychologically sensitive to, or disturbed by, the CS. They therefore maintain a greater generalization gradient than low anxious persons.

A factor which may be open to question in the Meyer et al (1953) procedure is the use of EBR during the rest periods rather than performance periods. It seems tenuous to use these EBR's to look at anxiety, since it is very likely that anxiety level during rest is different than during performance. The significance of the positive correlations between EBR and the Rotter scores is also open to question. The Rotter tests were all scored by one judge, "an expert clinician." Scoring a Rotter test requires sufficiently subjective judgments that several judges should be used in order to provide some indication of reliability.

Jackson and Bloomberg (1958) offer a caution with regard to measures of anxiety. They studied various acceptable measures of anxiety in an attempt to find the extent to which they reflected a single dimensional factor. Four measures were used in their study: (1) the Wechsler-Bellevue digit span score, (2) the Taylor MAS, (3) two one-

minute observations of blink rate while Ss viewed a drawing of a triangle, and (4) the fingerprint stain test of palmar sweating. These measures were administered to 37 male, V. A. hospital patients. The results showed no significant intercorrelations. Jackson and Bloomberg suggest that the manifestations of anxiety are multidimensional, and the dimensions may not even be correlated; hence, caution should be exercised in accepting any one measure as an indicator of generalized anxiety. This point is well worth bearing in mind. Another point that should be kept in mind is the applicability (validity and reliability) of the instrument used for measuring anxiety. For example, the use of the digit span subtest from the Wechsler scale as a measure of anxiety is unwarranted. Although it appears to be susceptible to anxiety in the testing situation, this does not necessarily mean it is a sensitive, validated measure of general anxiety.

Eye blink studies which have attempted to relate the physiological blink response to a verbal affect index have tended to use the MAS. Results have been inconsistent, if not generally negative. Lykken and Katzenmeyer's Activity Preference Questionnaire (1968), has recently been used in examining some physiological correlates of anxiety with some degree of success, but also with some inconsistency (Hare, 1971; Dengerink, 1971).

With both these scales, there is a limiting factor in that they measure more of a general anxiety, rather than a momentary, situational anxiety. Anxiety or any other affect state is subject to fluctuations. An affect score for an individual taken two or three weeks before an experiment will more than likely not provide an accurate indication of the affect state at the time when the individual is participating in

the experiment.

Zuckerman and Lubin (1965) designed the Multiple Affect Adjective Checklist (MAACL) (Appendix A) with this problem in mind. They developed self-report scales which purport to measure momentary or situational changes in verbalizable anxiety, depression, and hostility as well as the more general levels of these affects.

Zuckerman and Lubin (1965) made up a list of affectively toned adjectives for the anxiety scale. Adjectives which differentiated high and low anxiety groups according to psychiatric interviews, and which showed significant changes in checking frequency while Ss were under a hypnotically suggested anxiety state were selected (Zuckerman, 1960). The depression and hostility scales were developed in a similar manner. The depression items were selected according to differentiation based on psychiatrists' ratings of inpatients according to "severely" or "moderately" depressed and normals. The hostility items were selected according to responses of college freshmen in a hostility induction procedure with hypnosis (Zuckerman, Lubin, Vogel, and Valerius, 1964).

The MAACL has two forms, a General-form and a Today-form; the former measures general affect, while the latter measures current or "now" affect. The only difference between the two forms is in the instructions: the General-form calls for checking items according to how the person generally feels, the Today-form according to how he feels today or now. Although the MAACL is still essentially at an experimental stage, numerous validational studies have been conducted including school examination anxiety, hypnotically induced anxiety, perceptual isolation, stage fright, pictorial stimuli, clinical observations, drug studies, and correlations with other tests (Appendix B).

A pictorial study (Zuckerman et al (1964) looked at affect ratings using a documentary film about a slaughterhouse. The anxiety and depression scales were used. A pre- and post-film scores comparison found significant increases on both scales for females but not for males.

Several studies have compared clinical ratings to scale rating. Zuckerman and Lubin (1965) summarize the results as follows: (1) anxiety and depression scales were significantly related to anxiety and depression clinical ratings, (2) there was little differentiation between anxiety and depression in the scale or in the clinical ratings, (3) the highest correlation occurs between the anxiety scale and clinical ratings of anxiety, (4) the hostility scale and clinical ratings for hostility were not significantly correlated.

The studies of school examination anxiety scores showed significant increases in anxiety for examination days. And studies of theater performers showed significant increases in actors' scores just before their performances (Zuckerman and Lubin, 1965).

Finally, Herron (1969) cautions that the scale may be susceptible to response set, but Zuckerman and Lubin (1965) indicate that their data show that the scales are not subject to response set influence, especially the Today-form.

The current investigation used two types of affective stimuli--automobile accident, intended to be highly arousing, and landscape scenery, intended to be less arousing. Each type of stimulus content was presented in two modalities--visual (films), and auditory (tapes). EBR's were measured during each stimulus presentation. The MAACL Today-form was used to obtain the subjective anxiety ratings; a pre-

and post-test was given to each S.

In light of the previous findings in the literature, it was expected that EBR would be greater for the more arousing stimuli--automobile accidents, than for the more neutral landscape stimuli. If EBR is an indicator of physiological response to arousal, then the effect should hold across the different modalities, though probably at different relative rates; and if this arousal is related to anxiety due to the affective stimuli presented, then the effects should be reflected by differences in MAACL anxiety scores between pre- and post-stimulus ratings.

Each S was given an opportunity at the end of the experiment to rate her emotional reaction to the stimuli presented by indicating a number on a scale ranging from very pleasant to very unpleasant (1 to 21). This information was obtained in order to examine Ss' impressions of the stimuli, and perhaps provide a clearer picture of arousal, if any.

The sex factor was eliminated from the design for this study and only females were used since previous studies have found significant effects with females but not with males. For example, the Zuckerman et al (1964) study cited above found anxiety scale score differences for females but not for males. Weiner, Weber and Concepcion (1972) found significant sex differences in performance times on a simple circle drawing task which was followed by positive and negative stories presented auditorily. The female Ss decreased their speed in completing the task when it was followed by a negative story, while male Ss maintained a constant speed.

