THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

SENSITIVITY TO NONVERBAL COMMUNICATION AS RELATED TO PHYSIOGNOMIC PERCEPTION

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

HAROLD KENT NEWMAN

Norman, Oklahoma

1977

SENSITIVITY TO NONVERBAL COMMUNICATION

AS RELATED TO PHYSIOGNOMIC PERCEPTION

APPROVED BY

Abraham Sderman Chairman

Robert M Arnone

Tom W. Boyd

William H Speer

R E Ragland

DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to Dr. Avraham Scherman who, as committee chairman, guided this effort to its successful conclusion.

My warmest thanks go to the members of my committee, Dr. Albert Smouse and Dr. Tom Boyd dor their interest and help.

Special thanks are due Dr. Robert Ragland and Dr. William Graves for their support and assistance in the design and analysis of this study.

To Dr. Dorothy Foster my thanks for her encouragement and understanding.

For assistance above and beyond the call of duty, to Dr. Kirby Gilliland, my heartfelt gratitude.

To my wife, Carol, for your patience, your assistance, your understanding and your love; this is for you.

TABLE OF CONTENTS

SENSITIVITY TO NONVERBAL COMMUNICATION AS RELATED TO PHYSIOGNOMIC PERCEPTION

H. KENT NEWMAN

UNIVERSITY OF OKLAHOMA

Running Head: Sensitivity to Nonverbal

Abstract

This study focused on the relationship between Werner's concept of physiognomic perception as measured by the Physiognomic Cue Test (PCT) and sensitivity to nonverbal communications. Twenty-six subjects were shown items of the PCT and 28 of the Pictures of Facial Affect (PFA) while polygraphic readings of heart rate, palmar GSR, frontalis EMG and middle finger temperature were recorded. During a second testing session the subjects were administered the PCT and asked to judge the emotions portrayed on the PFA slides. Results failed to indicate a relationship between physiognomic perception and sensitivity to nonverbal cues. PCT scores did not significantly ($p < .05$) correlate with PFA scores. An inverse relationship between PFA scores and visceral responses to PCT and PFA items was indicated. This inverse relationship was discussed in terms of "labeling" and physiological reactions produced by uncertainty.

states that the average adult generally has a physiognomic experience only in the perception of the faces and bodies of other human beings. Children, on the other hand, frequently see physiognomic qualities in all objects, either animate or inanimate (Werner 1957, p. 72). The adult, then, generally experiences this perception of an effective state or emotion through the perception of facial expression.

Riech's (1970) study of the relationship between training in nonverbal behavior and the recognition and expression of emotion concluded that, (a) systematic training strategy was not effective in bringing about improvement in identifying or expressing emotions to others, (b) there seems to be no difference between the contribution from the voice inflection or facial display in the communication of emotion, and (c) there appeared to be a general factor of emotional sensitivity which may have accounted for the correlations he found between the identification and expression of emotions.

Comparisons of the studies of Rosenthal, et al. (1974), and Stein (1975) suggest that physiognomic perception as a cognitive control variable is a factor in a person's sensitivity to nonverbal cues or communications. Rosenthal, et al. (1974), reported the following results from a series of experiments that involved the use of the Profile of

Nonverbal Sensitivity (PONS): (a) Females are generally better than males at detecting nonverbal cues. Similar results were reported by Sweeney and Cottle (1976). (b) Those males in occupations or training that seem to require "nurturant," artistic or expressive behavior approached or surpassed females on the PONS. (c) Nonverbal sensitivity appears to be relatively independent of grades or scholastic aptitude. (d) People who score high on the PONS tend to possess greater integrative intelligence than those who score low.

Stein (1975) reports in the manual for the Physiognomic Cue Test (PCT) the results of several studies which are similar to the results obtained from the PONS studies: (a) Females generally scored higher on the PCT than males. (b) Males in artistic professions or training approached the scores of females. (c) High physiognomic males had significantly higher empathy scores than low physiognomic males. Females showed the same trend. (d) The PCT scores of students were generally independent of grades. (e) Persons with higher PCT scores tend to be more creative.

Hypotheses

This study sought to determine if the cognitive control principle of physiognomic perception as measured by

the PCT is linearly related to sensitivity to nonverbal communication, particularly facial affects. The review of the literature produced the following points which suggested the hypotheses to be tested: (a) Adults generally experience physiognomic perception in the faces and bodies of other human beings. (b) There is a trend, with age, toward inhibition of overt (somatic) expression of physiognomic perceptions concomitant with an intensification of visceral responses when based on galvanometric measurements (Werner 1957, p. 478). (c) An individual should tend to react in a visceral manner to the items of the PCT. The greater the degree of physiognomic perception, the greater the tendency to experience visceral response. (d) The results of the PCT and the PONS when compared suggest that a linear relationship exists between physiognomic perception and nonverbal sensitivity.

These factors indicated these hypotheses which were tested in this study:

I. There exists a linear correlation between physiognomic perception as measured by the PCT and nonverbal sensitivity as measured by the number of correct responses to the Pictures of Facial Affect (PFA).

II. There exists a linear correlation between the degree of visceral responses to the items of the

PCT and the degree of visceral responses to the PFA items.

III. There exists a linear correlation between physiognomic perception as measured by the PCT and the degree of visceral responses to the items of the PCT as measured by polygraphic techniques.

IV. There exists a linear correlation between the means of the subject's visceral responses as measured by polygraphic techniques of each item of the PCT and the total score of the PFA.

Method

Subjects

The subjects (n = 28) for this study were volunteers from the educational psychology subject pool supplemented by additional volunteers. No consideration was given to educational level or experience of the subjects. All subjects were over 20 years of age, well past the age at which internalization of emotional responses is reported to occur (Werner, 1959, p. 478). Thirteen males and fifteen females participated in this study.

Instruments

The Physiognomic Cue Test as developed by Stein (1975) was used as the measure of the degree of physiognomic perception for each subject. The PCT consists of 32 line drawings and each is provided with two descriptive alternatives,

a geometric-technical alternative and a physiognomic alternative. The test yields three scores: Factor A (feeling physiognomic), Factor B (thing-physiognomic) and a Total Score.

In order to present the items of the PCT to the subject during the polygraphic phase of the study, photograph slides were made of each item of the PCT. The slides were photographed at close range with the descriptors and response boxes masked so that only the line drawing portion of each item was visible. The commercially available printed form of the PCT was used during the second phase of the study.

The Pictures of Facial Affect developed by Ekman and Friesen (1976) were used to measure sensitivity to non-verbal cues. The PFA consists of 110 photographs of facial expressions of six frequently-experienced emotions (happiness, sadness, fear, anger, disgust and surprise) as well as a neutral category. Four pictures with high consistency scores (as reported by the authors) from each category were selected for a total of 28 slides.

Apparatus

A Beckman console model R polygraph with four channels and two event markers were used to record palmar galvanic skin response (GSR), heart rate (HR), middle finger temperature change (TC), electromyographic (EMG) readings from the frontalis, time and stimulus presentation. A shielded room was used to minimize extraneous electrical interference.

The slides were presented by a tape-activated slide projector which allowed programming of the exposure time for each slide.

Procedure

The subjects were tested in two sessions with a lapse of from three hours to two days between sessions. The physiological data was always collected during the first session. The subject being tested was seated in a comfortable chair in an electrically shielded room containing the chair, slide projector with attached tape activated control equipment and a projection screen. The polygraph was located in an adjoining room. The subject was attached to the polygraph leads and told to relax while the equipment was being adjusted.

When the polygraph showed the subject's physiological reactions had stabilized, a loud bell directly behind the subject was sounded. The reaction to this loud bell was used as a reference response to assist in judging the subject's reaction to the PCT and PFA slides to be presented. About one minute after the bell, the projector was started. A 15 second blank slide was followed by a 15 second exposure to one of the PFA slides until all 28 PFA slides were exposed. After the last PFA slide the bell was again sounded to generate a second reference response.

The PCT slides were then shown in the same manner, 15 seconds of blank slide followed by a 15 second exposure of the PCT item until all 32 items were presented. The

loud bell was again sounded to generate a third reference response. The first one-half of the subjects were shown the PFA items first; the remaining one-half were shown the PCT items first.