CHAPTER II

METHOD

Subjects

Forty volunteer undergraduate female students at Oklahoma State University served as Ss. Ten Ss were randomly assigned to each of four groups: visual accident, visual landscape, auditory accident, auditory landscape.

Apparatus and Materials

Visual Stimuli

Two $2\frac{1}{2}$ minute color films were used. The accident film showed the lead-up to an accident and the victims at the scene of the accident. The film was a safety education training film entitled Wheels of Tragedy (1964). The accident victims in the film were actual victims, photographed after the accident, including some very bloody scenes. The landscape film consisted of scenes of forest, mountains, and meadows, with squirrels playing in the fields. The title of the film was A Visit to a Valley (1971).

Auditory Stimuli (Appendix B)

The two films were shown to a group of psychology graduate students and two faculty members, who were told to write a description of

the material they were shown. Those descriptions which were common to most people were selected as the verbal counterpart of the films. The two verbal description passages were then recorded on tape cassettes with each recording $2\frac{1}{2}$ minutes in length.

Multiple Affect Adjective Checklist (Appendix A)

The checklist consisted of 132 items, requiring the S to check every item that describes "how you feel right now."

Emotional Reaction Scale (Appendix C)

This was a Likert-type scale ranging from 1 to 21, corresponding to a range of very pleasant to very unpleasant, with S instructed to indicate her emotional reaction to the stimulus by circling a number from 1 to 21.

Projection Equipment

Projection equipment consisted of a Graflex 16 mm projector. The projection screen was 72.3 cm by 56 cm, and set into a projection box 1 meter by 1 1/3 meter by 1 2/3 meter.

Tape Recorder

Tapes were played on a Sony 110A Cassette recorder.

Video Equipment

Recording equipment consisted of a Sony Videocorder. The camera was placed inside an adjoining observation room for recording through a one-way mirror.

Procedure

Each S was brought into the experimental room by the experimenter. She was seated at a desk in front of, and facing the projection box. E sat several feet behind S, at a table with the projector and cassette tape recorder. E then read S the instructions (Appendix D).

Each S was told the content of the material she would be exposed to, and how it would be presented (a film or a tape, of an automobile accident or woods and nature). The S was told that the purpose was to obtain her reaction to the material and that she would be asked to fill out some forms and, in addition, would be videotaped. All Ss were told that they were free to leave the experiment at any time if they wished. Each S was instructed to begin watching the screen when E told her to "Fixate on the screen," to watch the screen during the presentation of the material, and to continue watching the screen after termination of the material until E said "Stop."

After the instructions, the S was given an MAACL and directed in completing the form. While S filled out the MAACL, E left the room, and went into the adjoining observation room and turned on the video recorder. E returned to the experimental room while S was finishing the scale, and after she finished, told her to put on a set of headphones. The visual condition Ss were told the purpose of the headphones was to reduce outside noises. The S was then told to fixate on the screen. Time was recorded from a stopwatch. After a 20 second fixation period, the $2\frac{1}{2}$ minute stimulus was presented with a 20 second fixation period immediately following the stimulus. The S was then again given the MAACL, during which E left the room, returning when S

was finishing the scale. After finishing the scale, S was given the emotional reaction scale.

Schematic of Procedure

/Instructions/MAACL/ Base /Stimulus/Re-Base/MAACL/Emotional Reaction/
20" 150" 20"
Period 1/Period 2/Period 3

Experimental Design

The eye blink data were analyzed within a 2x2x3 repeated measures analysis of variance with the repeated measures over periods (base-period, stimulus-period, re-base-period), using EBR as the dependent variable with modality (visual vs. auditory) as one factor, and content (accident vs. landscape) as the other factor. The anxiety test data were analyzed within a 2x2 analysis of variance with anxiety score differences between pre-stimulus and post-stimulus scores as the dependent variable with modality (visual vs. auditory) as one factor, and content (accident vs. landscape) as the other factor. The emotional reaction data were analyzed within a 2x2 analysis of variance, with reaction rating score as the dependent variable with modality (visual vs. auditory) as one factor, and content (accident vs. landscape) as the other factor.

CHAPTER III

RESULTS

The 2x2x3 ANOV with EBR as the dependent variable showed significant main effects for modality of stimulus presentation (auditory vs. visual), F (1,36) = 8.79, $p<.01$; and for periods (base-period vs. stimulus-period vs. re-base-period), F (2,72) = 50.21, $p<.01$ (Table I). A significant interaction was found for modality by periods, F (2,72) = 13.03, $p<.01$; and for content by periods, F (2,72) = 4.14, $p<.05$ (Table I). Scheffé analysis of the interaction effects between modality and periods revealed a significantly higher EBR for the auditory mode than for the visual mode for period 2 (stimulus-period), F (2,72) = 12.36, $p<.01$ (Figure 2). In addition, EBR was higher for the auditory mode during period 2 than it was for the average of periods 1 and 3, F (2,72) = 16.95, $p<.01$ (Figure 1). Analysis of the interaction between content and periods showed EBR to be significantly higher for both content conditions (accident and landscape) during period 2 than for the average of periods 1 and 3, F (2,72) = 14.45, $p<.01$; and F (2,72) = 8.01, $p<.01$ respectively (Figures 1 and 3).

An examination of the differences between EBR for the auditory accident group and the visual accident group showed the auditory accident group to have a significantly higher EBR, F (2,72) = 16.32, $p<.05$ (Figure 1).

The planned comparisons between the contents (accident vs. land-

scape) for each modality revealed a significantly higher EBR for the auditory-accident group than for the auditory-landscape group, F (1,72) = 18.33, $p<.01$ (Figure 1).

The 2x2 ANOV for anxiety indicated a significant change in anxiety level for content of stimulus (accident vs. landscape), F (1,36) = 19.15, $p<.01$ (Table II). Examination of Figures 4 and 5 shows the mean anxiety change for the two accident groups (visual and auditory) to be in a positive direction, and the mean anxiety change for the two landscape groups (visual and auditory) to be in a negative direction.

The 2x2 ANOV for emotional reaction rating showed a significant difference between Ss' ratings according to content (accident vs. landscape), F (1,36) = 275.55, $p<.01$ (Table III), with the two accident group scores being greater than the two landscape group scores (Figure 6).

TABLE I

ANOV SUMMARY TABLE FOR EYEBLINK RATE

Source of Variation	df	MS	F
Between Subjects	39	96.06	
A (modality)	1	672.61	8.79 **
B (content)	1	239.98	3.15
AB	1	79.22	1.04
Subject W. Groups Error (between)	36	76.51	
Within Subjects	80	87.55	
C (trials)	2	1680.86	50.21 **
AC	2	436.18	13.03 **
BC	2	138.73	4.14 *
ABC	2	41.08	1.23
Cx Subject W. Groups Error (within)	72	33.48	

* F.95 (1,36) = 4.12
** F.99 (1,36) = 5.26
* F.95 (2,72) = 3.05
** F.99 (2,72) = 4.94

TABLE II

ANOV SUMMARY TABLE FOR ANXIETY
SCORE DIFFERENCES

Source of Variation	df	MS	F
A (sensory modality)	1	18.22	
B (content)	1	2325.62	19.15 **
AB	1	87.02	
Within Cell Error	36	121.43	

** F.99 (1,36) = 5.26

TABLE III

ANOV SUMMARY TABLE FOR EMOTIONAL
REACTION RATING

Source of Variation	df	MS	F
A (modality)	1	1.22	275.55 **
B (content)	1	1677.02	2.57
AB	1	15.62	
Within Cell Error	36	6.09	