During the second session, the automatic projection equipment was used to present the subject with a 2 second exposure of each PFA slide followed by a 20 second exposure of a blank slide. The subject was asked to respond on the answer sheet by checking the one word which best described the emotion expressed in each slide. The choices offered were happy, sad, fear, anger, surprise, disgust and neutral. After the subject had rated all 28 PFA slides, the printed form of the PCT was administered as per the instructions in the manual.

Physiological Criteria

Each PCT and PFA physiological score was derived from inspection of the subject's graph. If the presentation of an item resulted in a change in any single channel of at least 25% of the nearest reference response, that response was assigned a score of 1. If the presentation of the item resulted in a change of at least 50% of the nearest reference response in a single channel, or two or more of the four channels indicated responses of at least 25% of the nearest reference response that response was assigned a score of 2. Thus, the physiological score for

each PFA or PCT item was 0, 1 or 2.

Results

The means and standard deviations of the subjects PCT, PFA, PCT Physiological and PFA Physiological scores and of the subjects ages are reported in Table 1. The data from one subject were discarded because of poor electrode attachment. Another subject reported developing a severe headache during the physiological testing, so these data were also discarded, leaving the number of subjects used for this study at 26.

Insert Table 1 about here

The correlation matrix for the above scores is presented in Table 2. Of primary interest are the following three sets of correlations; (a) between the PCT Total Score and the PFA Total Score, $r = -.05$, NS, (b) between the PCT Total Score and the PCT Physiological Score, $r = -.14$, NS, and (c) between the PCT Physiological Score and the PFA Physiological Score, $r = .59$, $p < .01$.

Insert Table 2 about here

When the scores of all the subjects physiological reactions to each item of the PCT were correlated with the PFA Total Scores, only two items showed any significant level of correlation. For item 1, $r = -.50$, $p < .05$, and

for item 4, $\underline{4} = -.48$, $\underline{p} < .05$. All other correlations were not significant, but 75% of these correlations had negative values. The highest positive correlation was $\underline{r} = .25$, NS, for item 12. No significant ($\underline{p} < .05$) correlations were found between the subject's age and any of the PCT, PFA or physiological scores. Likewise, t-tests failed to show any significant differences between the mean scores of males and the mean scores of females for any of the PCT, PFA or physiological scores.

Discussion

The results of this study in general fail to support the hypotheses put forward with one exception. The correlation between the PCT and PFA for this study fails to indicate a linear relationship between physiognomic perception as measured by the PCT and sensitivity to nonverbal communications as measured by the PFA. One factor which could account for this is the apparent lack of discrimination between subjects by the PFA. The mean of 25.69, $\underline{SD} = 2.40$, out of a total of 28 items shows that most subjects correctly judged most of the Pictures of Facial Affect. It is possible that the selection procedure for the PFA slides produced this lack of discrimination. Each slide was selected from those slides of each category which were reported to have the highest percentage of judgments of the emotion portrayed. The slides may have been so obvious that most subjects were able to identify them readily. It is also possible that

Rosenthal's (1974) finding of maximum discrimination occurring with a 2 second exposure to the PONS items does not apply to the pictures of the PFA. Decreased exposure time and the addition of more PFA items could increase the discrimination of this instrument.

The correlation of $r = .59$, $p < .01$, supports hypothesis II that a linear correlation exists between the degree of visceral responses to the items of the PCT and the degree of visceral responses to the items of the PFA. Considering that no significant correlation appears to exist between the PCT and PFA Total Scores, it seems that this correlation of physiological responses is due to a general factor of "reactability" to stimulus items rather than a result of physiognomic perception. Burciaga's (1976) study reports a similar type of finding. This concept is also strengthened by this study's finding of a non-significant negative correlation between the PCT Total Score and the degree of visceral responses to the items of the PCT, $r = -.14$, NS. Thus, this study fails to find any significant linear relationship between physiognomic perception and physiological reactions to either the items of the PCT or the items of the PFA. This point is further emphasized by the results of correlations of physiological reactions to each item with the total PFA score. Only two items showed any significant level of correlation and these were opposite that predicted by the theory (Item 1, $r = -.50$, $p < .05$ and Item 4,

$r = -.48$, $p < .05$). Since 32 sets of correlations were produced, chance alone could account for these items reaching significant levels. As reported in the results section, 75% of these correlations were negative, thus counter to that hypothesized.

Two sets of correlations were suggestive. When the PFA score was correlated with PFA physiological score ($r = -.46$, $p < .05$), and with the PCT physiological score ($r = -.45$, $p < .05$) both sets of physiological reactions showed a moderate inverse relationship to the ability to correctly judge nonverbal cues. This suggests that an additional factor such as a "labeling vs. uncertainty" factor may be present. Possibly some subjects could quickly (and in this case correctly) "label" the emotions portrayed in the PFA slides or could generate some "label" for the unlabeled PCT items and this labeling or categorization process removed uncertainty and with this process there was little physiological reaction. On the other hand, possibly those subjects whose cognitive styles did not predispose the labeling process were uncertain about the stimulus items. This uncertainty could then have produced the physiological reactions. This is consistent with the findings of Lawler's (1974) study in which uncertainty increased physiological reactions in the form of increased heart rate accelerations.

This study based the physiological reaction scores on a combination of four different measurements or channels (GSR, HR, EMG and Temp.). The possibility exists that an analysis of each individual channel may have produced different results. Reactions on one channel may have correlated with the PCT or PFA scores but these results were masked by extraneous reactions on one or more of the remaining channels thus producing nonsignificant findings.

In summary, the results of this study do not support the use of the Physiognomic Cue Test as a measure of sensitivity to nonverbal communications. Likewise, the results do not support Werner's (1957) theories concerning visceral reactions to physiognomic perceptions nor do they support the concept that physiognomic perception is a factor in sensitivity to nonverbal communication. This study produced no results which would tend to strengthen the validity of the PCT.

References

Burciaga, L. E. The Effects of Thought Stopping and Covert Treatment on the Physiological and Subjective Reactions to Phobic Anxiety, Unpublished doctoral dissertation, The University of Texas at Austin, 1976.

Ekman, P. & Friesen, W.V. Pictures of Facial Affect. Palo Alto, California: Consulting Psychologists Press, Inc., 1976.

Haase, R.F. & Tepper, D.T., Jr. Nonverbal Components of Empathic Communication. Journal of Counseling Psychology, 1972, 19 (5). 417-424.

Lawler, K.A. Psychophysiological Correlates of Attention in Children and Adults: I. The Effects of Uncertainty and Motivation. II. The Cardiac-Somatic Relationship. Unpublished doctoral dissertation, The University of North Carolina at Chapel H-11, 1974.

Riech, L.H. Nonverbal Communication of Emotions: A Study of the Relationship Between Training, Expression and Recognitions of Emotions. Unpublished doctoral dissertation, Arizona State University, 1970.

Rosenthal, R., DiMatteo, M.R., Koivumaki, J.H., and Rogers, P.L. Body Talk and Tone of Voice: The Language Without Words. Psychology Today, September 1974, 64-68.

Stein, M.I. Manual for PCT, the Physiognomic Cue Test. New York: Behavioral Publications, 1975.

Sweeney, M.A. & Cottle, W.C. Nonverbal Acuity: A Comparison of Counselors and Noncounselors. Journal of Counseling Psychology, 1976, 23, (4), 394-397.

Werner, H. Comparative Psychology of Mental Development. New York: International Universities Press, 1957.

Table 1

Means and Standard Deviations of PCT Scores and PFA Scores

	M	SD
PCT		
Factor A	32.92	13.25
Factor B	47.12	10.07
Total	94.88	24.28
Physiological Total	19.15	9.14
PFA		
Total	25.69	2.40
Physiological Total	16.12	13.01

n = 26

Table 2

Correlation Matrix for PCT Scores,

and PFA Scores

		PCT Scores				PFA Scores	
		Factor A	Factor B	Total	Physiological	Total	Physiological
PCT	Factor A	1.00	.60**	.91**	-.26	.04	.08
	Factor B		1.00	.85**	-.01	-.08	-.11
	Total			1.00	-.14	-.05	.02
	Physiological				1.00	-.45*	.59**
PFA	Total					1.00	-.46*
	Physiological					-.46*	1.00

* = $p < .05$

** = $p < .01$

APPENDIX A

APPENDIX A

Prospectus

Sensitivity to Nonverbal Communication

AS RELATED TO PHYSIOGNOMIC PERCEPTION

CHAPTER I

Introduction

> *As professionally literate members of a culture devoted to literacy, we are strongly tempted to believe that words carry meaning and that all other nonword behavior merely modifies it. Thus, there are those who feel that words form the natural center of the communicational universe and that all other modes of communication are to be studied as subsystems subordinate to it. Such a decision predetermines the nature of the communicational process and I am as yet unwilling, from the situations which I have examined, to assign such priority to any of the infracommunicational systems. For the kinesicist, silence is just as golden as are those periods in which the linguistic system is positively operative (Birdwhistell, 1970, p. 188).*

If any counselors are no less literate than other "professionally literate members of a culture," Birdwhistell's comments are important when viewed in the perspective of fifty years of counseling theory and research. A review of the literature suggests that most previous research has attended to the verbal channel of interactions, almost, until recently, to the exclusion of other nonlinguistic channels which pervade the counseling process (Haase and Tepper, 1972).

This does not imply that counselors and therapists have not been aware of the importance of nonverbal communications.

Rather, the case is more as stated by Sapir (1949) who writes that:

> *We respond to gestures with extreme alertness and one might almost say, in accordance with an elaborate secret code that is written nowhere, known by none, and understood by all (p. 566).*

Briefly, people in general and probably counselors and therapists in particular have a strong intuitive sense of the nonverbal communications of others (Darwin, 1872); Deutsch, 1952; James, 1932; Sullivan, 1954). The major problem with intuitive understanding of this phenomenon is that it is difficult to articulate and systematically relate to others, especially in training settings where the focus is on facilitating the communicational process, as in counseling.

Lately, however, nonverbal patterns of communication have been given the beginnings of a systematic empirical foundation (Birdwhistell, 1970; Mehrabian, 1969; Sommer, Scheflen, 1972, 1973; Harrison, 1974). A parallel development of research can be seen within the area of counseling and therapy, a situational context that is different from the more general social interaction context, (Haase, 1970; Kelly, 1971; Pierce, 1970; Smith, 1971; Strahan and Zytowski, 1976).

The nonverbal communicational research in counseling has been orientated toward determining the degree to which people engage in or show preference for nonverbal components of communications. Little research has focused on the nonverbal sensitivity of the counselor because many writers in the field, such as Haase and Tepper (1972), have assumed that counselors have an intuitive sense of nonverbal communications. Other

writers (Sweeney and Cottle, 1976) state that people educated as counselors are no different from other graduate students in their sensitivity to nonverbal cues. Since both individuals in a dyadic relationship are transmitting as well as receiving nonverbal messages, it becomes important that the counselors be sensitive to these nonverbal cues and proficient in their interpretation. For this reason, the factors influencing an individual's sensitivity to nonverbal communications become important areas for study. This study seeks to determine if a person's sensitivity to nonverbal communications is influenced by the cognitive control principle of physiognomic perception, "the degree of unity between subject and object, mediated by the motor-affective reactivity of the organism," as described by Stein (1975).

Review of the Literature

Little research has been accomplished in either the area of sensitivity to nonverbal communication or in the area of physiognomic perception, "the degree of unity between subject and object, mediated by the motor-affective reactivity of the organism" (Werner, 1957; p. 68). The origins of physiognomic perception are traced by Werner in an earlier work (1948) where he reacts to Stern's (1928, p. 46) remarks that the mentality of the newborn child is a blurred state of consciousness in which sensorial and emotional phenomena are inseparably fused. Werner adds that this state of consciousness may be described as a mere feeling state, a total

sensation, in which object and subject are merged. Many of the young child's activities can be understood only through the assumption that the motor-emotional and sensory factors are blended into one another. Later he states that the high degree of unity between the subject and the object which is mediated by the motor-affective reactivity of the organism results in a dynamic, rather than static, apprehension of things. Things as constituent parts or elements of a dynamic event must necessarily be dynamic in nature. Animal biologists and psychologists have described, from both the experimental and theoretical standpoints, the importance of movement (the movement of the animal itself as well as of the object) in the construction and interpretation of the environment. (Werner, 1957, p. 67).

The preference of interpretation in terms of dynamic rather than static properties can be observed in children when a child is free to grasp the object in his own way. Grantschewa (1930) observed this fact in experiments in clay-modeling carried on with children ages three to six years. She says: "A dog, for the child, is not an objective structure possessing objective shape and parts. The dog is something that 'bites' or 'barks', a 'woodpecker' is a bird that 'hangs on the side of a tree'!" Werner explains this as follows:

> *Such dynamization of things based on the fact that the objects are predominantly understood through the motor and affective attitude of the subject may lead to a particular type of perception. Things perceived in this way may appear "animate" and, even though actually lifeless, seem to express some inner form of life. All of us at some time or other, have had this experience. A landscape,*

> *for instance, may be seen suddenly in immediacy as expressing a certain mood - it may be gay or melancholy or pensive. This mode of perception differs radically from the more everyday perception in which things are known according to their "geometrical technical," matter-of-fact qualities, as it were. In our own sphere there is one field where objects are commonly perceived as directly expressing an inner life. This is in our perception of the faces and bodily movements of human beings and higher animals. Because the human physiognomy can be adequately perceived only in terms of its immediate expression, I have proposed the term physiognomic perception for this mode of cognition in general. (Werner 1957, p. 69).*

Werner again refers to the relationship between physiognomic perception and nonverbal communications when he states that "The average adult generally has a physiognomic experience only in his perception of other human beings, their faces and bodies. The child, on the other hand, frequently sees physiognomic qualities in all objects, animate or inanimate" (Werner 1957, p. 72). The adult then generally experiences this perception of an affective state or emotion through the perception of facial expression.

Werner brings forth some of the following evidence for genetic changes in emotional behavior in accordance with developmental laws outlined in his work.

First, a genetic change from "syncretic" (bodily motor-affective) and massive behavior to specifically emotional reactions was observed. One of the signs of this trend is the decrease of overtness ("internalization") of the emotional response. Bayley, Blatz, Lippman, a.o., studied the diminishing rate of crying during early infancy. A comparison of Goodenough's records on the behavior of young children with

that of older subjects demonstrates the decrease with age of the frequency of public display of anger. H. E. Jones, using the galvanometric method with infants and preschool children, found a genetic trend toward the inhibition of overt (somatic) expression concomitant with an intensification of visceral responses. (Werner 1957, p. 478). An emotional response from a physiognomic perception will produce a visceral response which should be indicated by using galvanometric methods.

Riech (1970) studied the relationship between training in nonverbal behavior and the recognition and expression of emotion. The effectiveness of a training strategy on the accuracy of identification and expression of emotion was one area investigated. Second, the study examined which of two modes of nonverbal communication, audio or visual, contributed more to the accurate recognition of emotional expression in others. The interaction effect between training and mode of communication was another. Finally, the study performed to assess the relationship between a subject's capacity to recognize emotional expression of others and his ability to express emotion to others.

Riech's first conclusion was that the systematic training strategy was not effective in bringing about improvement in identifying or expressing emotions to others. The second conclusion was that there seems to be no difference in the contribution from the voice inflection or facial display in the communication of emotion. This differs from Mehrabian's (1971) report of investigations apportioning relative

contributions to communication as 7% verbal, 38% vocal and 55% facial.

The third conclusion Riech states is that there appeared to be a general factor of emotional sensitivity which may account for the correlations between identification and expression of emotions that he found. This general factor of emotional sensitivity and its relationship to physiognomic perception is the focus of this study.

Rosenthal, et al., (1974) reported the results of several studies, which when compared with the studies reported by Stein (1975) in the manual for the Physiognomic Cue Test (PCT) suggests that physiognomic perception as a cognitive control variable is a factor in a person's sensitivity to nonverbal cues or communications.

The Profile of Nonverbal Sensitivity (PONS) was developed by Rosenthal, et al., (1974) to measure a person's ability to understand two kinds of wordless communication - tones of voice and movements of the face and body. The PONS uses eleven different "channels, face only, body only (neck to knees), and face plus body. Two channels are pure audio channels which are "electronically content filtered" and "randomized-spliced." Besides the five pure channels the PONS also tests sensitivity to six mixed channels which are audio-visual combinations of the pure channels. A person's scores on the eleven channel test are represented as a line on a graph in the form of a profile of nonverbal sensitivity.