* F.95 (1,36) = 4.12
** F.99 (1,36) = 5.26

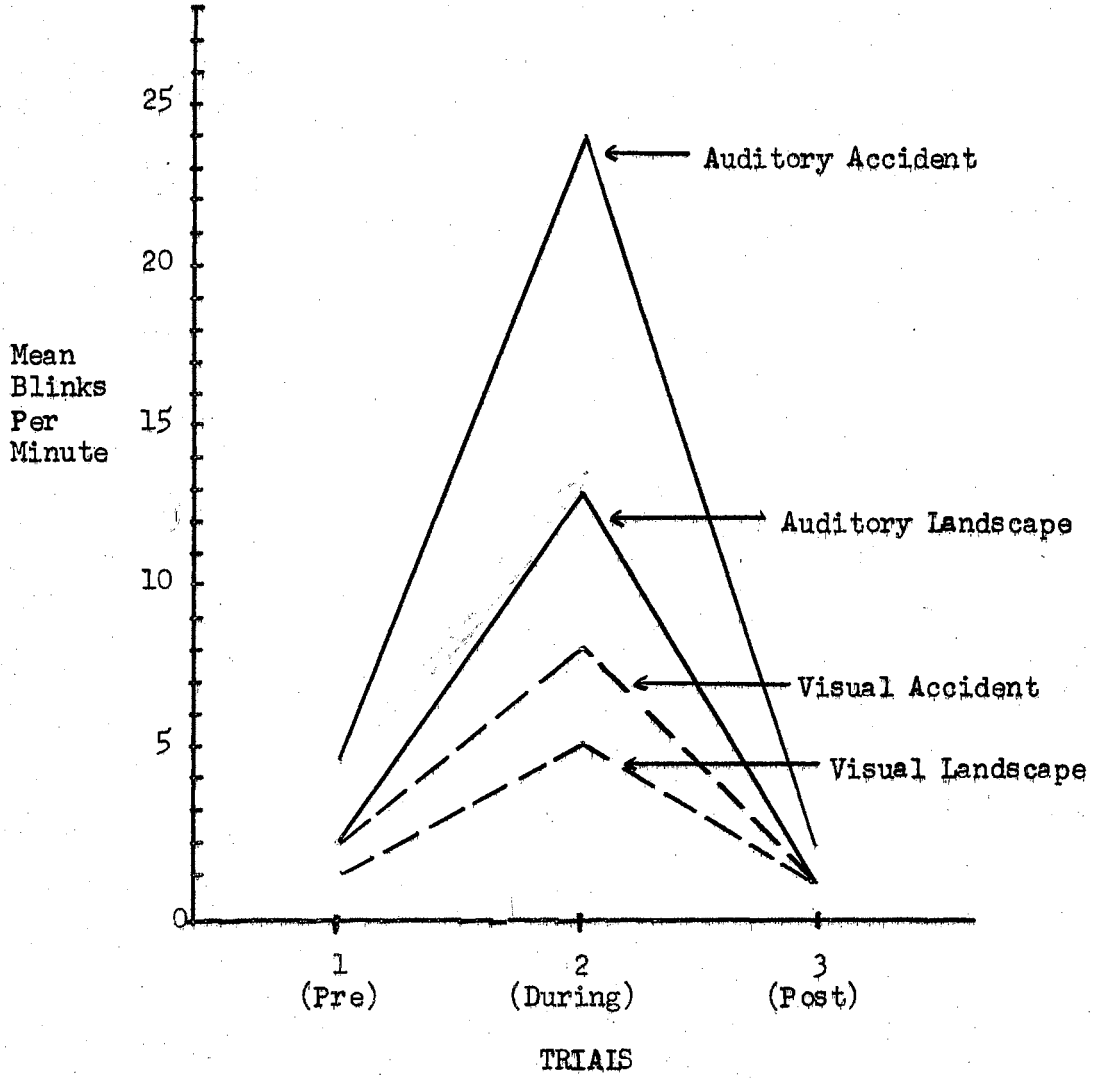

Figure 1. Mean Eye Blink Rate for the Four Treatment Groups, Across Trials

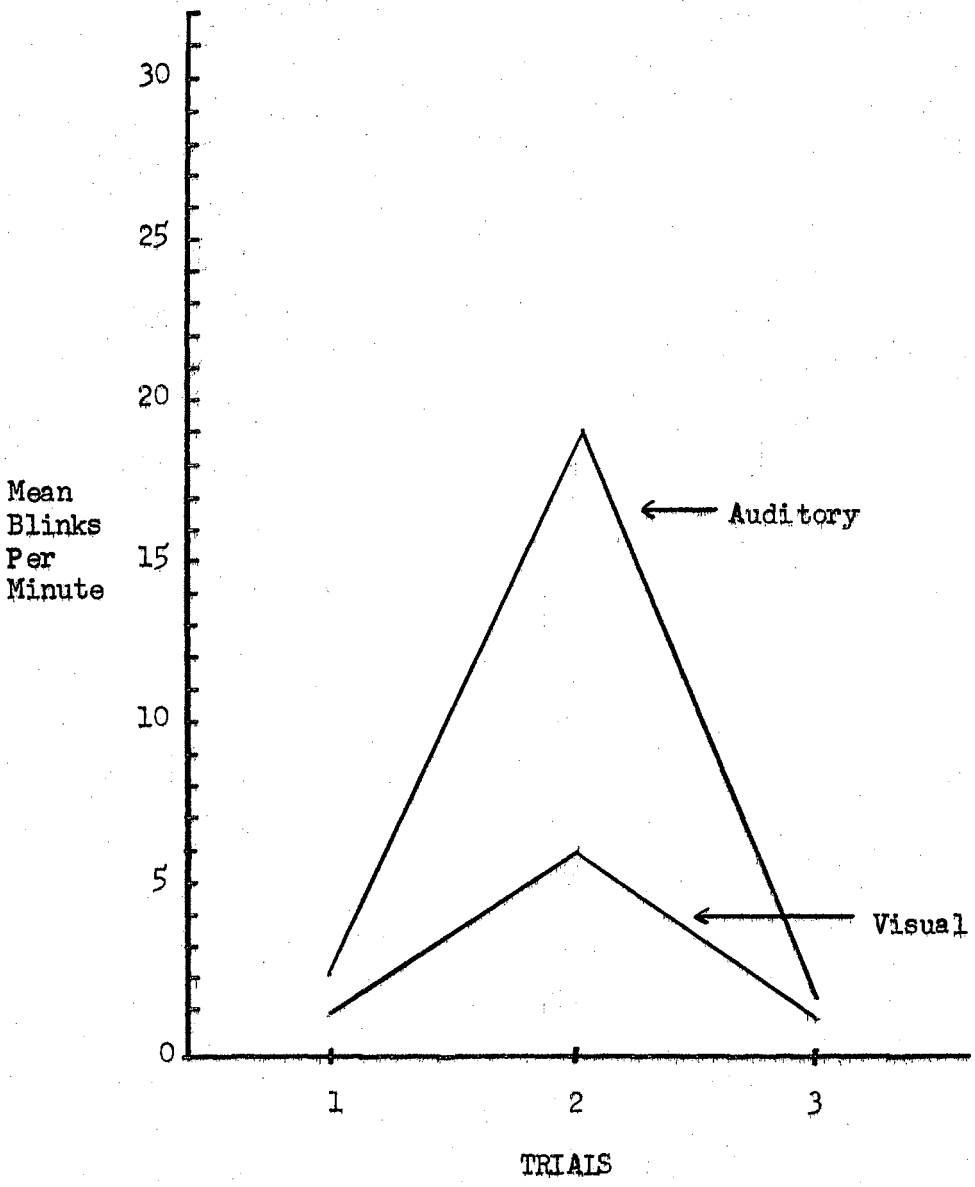

Figure 2. Mean Eye Blink Rate for the Two Modalities, Across Trials

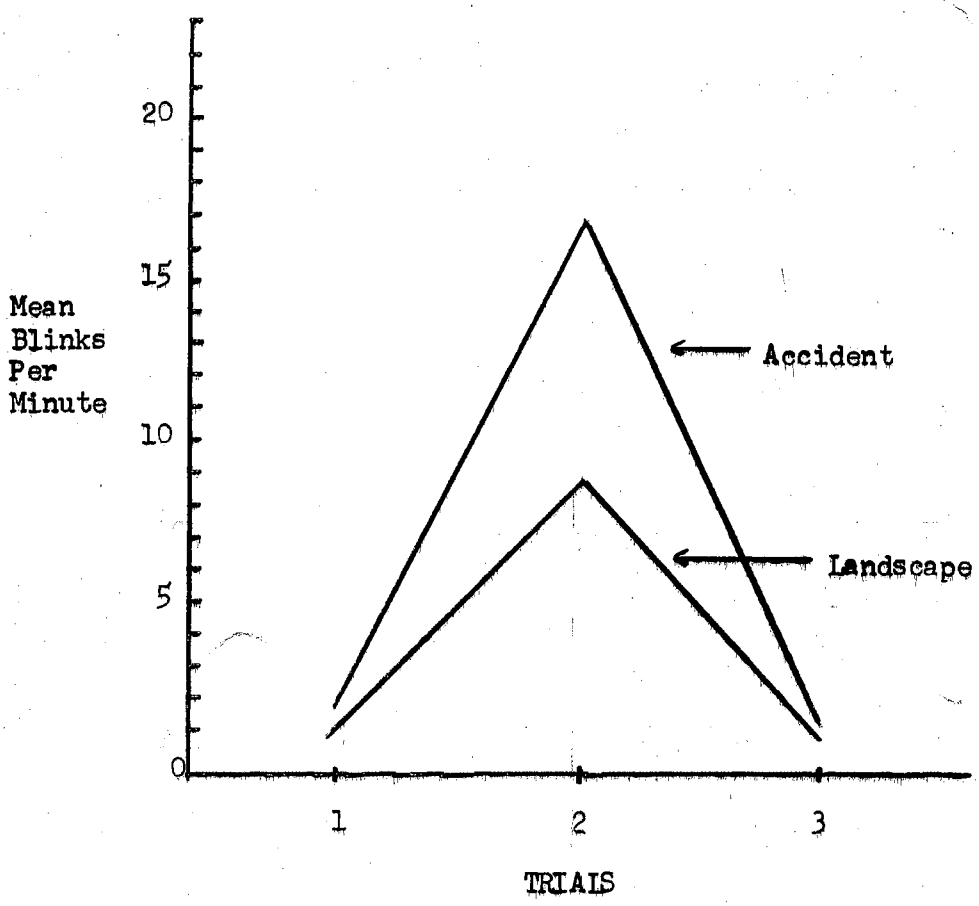

Figure 3. Mean Eye Blink Rate for the Two Content Groups, Across Trials

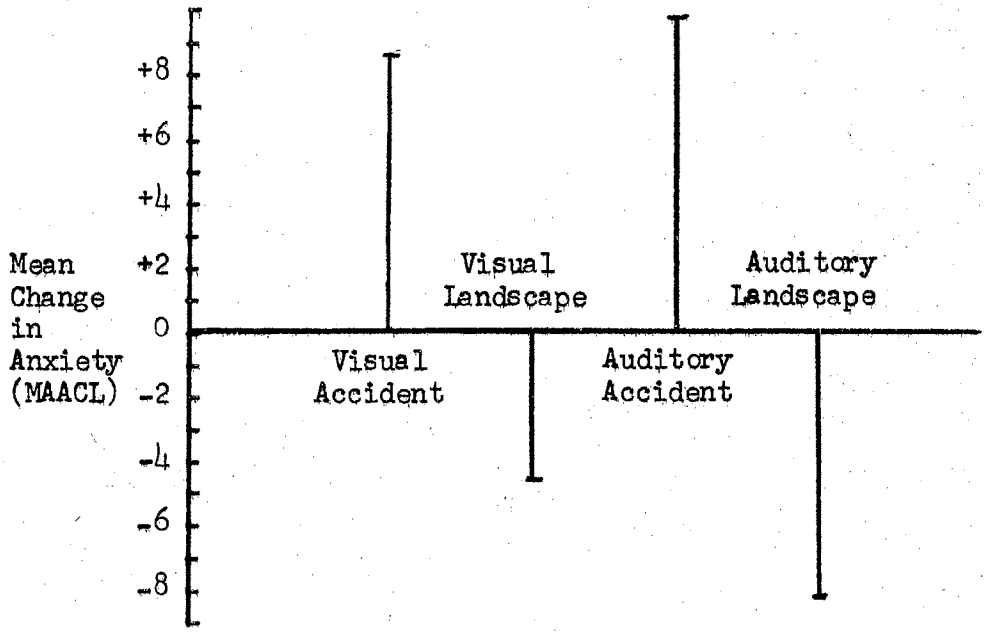

Figure 4. Mean Anxiety Score Differences, Pre-Stimulus Minus Post-Stimulus

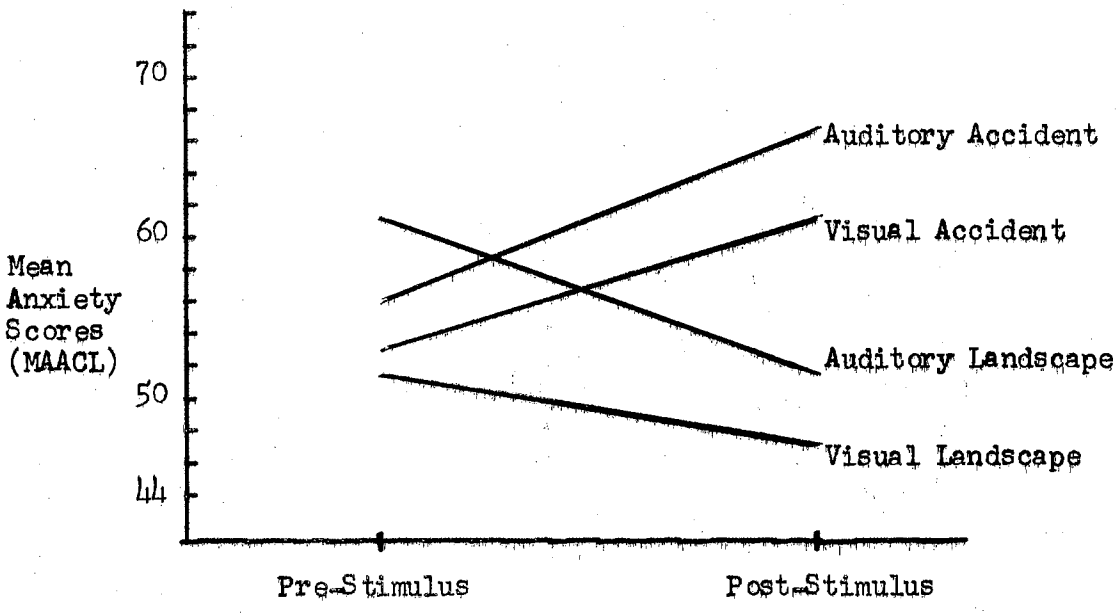

Figure 5. Mean T-scores for the Four Treatment Groups, Before and After Stimulus

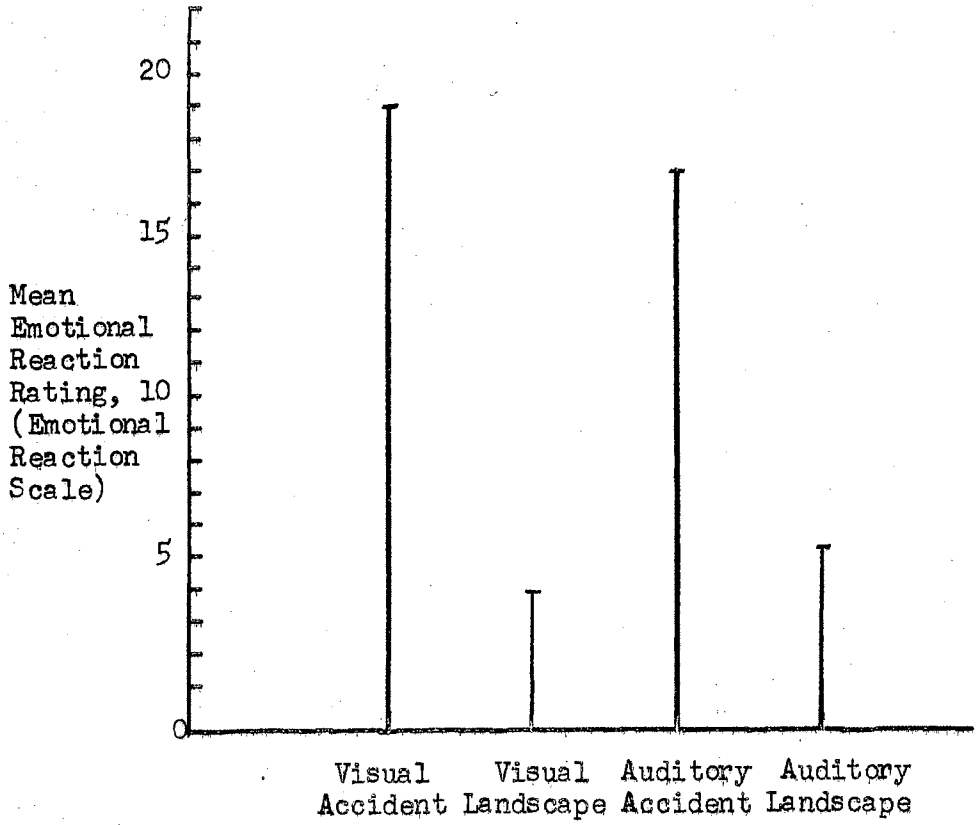

Figure 6. Mean Emotional Reaction Rating Score for the Four Treatment Groups

CHAPTER IV

DISCUSSION AND CONCLUSIONS

The results partially supported the hypothesis that EBR would be higher for the more arousing affective stimuli in that the auditory accident group demonstrated a higher blink rate than the auditory landscape group, though this difference did not occur for the visual groups. Figure 1, however, shows that although there was no significant difference between the visual groups, the effect was in the same direction as for the auditory groups.

Perhaps, as Ponder and Kennedy (1927), suggested, arousal is associated with some kind of nervous tension or energy which is dissipated by the organism, and blinking is one of the mechanisms for this dissipation. This however, does not fully explain why only the auditory accident group demonstrated a significantly higher EBR than the other groups. Both the auditory accident group and the visual accident group demonstrated significant increases in anxiety, and significantly higher emotional reaction rating scores than the two landscape groups (which actually decreased in anxiety as well as showing low emotional reaction ratings).

Both visual modality groups had significantly lower EBR's than the two auditory groups (the groups within each modality taken together, Figure 2), with no difference between the decreased EBR's for the two visual groups and the auditory landscape group (Figure 1). The problem