Rosenthal, et al., reports the following results from a

series of experiments involving the use of the PONS test.

1. Females are generally better than males at detecting nonverbal cues. Similar results were reported by Sweeney and Cottle (1976).
2. Those males in occupations or training that seem to require "nurturant," artistic or expressive behavior approached or surpassed females on the PONS.
3. Nonverbal sensitivity appears to be relatively independent of grades or scholastic aptitude.
4. People who score high on the PONS tend to possess greater integrative intelligence than those who score low.

Stein describes the Physiognomic Cue Test (PCT) that he developed as follows:

> *The PCT consists of 32 line drawings, and each is provided with two descriptive alternatives. One of these refers to its form, shapes or structural characteristics. The other, the physiognomic alternative, attributes feeling, action or some representational characteristic to it. Those physiognomic alternatives which involve feeling are referred to as feeling-physiognomic and generally fall into what will later be noted as belonging to Factor A. The other physiognomic alternative is described as thing-physiognomic or Factor B alternative (Stein, 1975), p. 7).*

In other words, the PCT measures the degree to which a person perceives an affective quality in simple line forms. The person responds with an emotional, almost visceral, response to a visual stimulus.

Stein (1975) reports in the PCT manual the results of several studies which are similar to the results obtained from

the PONS studies.

1. Females generally scored higher on the PCT than males (Rosett, et al., 1967).
2. Males in artistic professions or training approached the scores of females (Rosett, et al., 1967).
3. High physiognomic males had significantly higher empathy scores than low physiognomic males. Female differences were not significant (but in the same direction).
4. The PCT scores of students are generally independent of grades of scholastic aptitude.
5. Persons with higher PCT scores tend to be more creative (Walker, 1955; Mitchell, 1974).

From the review of the current available literature it was found that the results of the studies by Rosenthal, et al., (1974) and of those cited by Stein (1975) have reported similar patterns of occurrence.

Statement of the Problem

The purpose of this study is to determine if the cognitive control principle of physiognomic perception as measured by the PCT is linearly related to sensitivity to nonverbal communication, particularly facial affects. From the review of the literature, several relevant points have been gathered.

1. Adults generally experience physiognomic perception in the faces and bodies of other human beings.
2. There is a trend, with age, toward inhibition of

overt (somatic) expression of physiognomic perceptions concomitant with an intensification of visceral responses (based on galvanometric measurements.

3. An individual should tend to react in a visceral manner to the items on the PCT. The greater the degree of physiognomic perception, the greater the tendency to experience visceral response.
4. The results of the PCT and the PONS when compared suggest that a linear correlation exists between physiognomic perception as measured by the PCT and a measure of nonverbal sensitivity such as accuracy of judgment of facial affect.

The above factors indicate the following hypotheses to be tested in this study.

I. There exists a linear correlation between physiognomic perception as measured by the PCT and nonverbal sensitivity as measured by the number of correct responses to the Pictures of Facial Affect (PFA).

II. There exists a linear correlation between the degree of visceral responses to the items of the PCT and the degree of visceral responses to the PFA items.

III. There exists a linear correlation between physiognomic perception as measured by the PCT and the degree of visceral responses to the items of the PCT as measured by polygraphic techniques.

IV. The mean of the subjects' visceral responses as measured by polygraphic techniques to each item of the PCT will be significantly different than the mean expected from chance alone.

CHAPTER II

Method

Subjects

The subjects for this study will be randomly selected from the educational psychology subject pool. A minimum of twenty five (25) subjects will be used for this study. No consideration will be given to gender, education or experience of the subjects.

Instruments

The Physiognomic Cue Test as developed by Stein (1975) will be used as the measure of the degree of physiognomic perception for each subject. The PCT manual reports test-retest reliability after a six month period to be: Factor A (Feeling-physiognomic items), .82; Factor B (Thing-physiognomic items), .72; and Total Score, .82. The Split-Half coefficient of reliability corrected by the Spearman-Brown formula was reported to be .72 for the total score. The coefficient alpha used to study the internal consistency of the PCT and to provide a measure of the reliability of the scores (which would be obtained by splitting the test in half in all possible ways) was reported to be: .83 for Factor A; .65 for Factor B; and .81 for the Total Score.

The Pictures of Facial Affect developed by Ekman and Friesen (1976) will be used to measure sensitivity to non-verbal cues. The authors chose six frequently-experienced emotions believed to yield characteristic facial expressions. These were happiness, sadness, fear, anger, disgust, and surprise. The posers were trained to contract or relax different facial muscles associated with various facial expressions. Generally, posers were instructed to activate certain muscles rather than to pose a particular emotion. The present set was chosen from hundreds of photographs on the basis of empirical studies which measured the consistency of judgments of the various pictures. Photographs which fit the authors' theory of facial expressions of affect and which yielded highly consistent judgments were selected for inclusion in the set. A more detailed description of the Pictures of Facial Affect (PFA), along with the procedures and results of the studies, are included in the appendix.

For this study, one set of twenty eight pictures will be selected from the series. The set will consist of four pictures to be selected from the photographs in each category with the highest consistency scores as reported by the authors.

Apparatus

A Beckman console model R polygraph with four channels and two event markers will be used to record palmar galvanic skin response (GSRp), heart rate (HR), middle finger temperature change (TC), electromyographic (EMG) readings from the

physiological reactions to this stimulus as indicated on the polygraph will serve as the reference response for that subject. After a thirty second delay the items of the PCT and PFA set will be projected on the screen for fifteen seconds each. A fifteen second blank period will exist between each of the slides to allow reactions to stabilize. One half of the subjects will receive the PCT items first, the other half will receive one set of PFA items first.

During the second part of the session the subjects will each be given the PCT using the method recommended in the manual. Nonverbal sensitivity will be measured by using the set of PFA photographs. Each picture will be projected on a screen for a two second exposure following Rosenthal's finding for maximum discrimination. The subjects will be asked to select which one of the seven categories best describes the emotion expressed in the picture. One half of the subjects will receive the PCT first, the other half will receive a PFA set first.

CHAPTER III

Results

Data

Thirty six scores will be gathered for each subject; a PCT physiological score, a PFA physiological score, a PCT score, a PFA score and a physiological score for each item of the PCT. These individual scores are derived as follows:

The PCT physiological score for each subject will be derived from inspection of each subject's graph. If the presentation of an item results in a change of at least twenty five percent (25%) of the reference response, that response will be assigned a score of one (1). If the presentation of the item results in a change of at least fifty percent (50%) of the reference response, or two or more of the four channels each indicate responses of at least twenty five percent (25%) of the reference response, that response will be assigned a score of two (2). Thus, the PCT physiological score for each item presented to each subject will be zero, one or two. The total PCT physiological score for each subject will be the total of the thirty two item PCT physiological scores for that subject. The maximum score obtainable is sixty four (64).

The PFA physiological score will be obtained in the same manner as the total PCT physiological score. Maximum score obtainable is fifty two (52).

The PCT will be scored using the method described in the manual. Maximum obtainable score is one hundred ninety two (192).

The PFA score will be determined by the number of correct judgments of facial affect produced by each subject. Maximum obtainable score is twenty six (26).

Statistics

Three sets of correlations will be calculated and these used to test the hypotheses of linear relationships as stated above. In brief, the correlations and t-tests will be performed on the following sets of data:

1. PCT with PFA.
2. PCT with PCT physiological.
3. PCT physiological with PFA physiological.

A z-test will be used to test the hypothesis that the mean of the PCT physiological scores for each item is significantly different than could be expected from chance alone.

Each hypothesis will be considered accepted if the statistical test is significant at the .05 level or less.

Results

Of the possible combinations of acceptance and rejection of the hypotheses, three will be of primary interest:

1. The acceptance of Hypothesis I will strengthen Werner's theories and tend to strengthen the validity of the PCT.

2. The acceptance of Hypothesis II will tend to strengthen both Werner's theories and the validity of the PCT.
3. The acceptance of Hypothesis III will tend to strengthen the validity of the PCT.

Also the acceptance of Hypothesis IV for each PCT item will strengthen the validity of that item and the validity of the PCT as a whole.

Importance of the Study

The results of this study could have a direct effect on certain aspects of counselor education programs. If physiognomic perception is related to sensitivity to nonverbal communications, and this could be assessed quickly and easily by the use of PCT, this information about the individual counselor trainee could be useful to his trainers and supervisors in attempting to develop the most effective style of counseling for each particular student. As noted above, Riech (1970) concluded that training did not improve sensitivity to nonverbal communication, nor did it improve the ability to identify emotions from nonverbal cues. Therefore, if a student ranks relatively low in physiognomic perception as measured by the PCT, it would be most productive to train this student to use other methods of assessing affective states. On the other hand, a student with a relatively high degree of physiognomic perception could be encouraged to use the information gathered from the nonverbal cues given by the

client. The author feels that this aspect of facilitating the development of the most effective counseling style for each student and the hope of finding a more efficient method of making this judgment concerning style fully justifies the time, energy and expense of this study.

Kelly, F. D. Nonverbal communication in the counseling and psychotherapeutic interaction. Unpublished doctoral dissertation, University of Massachusetts, 1971.

Mehrabian, A. Significance of posture and position in the communication of attitude and status relationships. Psychological Bulletin, 1969, 71, 359-372.

Mehrabian, A. Nonverbal communication. In J. K. Cole (Ed.) Nebraska Symposium on Motivation (Vol. 19). Lincoln: University of Nebraska Press, 1971.

Mitchell, R. R. Psysiognomic responsiveness, primary process thinking and Rorscbach measures of creativity. Unpublished doctoral dissertation, New York University, 1974.

Pierce, P.A.B. Client attitudes generated by varied interaction distances and counselor trunk lean in dyadic counseling interaction. Unpublished doctoral dissertation, University of Massachusetts, 1970.

Riech, L. H. Nonverbal Communication of Emotions: A Study of the Relationship Between Training, Expression and Recognitions of Emotions. Unpublished doctoral dissertation, Arizona State University, 1970.

Rosenthal, R., DiMatteo, M.R., Koivumaki, J. H., & Rogers, P.L., Body Talk and Tone of Voice: The Language Without Words. Psychology Today, September 1974, 64-68.

Rosett, H. L., Robbins, J. & Watson, W. S. Standardization and construct validity of the Physiognomic Cue Test. Perceptual and Motor Skills, 1968, 24, 707-719.

Sapir, E. A. The unconscious patterning of behavior in society. In D. G. Mandelbaum (Ed.), Selected writings of Edward Sapir in language culture and personality. Berkeley: University of California Press, 1949.

Scheflen, A.E. Body Language and the Social Order. Englewood Cliffs, N.J.: Prentice-Hall, 1972.

Scheflen, A. E. How Behavior Means. New York: Gordon and Breach, 1973.

Smith, E.W.L. Postural and gestural communications of A and B "therapist types" during dyadic interviews. Journal of Consulting and Clinical Psychology, 1972, 39, 29-36.

Sommer, R. Personal Space. Englewood Cliffs: Prentice-Hall, 1969.

Stein, M. I. Manual for PCT, The Physiognomic Cue Test. New York: Behavioral Publications, 1975.

Stern, W. Psychology of Early Childhood, 1930. (Germ. ed.) 1928.

Strahan, C., & Zytowski, D. G. Impact of Visual, Vocal, and Lexical Cue on Judgments of Counselor Qualities. Journal of Counseling Psychology, 1976, 23, 387-393.

Sullivan, H. S. The Psychiatric Interview. New York: W. W. Norton, 1954.

Sweeney, M. A. & Cottle, W. C. Nonverbal Acuity: A Comparison of Counselors and Noncounselors. Journal of Counseling Psychology, 1976, 23 (4), 394-397.

Walker, D. R. The relationship between creativity and selected behavior of chemists and mathematicians. Unpublished doctoral dissertation, University of Chicago, 1955.

Werner, H. Comparative Psychology of Mental Development. New York: International Universities Press, 1957.

APPENDIX B

NAME_____ DATE_____

ADDRESS_____ TEL.NO._____

Age: (to nearest year)_____ Sex: Male_____ Female_____

Marital Status: (Check one)

Single_____	Divorced_____	Widow and
Engaged_____	Divorced	Remarried_____
Married_____	and	Widower_____
Separated___	Remarried___	Widower and
	Widow_____	Remarried_____

Your present occupation, profession or student status_____

Highest grade you completed or highest degree you obtained _____

INSTRUCTIONS

DO NOT WORK ON THIS TEST UNTIL THE INSTRUCTIONS ARE CLEAR

Each item in this test consists of a drawing and corresponding scale underneath the drawing. Look at the drawing. Then look to the scale underneath where you will find two alternatives separated from each other by six boxes. Please put an X in the box that indicates what the figure looks like to you.

For example, look at drawing (A) below and then at the two alternatives underneath it- "Seven lines pointed inward" and "Sun rising or setting." Indicate your rating in the following manner:

Check #1 if the drawing looks like "seven lines pointed inward" to you.
Check #2 if the drawing looks something like "seven lines pointed inward" to you.
Check #3 if the drawing looks very little like "seven lines pointed inward" but is more like "seven lines pointed inward" than it is like a"sun rising or setting."
Check #4 if the drawing looks very little like a "sun rising or setting" but is more like a "sun rising or setting" than it is like "seven lines pointed inward."
Check #5 if the drawing looks something like a "sun rising or setting" to you.
Check #6 if the drawing looks like a "sun rising or setting" to you.

ALTHOUGH EACH OF THE DRAWINGS COULD BE SEEN IN TERMS OF EITHER ALTERNATIVE, YOU ARE REQUESTED TO INDICATE YOUR FIRST IMPRESSION.

(A)

Seven lines pointed inward ☐ ☐ ☐ ☐ ☐ ☐ Sun rising or setting
#1 #2 #3 #4 #5 #6

1) 

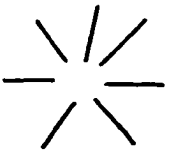
Two arcs ☐☐☐☐☐☐ Open mouth

2) 

A line ☐☐☐☐☐☐ Feeling of sadness

3) 

Waves of water ☐☐☐☐☐☐ Border design

4) 

Seven lines ☐☐☐☐☐☐ Feeling of excitement

5) 

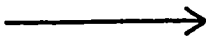
Triangles and lines ☐☐☐☐☐☐ Boats sailing

6)

Line ☐☐☐☐☐☐ Feeling of monotony

7) 

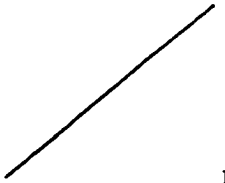
Cars crashing ☐☐☐☐☐☐ Two rectangles

8) 

Arrow ☐☐☐☐☐☐ Feeling of directness

9) 

Spiral ☐☐☐☐☐☐ Whirlpool

10) 

Line ☐☐☐☐☐☐ Feeling of happiness

11) 

Sheets of rain ☐☐☐☐☐☐ Diagonal lines

12) 

Peacefulness ☐☐☐☐☐☐ Curved line

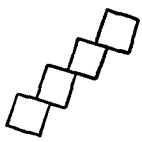
13)

Letter "h" ☐☐☐☐☐☐ Tilted chair

14)

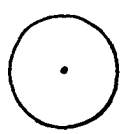
Jagged line ☐☐☐☐☐☐ Feeling of being upset

15)



Falling blocks ☐☐☐☐☐☐ Four squares

16)



Feeling of smallness ☐☐☐☐☐☐ Dot in a circle

17)

Spiral ☐☐☐☐☐☐ Twisting tornado

18)

Square ☐☐☐☐☐☐ Feeling of smallness

19)

Lightning striking ☐☐☐☐☐☐ Jagged line

20)

Feeling of stiffness ☐☐☐☐☐☐ Rectangle

21)

Cluster of lines ☐☐☐☐☐☐ Waterfall

22)

Trapezoid ☐☐☐☐☐☐ Feeling of cruelty

23)

Raised eyebrows ☐☐☐☐☐☐ Small arcs

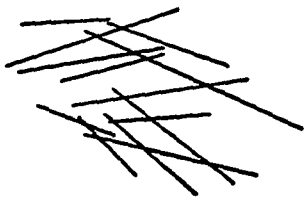
24)