may be that in the visual conditions it was necessary for the Ss to attend visually to the stimuli presented. Similar results occurred with attention for Hare et al (1971), Ponder and Kennedy (1927), Walter (1941), Drew (1951), Hall (1941), Poulton and Gregory (1952). It seems feasible for survival, that an organism receive as much information as possible from the sensory organs with which it is attending to the environment. Blinking would reduce the amount of material that can be taken in per unit time when the organism is attending to a visual task; hence, the result may be a tendency to suppress blinking. Then, if an arousing stimulus is presented visually, there will be a competition in the visual system between increased blinking as a means of tension release, and suppression of blinking in attending to the visual task. Since it would be more important for the organism's survival to attend maximally, then it is likely that the attention process would take higher priority, keeping blinking at low levels.

In any case, it appears that Ss experienced approximately equal amounts of anxiety and similar emotional reactions to a given affective stimulus, but responded differently with regard to the measured physiological index, EBR. This indicates that some factor differentially affected one of the modalities. What is being suggested here is that attention in the visual system may be the factor inhibiting expression of arousal through that same system in the form of blinking.

Arousal and attention as described here may be associated with blinking in another manner. Weber (1972), has suggested that blinking may serve as an erasing mechanism for visual imagery. An organism might want to erase imagery for two reasons: (1) in order to make room for processing new incoming information, or (2) to eliminate unwanted

or disturbing images. In this experiment the auditory accident group's higher blink rate may indicate elimination of disturbing imagery as well as maintenance of processing space. The auditory landscape group's lower EBR may indicate blinking at the level necessary to maintain processing space. The visual groups, again, might be caught in a dilemma--blinking to erase versus suppression of blinking while attending, with suppression winning out. Blinking in the visual groups would then occur only at the level necessary to maintain