Looping line ☐☐☐☐☐☐ Feeling of happiness

25)

Circle and two tangents ☐☐☐☐☐☐ Falling object

26)

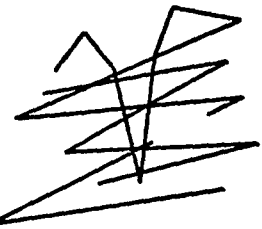


Feeling of sadness ☐☐☐☐☐☐ Random lines

27)

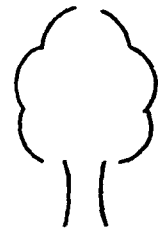
Small ovals ☐☐☐☐☐☐ Falling droplets

28)



Design ☐☐☐☐☐☐ Feeling of rage

29)



Tree ☐☐☐☐☐☐ Rising atomic blast

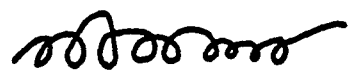
30)

Plant ☐☐☐☐☐☐ Feeling of yearning or desire

31)

Letter "l" ☐☐☐☐☐☐ Arm that beckons

32)



Spiral ☐☐☐☐☐☐ Feeling of exertion or strain

APPENDIX C

This brochure accompanies the Pictures of Facial Affect developed by Drs. Paul Ekman and Wallace V. Friesen, Human Interaction Laboratory, University of California Medical Center, San Francisco.

Pictures of Facial Affect

For more than fifty years psychologists have explored relationships between facial expression and emotions. What emotions can be judged from viewing a face? How reliable are such judgments? How much does context influence judgments of emotion in faces? At what ages can children judge facial expressions of feelings? Do people of different cultures interpret facial expressions differently?

A review of this research can be found in Ekman, Friesen and Ellsworth (1972). Recently studies have addressed questions of personality differences in the ability to judge emotions and the relationship of brain hemisphere laterality to judgments of emotion from faces. Another interest in facial expressions has been to teach the accurate interpretation of the emotions expressed on the face. Allport in 1924 did one of the earliest of such studies. Presently, professionals in a number of fields are seeking to teach skills in interpreting emotions from facial expressions. Recently Ekman and Friesen (1975) published an extensively illustrated text designed to help those wishing to improve their skills in judging emotional reactions from facial expressions.

A major obstacle to all such research and training has been the lack of a comprehensive set of photographs of different people expressing the different emotions, yielding high inter-rater reliability, and widely available in pictures of consistently high technical quality. Frois-Wittman (1930) pioneered a set of photographs still in use. Unfortunately, the pictures are all posed by one person and they lack the quality which modern photographic technology can provide. The more recent Lightfoot Series (Schlosberg, 1954) suffers from the same defects. Both series have many photos that fail to produce satisfactory consensus among subjects in many studies.

The present set of 110 pictures represents a serious attempt to overcome the limitations of earlier efforts. With the aid of the best current technology in lighting and photography, more than a dozen persons were photographed repeatedly while attempting to express one of six emotions. Hundreds of photographs were studied over a period of several years to obtain a series which yielded consistent agreement among viewers about the emotion being expressed. The result is the *Pictures of Facial Affect.*

Development of the Pictures

Six frequently-experienced emotions believed to yield characteristic facial expressions were chosen for study. These were: happiness, sadness, fear, anger, disgust, and surprise. Posers were trained to contract or relax different facial muscles associated with various facial expressions. Generally, posers were instructed to activate certain muscles rather than to pose a particular emotion.

From hundreds of photographs, the present set was finally chosen on the basis of empirical studies which measured the consistency of judgments of the various pictures. Photographs which yielded highly consistent judgments and which fit the authors' theory of facial expressions of affect were finally selected for inclusion in the set, which now provides 14 posers for the six emotions (plus one photograph of each poser in a "neutral" expression).

Reliability Studies

The pictures of each person which the authors thought best represented the expressions of the six emotions were shown to groups of observers. They judged which of six emotion words best described each photograph. There were two variations in the judgment procedure and the norms were calculated differently for the two procedures to provide comparable normative data across all photographs in this set.

Procedure 1. Each slide was shown for 10 seconds to small groups of U.S. born college students. The number of male and female observers was approximately equal. The answer sheet provided a choice of six emotions: happy, sad, fear, anger, surprise and disgust. The observers selected the *one* word which best described the emotion expressed in each slide. The percentage of observers judging each of the six emotions was calculated for each slide.

Procedure 2. Each slide was shown for 10 seconds to small groups of U.S. born college students. Again the number of male and female observers was approximately equal. The answer sheet listed the same six emotion words, but each emotion word was presented on a seven point scale, with neutral or no emotion at one end, and the intended emotion at the other. The observers rated every slide on each of the six emotion scales, i.e. they could rate a slide as showing maximum happiness and neutral on all other scales, or maximum on all six emotions, or some degree between the extremes.

To convert these data to a format comparable to the first procedure, each observer's ratings were reduced to a single judgment for each slide, i.e. the emotion to which he gave the highest rating. If he gave the same intensity rating to more than one emotion, or there was not a difference of at least two points between his ratings of two emotions expressed in a picture, his data were deleted from the analysis for that slide. (This procedure required deleting the data from less than 5 per cent of the observers.)

Procedure 2 was used in only one experiment. It is the only data source where observers could give "neutral" as a judgment choice (by circling the zero-point on all six emotion scales.)

The following table summarizes the results of these studies. All photographs in the present set were judged to show the intended emotion by at least 70 per cent of the observers. All but 11 were correctly rated more than 80 per cent of the time; 59 were correctly judged by more than 90 per cent of the raters.

Table 1. No. of Photographs Achieving Various Levels of Correct Judgments

Percent of correct judgments	*Happy*		*Sad*		*Fear*		*Anger*		*Surprise*		*Disgust*	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
71-80%			3		1	1	2	2	1		1	
81-90%			2	4	2	6	3	1		2	3	2
91-100%	9	9	3	5	4	1	2	7	5	6	3	6
TOTALS*	9	9	8	9	7	8	7	10	6	8	7	8

* Photos intended to pose a neutral face (N= 14) were not included in this table as some were not used in the experiment which allowed neutral as a choice.

Complete data for each photograph are provided in Tables 2 and 3 at the end of this report. Table 2 is organized by poser, Table 3 by the six emotions expressed (plus "neutral"), but the data are identical in the two tables. The last column (N) showing number of judges appears only in Table 2.

Investigators using the slides may, of course, wish to gather judgment norms using their own instructions, response sheets, exposure times, experimental procedure and subject populations to confirm selection of subsets of pictures, for any particular study.

Description of the Set of Slides

The present set of 110 35mm black and white slides are cardboard-mounted and numbered from 1 to 110, as listed in Table 2. Code numbers unique to each slide also appear in the picture with the poser identified by one or two letters. There are 14 different slides for all emotions except sadness (13) and fear (11). With three exceptions*, there are six male and eight female photographs for each emotion.

References

Allport, F.H. *Social Psychology.* Boston: Houghton Mifflin, 1924.

Ekman, P., & Friesen, W.V. *Unmasking the Face.* Englewood Cliffs, N.J.: Prentice-Hall, 1975.

Ekman, P., Friesen, W.V., & Ellsworth, P. *Emotion in the Human Face.* Elmsford, N.Y.: Pergamon Publishing Co., 1972.

Frois-Wittmann, S. The judgement of facial expression. *Journal of Experimental Psychology.* 1930, *13,* 113-151.

Schlosberg, H. Three dimensions of emotion. *Psychological Review.* 1954, *61,* 81-88.

Ordering Information

All orders must be on institutional or corporate purchase orders or must be accompanied by payment in full.

Complete Set of Slides, $100.00 plus $1.50 first class postage (add sales tax, if applicable). ***No return privileges are available on purchase of slides.***

Replacement Slides, $2.50 each; minimum order, $10.00. (Must be ordered by slide number *plus* photo ID). Replacement slides will be sold only to registered owners of complete sets.

Unmasking the Face by Paul Ekman and Wallace V. Friesen.

A lucidly-written volume for the non-professional, this profusely-illustrated book can help the reader improve his ability to identify emotions from facial expressions. *1975.* 212 pp. paperback. **$4.50.**

* Anger and fear, 5 males each; Fear, 6 females.