processing space, a rate not significantly different from that of the less aroused auditory landscape group. For example, if processing space is x seconds long, then a blink rate of 1/x blinks per second is necessary to maintain that space. With disturbing imagery, however, a blink would occur more quickly in order to erase the imagery, for example, at x - y seconds. The EBR for this latter case would be 1/x - y blinks per second, and hence higher than the rate for the non-disturbing imagery.

The erasure interpretation has a shortcoming--it does not explain why a positively arousing stimulus, e.g. sexual, can be associated with increased blink rates, as in the Felipe and Mahl (1969) study. Perhaps erasure should be looked at as a mechanism of cognitive functioning. Antrobus et al (1964) found more eye blinks for cognitive functions involving active thinking, thought suppressing, and visualizing moving imagery than for the counterparts of these functions. A cognitive function explanation such as this might more adequately account for the differences in results among the studies.

The results of this investigation demonstrated an impressive consistency among the different measures during the experimental manipulations. Both measures of arousal (emotionality) that were used yielded

results in the same direction. One measure was the MAACL with its built-in unobtrusive measure (score is dependent upon items checked plus items not checked), while the other measure was a straight-forward indication of what the S felt was her reaction. Although the blink response was a measure in the physiological realm, it too was sensitive to the experimental manipulations and varied in a direction consistent with the two psychological measures of emotionality, (barring the apparent confounding in the visual modality).

This consistency among the different measures used is worthy of note for two reasons. First, it tends to show a decreased probability that experimental bias in the form of demand characteristics were operating. Second, these results indicate that emotionality is subject to momentary changes. This concept of momentary emotionality often receives less attention than general emotionality, in both research and clinical settings.

The MAACL anxiety scale is a valuable step in the direction of examining situational variables. The Today-form was sufficiently sensitive to detect momentary changes in anxiety--in this case over a mere $2\frac{1}{2}$-minute period of time. In addition, administration and scoring of the scale is very simple and takes only a few moments in each case. The value of such a scale in research and diagnostic testing is evident.

The results from this study demonstrate that the blink response warrants consideration and further investigation as a valuable indicator of physiological responding. The fact that the results were not conclusive across all conditions only indicates that the eye blink response, like other physiological indices, is complex: arousal of the organism, cognitive content, cognitive functions, and attention may all

be applicable conceptual frameworks for describing this response. Separating and controlling the factors in these frameworks is crucial for a meaningful and adequate description.

CHAPTER V

SUMMARY

This study investigated the use of the eye blink response as an indicator of the physiological response to affective visual and auditory stimuli, and the relationship between the blink response and self-report anxiety level ratings. Previous work in the area has generally shown that arousal is accompanied by an increase in eye blink rate.

This study used a film and tape recorded description of an automobile accident as the strong, negatively affective stimuli, and a film and tape recorded description of woods and nature scenery as the more neutrally affective stimuli. It was hypothesized that the accident film and accident tape would elicit higher EBR's than the nature scenery film and tape respectively. In addition, it was expected that anxiety level scores and emotional reaction ratings on two self-report scales (MAACL and Likert-type scale) would reflect the arousal levels associated with the EBR's.

Forty undergraduate females were used as Ss. Ten Ss were randomly assigned to each of four groups: visual accident, visual landscape, auditory accident, and auditory landscape. Each S was presented one of the four stimuli. The stimulus lasted $2\frac{1}{2}$ minutes in each case. All Ss were given the MAACL immediately before and after the stimulus, and in addition each S rated her emotional reaction to the stimulus, as to how pleasant or unpleasant.

The results indicated that the accident groups experienced higher anxiety and unpleasant emotional reactions than the landscape groups. The auditory accident group displayed significantly higher EBR than the auditory landscape group, but the visual accident group did not show a significantly higher EBR than the visual landscape group. Hence, the hypothesis was only partially supported.

It was suggested that increased EBR for the auditory accident group accompanied arousal for two possible reasons: (1) as a means for dissipation of tension, or (2) as a means for elimination of disturbing visual imagery. It was further suggested that this effect did not occur for the visual modality because visual attention during a visual task tends to inhibit the blink response in order to ensure maximum reception of information, hence blink rates for both visual groups would be at a minimal level.

In view of the results it was felt that the blink response warrants further consideration and investigation as a physiological index. In addition, the MAACL proved to be a valuable, sensitive instrument for detecting momentary changes in anxiety.

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APPENDIXES

APPENDIX A

MULTIPLE AFFECT ADJECTIVE CHECKLIST

Today Form

By Marvin Zuckerman
and
Bernard Lubin

Name_____ Age_____ Sex_____

Date_____ Highest grade completed in school_____

DIRECTIONS: On this sheet you will find words which describe different kinds of moods and feelings. Mark an X in the space beside the words which describe how you feel now--today. Some of the words may sound alike, but we want you to check all the words that describe your feelings. Work rapidly.

1. __ active
2. __ adventurous
3. __ affectionate
4. __ afraid
5. __ agitated
6. __ agreeable
7. __ agressive
8. __ alive
9. __ alone
10. __ amiable
11. __ amused
12. __ angry
13. __ annoyed
14. __ awful
15. __ bashful
16. __ bitter
17. __ blue
18. __ bored
19. __ calm
20. __ cautious
21. __ cheerful
22. __ clean
23. __ complaining
24. __ contented
25. __ contrary
26. __ cool
27. __ cooperative
28. __ critical
29. __ cross
30. __ cruel
31. __ daring
32. __ desperate
33. __ destroyed
34. __ devoted
35. __ disagreeable
36. __ discontented
37. __ discouraged
38. __ disgusted
39. __ displeased
40. __ energetic
41. __ enraged
42. __ enthusiastic
43. __ fearful
44. __ fine
45. __ fit
46. __ forlorn
47. __ frank
48. __ free
49. __ friendly
50. __ frightened
51. __ furious
52. __ gay
53. __ gentle
54. __ glad
55. __ gloomy
56. __ good
57. __ good-natured
58. __ grim
59. __ happy
60. __ healthy
61. __ hopeless
62. __ hostile
63. __ impatient
64. __ incensed
65. __ indignant
66. __ inspired
67. __ interested
68. __ irritated
69. __ jealous
70. __ joyful
71. __ kindly
72. __ lonely
73. __ lost
74. __ loving
75. __ low
76. __ lucky
77. __ mad
78. __ mean
79. __ meek
80. __ merry
81. __ mild

82. __ miserable
83. __ nervous
84. __ obliging
85. __ offended
86. __ outraged
87. __ panicky
88. __ patient
89. __ peaceful
90. __ pleased
91. __ pleasant
92. __ polite
93. __ powerful
94. __ quiet
95. __ reckless
96. __ rejected
97. __ rough
98. __ sad
99. __ safe
100. __ satisfied
101. __ secure
102. __ shaky
103. __ shy
104. __ soothed
105. __ steady
106. __ stubborn
107. __ stormy
108. __ strong
109. __ suffering
110. __ sullen
111. __ sunk
112. __ sympathetic
113. __ tame
114. __ tender
115. __ tense
116. __ terrible
117. __ terrified
118. __ thoughtful
119. __ timid
120. __ tormented
121. __ understanding
122. __ unhappy
123. __ unsociable
124. __ upset
125. __ vexed
126. __ warm
127. __ whole
128. __ wild
129. __ willful
130. __ wilted
131. __ worrying
132. __ young

APPENDIX B

AUDITORY STORIES

Accident Story

Cruising down a modern four-lane highway in a late model automobile are two men who appear to have been traveling for some time. The road has become dreary and monotonous and the passenger has fallen asleep, peacefully dreaming, trusting the driver to remain alert. However, the long trip has taken its toll on the driver also and he is slowly drifting off to sleep. His eyes flutter, fighting to remain open, but the comfort of sleep soon overtakes him, and his head nods and his chin drops to his chest. Suddenly, the passenger awakes and to his astonished horror sees the car rapidly advancing into the rear of a giant semi-trailer! His face takes on the look of a terrified prisoner of fate! There is nothing he can do! He is trapped and headed for doom! That horrible last instant is the last he'll ever know. His face is paralyzed with panic as the car goes hurtling into the rear of the truck. The driver never awoke to meet his horrible death.