Consulting Psychologists Press, Inc.
577 College Ave., Palo Alto, California 94306

Table 2. Per cent of Judgments of Each Emotion for Each Photograph
(Asterisk shows intended emotion for each picture)

Photograph No.	ID	Hap	Sad	Fear	Ang	Sur	Disg	Neu°	N
1	A-1-06	100*	0	0	0	0	0	0	31
2	A-2-06	0	90*	6	3	0	0	0	31
3	A-1-14	0	3	0	97*	0	0	0	31
4	A-1-24	0	0	3	0	97*	0	0	31
5	A-1-25	1	0	0	6	0	93*	0	146
6	A-1-02	14	30	11	30	2	13	0*	141
7	C-2-18	99*	0	0	1	0	0	0	147
8	C-1-18	2	90*	5	1	0	2	0	145
9	C-1-23	0	0	88*	13	0	0	0	24
10	C-2-12	3	0	0	74*	3	19	0	31
11	C-1-10	1	0	5	1	94*	0	0	147
12	C-1-04	1	1	0	2	0	96*	0	147
13	C-2-03	6	35	0	26	0	32	0*	31
14	EM-4-07	100*	0	0	0	0	0	0	32
15	EM-4-24	0	97*	0	0	3	0	0	31
16	EM-5-21	0	0	92*	0	8	0	0	24
17	EM-5-24	0	10	83*	3	3	0	0	30
18	EM-5-14	0	0	0	83*	3	13	0	30
19	EM-2-11	3	0	0	0	91*	3	3	32
20	EM-4-17	0	0	0	3	0	97*	0	30
21	EM-2-04	25	3	3	0	0	0	69*	32
22	GS-1-08	96*	0	0	0	4	0	0	24
23	GS-2-01	0	71*	3	13	0	13	0	31
24	GS-1-25	0	0	77*	0	19	3	0	31
25	GS-2-08	0	0	4	70*	0	26	0	23
26	GS-1-16	0	0	0	0	100*	0	0	24
27	GS-2-25	0	3	0	13	0	84*	0	31
28	GS-1-04	13	21	0	21	4	42	0*	24
29	JB-1-09	100*	0	0	0	0	0	0	32
30	JB-1-23	0	7	0	81*	0	11	0	27
31	JB-1-12	0	3	3	0	93*	0	0	29
32	JB-1-16	0	0	0	0	0	100*	0	30
33	JB-1-03	0	13	3	3	0	3	78*	32
34	JJ-4-07	100*	0	0	0	0	0	0	31
35	JJ-4-08	97*	0	0	0	3	0	0	31
36	JJ-5-05	3	93*	0	3	0	0	0	30
37	JJ-5-13	0	4	96*	0	0	0	0	25
38	JJ-3-12	0	0	15	76*	3	6	0	33
39	JJ-4-13	0	0	3	0	97*	0	0	30
40	JJ-3-20	0	12	0	0	0	88*	0	33
41	JJ-3-04	17	47	0	17	0	20	0*	30
42	JM-1-04	100*	0	0	0	0	0	0	24
43	JM-3-11	0	96*	0	0	0	4	0	23
44	JM-5-03	0	4	4	92*	0	0	0	24
45	JM-1-16	0	0	4	0	96*	0	0	24
46	JM-2-08	0	0	0	3	0	97*	0	31
47	JM-1-09	63	21	8	0	0	8	0*	24
48	MF-1-06	100*	0	0	0	0	0	0	31
49	MF-1-30	0	90*	3	0	0	6	0	31
50	MF-1-26	0	4	88*	0	8	0	0	24
51	MF-1-27	0	0	83*	0	17	0	0	24
52	MF-2-05	0	3	3	84*	6	3	0	31
53	MF-2-07	0	0	0	100*	0	0	0	24
54	MF-1-09	0	0	0	0	96*	4	0	24
55	MF-2-13	0	0	0	10	0	90*	0	30
56	MF-1-02	16	68	3	0	3	10	0*	31
57	MO-1-04	100*	0	0	0	0	0	0	24
58	MO-1-30	0	88*	4	0	0	8	0	24
59	MO-1-23	0	0	88*	0	13	0	0	24
60	MO-1-26	0	0	88*	8	4	0	0	24
61	MO-2-11	0	0	0	100*	0	0	0	24
62	MO-2-13	0	0	0	96*	0	4	0	24
63	MO-1-14	0	0	6	3	90*	0	0	31
64	MO-2-18	0	0	0	0	0	100*	0	24
65	MO-1-05	26	61	0	3	0	10	0*	31
66	NR-1-06	92*	0	4	0	4	0	0	24
67	NR-2-15	0	94*	0	3	3	0	0	31
68	NR-1-19	0	10	84*	0	3	3	0	31
69	NR-2-07	0	0	0	100*	0	0	0	31
70	NR-1-14	0	0	16	0	81*	3	0	31
71	NR-3-29	0	0	0	17	0	83*	0	24
72	NR-1-03	17	29	0	13	4	38	0*	24
73	PE-2-06	97*	0	0	0	0	0	3	32
74	PE-2-12	100*	0	0	0	0	0	0	31
75	PE-2-31	0	74*	16	3	0	6	0	31
76	PE-5-07	0	92*	8	0	0	0	0	24
77	PE-5-10	0	83*	0	4	0	13	0	24
78	PE-3-16	0	0	91*	2	7	0	0	44
79	PE-3-21	0	0	92*	4	4	0	0	25
80	PE-2-21	0	3	0	83*	7	7	0	30
81	PE-6-02	0	0	23	0	74*	3	0	31
82	PE-4-05	0	0	0	10	0	90*	0	31
83	PE-2-04	16	16	3	0	3	0	63*	32
84	PF-1-05	96*	0	0	0	4	0	0	24
85	PF-1-06	100*	0	0	0	0	0	0	31
86	PF-2-12	0	100*	0	0	0	0	0	24
87	PF-2-16	0	100*	0	0	0	0	0	31
88	PF-2-30	0	0	100*	0	0	0	0	31
89	PF-2-04	0	0	0	79*	0	21	0	24
90	PF-1-16	7	0	0	0	93*	0	0	30
91	PF-1-24	4	0	0	0	0	96*	0	24
92	PF-1-02	47	30	7	3	7	7	0*	30
93	SW-3-09	100*	0	0	0	0	0	0	24
94	SW-2-16	0	92*	0	0	0	8	0	24
95	SW-2-30	4	0	79*	0	8	8	0	24
96	SW-4-09	0	0	0	100*	0	0	0	30
97	SW-1-16	0	0	0	0	100*	0	0	31
98	SW-1-30	0	0	0	6	0	94*	0	31
99	SW-3-03	25	46	0	0	0	29	0*	24
100	WF-2-11	97*	0	0	0	0	3	0	32
101	WF-2-12	100*	0	0	0	0	0	0	31
102	WF-3-28	7	79*	0	3	3	7	0	29
103	WF-5-06	0	88*	0	4	0	8	0	24
104	WF-3-16	0	4	88*	0	4	4	0	25
105	WF-3-01	0	0	0	100*	0	0	0	30
106	WF-3-04	0	0	2	96*	0	2	0	45
107	WF-2-16	0	0	9	0	91*	0	0	69
108	WF-3-11	0	0	0	3	0	97*	0	29
109	WF-4-22	0	0	0	20	0	80*	0	30
110	WF-2-05	0	7	0	28	0	7	59*	29

°In all cases where a zero appears in this column for a photo intended as neutral, neutral was not an available choice in the study (see text).