The state highway patrolmen, having been notified of the accident, rush to the scene finding when they arrive, a knarled, mangled, and twisted wreckage strewn over the highway. Surprisingly, the truck itself has very little damage. The accident has attracted several onlookers and a little dog looks on curiously.

As the patrolmen arrive, they are sickened at the sight. What once was an automobile is now a tangled mess of steel and upholstry. What once was a man is now a crushed and torn mass of flesh lying in a gorey pool of its own blood. His clothes have been partially ripped from his body during the impact. As the officers lift his mangled and limp body, the man's head droops revealing a portion of his head and

brain which has been crushed and destroyed leaving a bloody, gaping, cavity with dangling flesh and dripping with blood, coloring the pavement a dark red.

The second man lies with his neck jerked violently back as if broken. In his throat are several deep and vicious-looking puncture wounds. Blood runs down his face in a red stream, producing a frightening contrast with the purplish blue pallor of his still face, as it flows down to the green grass on which his broken body lies.

As the experienced patrolman writes out the report, his young partner appears very pale. It is obvious that he has become very sick and appalled at the ugly sight.

Landscape Story

It is a beautiful, bright and gloriously fresh morning to which the chipmunks first open their eyes. As they scamper about in the security of their little homes, nature is all around them in her finest dress. The chipmunks chatter incessantly as they play hide and seek in and out of the nooks and crannies in the rocks that form their home. Their energy seems infinite and their hunger insatiable as they eat their nuts and berries. One tiny chipmunk peers from behind an overhanging canopy of long grass looking as though he owns the world. Another, perhaps his mate, peeks out from behind a large boulder.

Across a peaceful meadow of tall waving grass and bending trees loom the majestic purple mountains above the valley. A gentle breeze sings through the trees proclaiming the beauty of the morning. The chipmunk occupies himself on a fallen tree limb, busily searching for additional tidbits for breakfast.

The spiraling pine trees stand tall and proud overlooking the grassy field. A clear blue stream winds lazily through the woods finding its way to a quiet pond in the meadow.

A small log arches across the pond providing a miniature bridge for nature's pets. Small white flowers sprinkle their petals among blades of grass beautifying, even more, the playground of the adventuresome creatures.

The soft summer breeze sends ripples of its breath through the tall willowy reeds of grass. A large flower in a negligee of white adorns the green field with her splendor.

Further in the field romp two frisky little ground hogs scurrying

in and out of their burrow. As they finish their game of tag, one suddenly sits up with his paws suspended to his chest and listens intently to an approaching deer.

Soon a young white-tailed doe bounds gracefully across the meadow enjoying the freedom of her world. Small red flowers dot the ocean of green grass in which the young doe frolics, her tail flipping happily behind her. The fragrance of the pine trees and soft green grass, give the crisp clean air a fresh, invigorating quality. A mood of peace and calm blends with the majestic scenery of the valley and mountains producing a wonderful restful feeling.

APPENDIX C

EMOTIONAL REACTION SCALE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Directions

We would like you to indicate your emotional reaction to the (tape) (film) by circling a number between 1 and 21, where numbers toward the low end indicate a pleasant reaction, with 1 corresponding to a very pleasant emotional reaction; and numbers toward the high end indicate an unpleasant reaction, with 21 corresponding to a very unpleasant emotional reaction.

APPENDIX D

INSTRUCTIONS

You will (listen to a tape about) (the woods and nature).
(be shown a film of) (an automobile accident).

We are interested in your reaction to the (tape), and will ask you to fill out some forms. In addition, you will be videotaped. This will be used only by the experimenters, and will be erased after the data are recorded from the tape. You are free to leave the experiment at any time if you wish. Before you begin (listening to the tape) (watching the film) you will be asked to fixate on the screen, at which time you should start watching the screen. During the (tape) (film) please look toward the screen, and after the (tape) (film) is over, continue watching the screen until I say stop.

APPENDIX E

RAW DATA

BLINKS PER 2½ MINUTES

Film-Accident

Pre	During	Post
3	19	2
4	37	3
3	7	1
1	22	5
11	41	7
1	16	0
5	14	8
2	25	3
0	3	1
6	24	1

Film-Landscape

Pre	During	Post
3	8	2
0	4	2
1	13	1
4	18	8
1	2	1
2	13	4
4	7	2
1	22	3
6	29	1
6	13	4

Tape-Accident

Emotional Reaction	Anxiety Pre	Anxiety Post
17	48	87
21	62	65
14	51	62
21	57	57
15	62	78
15	59	59
20	48	81
12	54	51
14	65	59
20	84	84

Tape-Landscape

Emotional Reaction	Anxiety Pre	Anxiety Post
6	65	54
5	65	48
1	68	57
9	68	59
4	59	54
4	57	54
7	65	65
7	57	51
3	68	46
6	59	54

Film-Accident

Emotional Reaction	Anxiety Pre	Anxiety Post
18	59	62
18	51	70
21	51	62
17	62	70
20	62	62
17	65	57
19	37	76
21	65	59
15	54	62
19	46	59

Film-Landscape

Emotional Reaction	Anxiety Pre	Anxiety Post
2	48	40
5	40	48
2	59	51
3	62	59
8	54	51
5	62	59
6	43	35
2	48	37
6	62	54
4	59	57

VITA

Paul Concepcion, Jr.

Candidate for the Degree of

Master of Science

Thesis: THE EFFECTS OF VISUAL AND AUDITORY AFFECTIVE STIMULI UPON EYE BLINK RATE AND SUBJECTIVE ANXIETY

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