Table 3. Per cent of Judgments of Each Emotion for Each Photograph* (Based on 10 second exposures)

Photograph No.	ID	Hap	Sad	Fear	Ang	Sur	Disg	Neu*
Happy Photos								
1	A-1-06	100	0	0	0	0	0	-
7	C-2-18	99	0	0	1	0	0	-
14	EM-4-07	100	0	0	0	0	0	0
22	GS-1-08	96	0	0	0	4	0	-
29	JB-1-09	100	0	0	0	0	0	0
34	JJ-4-07	100	0	0	0	0	0	0
35	JJ-4-08	97	0	0	0	3	0	0
42	JM-1-04	100	0	0	0	0	0	-
48	MF-1-06	100	0	0	0	0	0	-
57	MO-1-04	100	0	0	0	0	0	-
66	NR-1-06	92	0	4	0	4	0	-
73	PE-2-06	97	0	0	0	0	0	3
74	PE-2-12	100	0	0	0	0	0	0
84	PF-1-05	96	0	0	0	4	0	-
85	PF-1-06	100	0	0	0	0	0	-
93	SW-3-09	100	0	0	0	0	0	-
100	WF-2-11	97	0	0	0	0	3	0
101	WF-2-12	100	0	0	0	0	0	0
Sad Photos								
2	A-2-06	0	90	6	3	0	0	-
8	C-1-18	2	90	5	1	0	2	-
15	EM-4-24	0	97	0	0	3	0	0
23	GS-2-01	0	71	3	13	0	13	-
36	JJ-5-05	3	93	0	3	0	0	0
43	JM-3-11	0	96	0	0	0	4	-
49	MF-1-30	0	90	3	0	0	6	-
58	MO-1-30	0	87	4	0	0	8	-
67	NR-2-15	0	94	0	3	3	0	-
75	PE-2-31	0	74	16	3	0	6	-
76	PE-5-07	0	92	8	0	0	0	-
77	PE-5-10	0	83	0	4	0	13	-
86	PF-2-12	0	100	0	0	0	0	-
87	PF-2-16	0	100	0	0	0	0	-
94	SW-2-16	0	92	0	0	0	8	-
102	WF-3-28	7	79	0	3	3	7	0
103	WF-5-06	0	88	0	4	0	8	-
Fear Photos								
9	C-1-23	0	0	87	13	0	0	-
16	EM-5-21	0	0	92	0	8	0	-
17	EM-5-24	0	10	83	3	3	0	-
24	GS-1-25	0	0	77	0	19	3	-
37	JJ-5-13	0	4	96	0	0	0	0
50	MF-1-26	0	4	87	0	8	0	-
51	MF-1-27	0	0	83	0	17	0	-
59	MO-1-23	0	0	88	0	13	0	-
60	MO-1-26	0	0	88	8	4	0	-
68	NR-1-19	0	10	84	0	3	3	-
78	PE-3-16	0	0	91	2	7	0	-
79	PE-3-21	0	0	92	4	4	0	0
88	PF-2-30	0	0	100	0	0	0	-
95	SW-2-30	4	0	79	0	8	8	-
104	WF-3-16	0	4	88	0	4	4	0
Anger Photos								
3	A-1-14	0	3	0	97	0	0	-
10	C-2-12	3	0	0	74	3	19	-
18	EM-5-14	0	0	0	83	3	13	-
25	GS-2-08	0	0	4	70	0	26	-
30	JB-1-23	0	7	0	81	0	11	0
Anger Photos (Cont'd.)								
38	JJ-3-12	0	0	15	76	3	6	-
44	JM-5-03	0	4	4	92	0	0	-
52	MF-2-05	0	3	3	84	6	3	-
53	MF-2-07	0	0	0	100	0	0	-
61	MO-2-11	0	0	0	100	0	0	-
62	MO-2-13	0	0	0	96	0	4	-
69	NR-2-07	0	0	0	100	0	0	-
80	PE-2-21	0	3	0	83	7	7	0
89	PF-2-04	0	0	0	79	0	21	-
96	SW-4-09	0	0	0	100	0	0	-
105	WF-3-01	0	0	0	100	0	0	0
106	WF-3-04	0	0	2	96	0	2	-
Surprise Photos								
4	A-1-24	0	0	3	0	97	0	-
11	C-1-10	1	0	5	1	94	0	-
19	EM-2-11	3	0	0	0	91	3	3
26	GS-1-16	0	0	0	0	100	0	-
31	JB-1-12	0	3	3	0	93	0	0
39	JJ-4-13	0	0	3	0	97	0	0
45	JM-1-16	0	0	4	0	96	0	-
54	MF-1-09	0	0	0	0	96	4	-
63	MO-1-14	0	0	6	3	90	0	-
70	NR-1-14	0	0	16	0	81	3	-
81	PE-6-02	0	0	23	0	74	3	-
90	PF-1-16	7	0	0	0	93	0	-
97	SW-1-16	0	0	0	0	100	0	-
107	WF-2-16	0	0	9	0	91	0	-
Disgust Photos								
5	A-1-25	1	0	0	6	0	93	-
12	C-1-04	1	1	0	2	0	96	-
20	EM-4-17	0	0	0	3	0	97	0
27	GS-2-25	0	3	0	13	0	84	-
32	JB-1-16	0	0	0	0	0	100	0
40	JJ-3-20	0	12	0	0	0	88	-
46	JM-2-08	0	0	0	3	0	97	-
55	MF-2-13	0	0	0	10	0	90	-
64	MO-2-18	0	0	0	0	0	100	-
71	NR-3-29	0	0	0	17	0	83	-
82	PE-4-05	0	0	0	10	0	90	0
91	PF-1-24	4	0	0	0	0	96	-
98	SW-1-30	0	0	0	6	0	94	-
108	WF-3-11	0	0	0	3	0	97	0
109	WF-4-22	0	0	0	20	0	80	-
Neutral Photos								
6	A-1-02	14	30	11	30	2	13	-
13	C-2-03	6	35	0	26	0	32	-
21	EM-2-04	25	3	3	0	0	0	69
28	GS-1-04	13	21	0	21	4	42	-
33	JB-1-03	0	13	3	3	0	3	78
41	JJ-3-04	17	47	0	17	0	20	-
47	JM-1-09	63	21	8	0	0	8	-
56	MF-1-02	16	68	3	0	3	10	-
65	MO-1-05	26	61	0	3	0	10	-
72	NR-1-03	17	29	0	13	4	38	-
83	PE-2-04	16	16	3	0	3	0	63
92	PF-1-02	47	30	7	3	7	7	-
99	SW-3-03	25	46	0	0	0	29	-
110	WF-2-05	0	7	0	28	0	7	59

*Where a dash appears in the Neutral column, the judges did not have "Neutral" as an alternative choice in the study (see text).

Pictures of Facial Affect

Selected for Use in This Study

Order Presented	PFA Number	PFA ID	Emotion Expressed
1	14	EM-4-07	Happy
2	69	NR-2-07	Anger
3	20	EM-4-17	Disgust
4	45	JM-1-16	Surprise
5	57	MO-1-04	Happy
6	26	GS-1-16	Surprise
7	87	PF-2-16	Sad
8	96	SW-4-09	Anger
9	100	WF-2-11	Happy
10	32	JB-1-16	Disgust
11	15	EM-4-24	Sad
12	33	JB-1-03	Neutral
13	17	EM-5-24	Fear
14	39	JJ-4-13	Surprise
15	110	WF-2-05	Neutral
16	53	MF-2-07	Anger
17	64	MO-2-18	Disgust
18	78	PE-3-16	Fear
19	83	PE-2-04	Neutral
20	88	PF-2-30	Fear
21	43	JM-3-11	Sad
22	46	JM-2-08	Disgust
23	106	WF-3-04	Anger
24	37	JJ-5-13	Fear
25	21	EM-2-04	Neutral
26	97	SW-1-16	Surprise
27	42	JM-1-04	Happy
28	86	PF-2-12	Sad

APPENDIX D

APPENDIX E

DATA SUMMARY

Variable	Sum	Mean
Physiological Score to PCT Item		
1	27	1.04
2	18	.69
3	17	.65
4	12	.46
5	17	.65
6	13	.50
7	19	.73
8	19	.73
9	10	.38
10	13	.50
11	13	.50
12	15	.57
13	14	.54
14	11	.42
15	17	.65
16	18	.69
17	14	.54
18	15	.58
19	14	.54
20	11	.42
21	15	.58
22	13	.50
23	17	.65
24	12	.46
25	22	.85
26	19	.73
27	14	.54
28	19	.73
29	16	.62

continued

DATA SUMMARY cont'd.

Variable	Sum	Mean
Physiological Score to PCT Item		
30	13	.50
31	15	.58
32	15	.58
PCT Physiological Total Score	498	19.15
PCT Factor A	856	32.92
PCT Factor B	1225	47.12
PCT Total	2467	94.88
PFA Total	668	25.69
PFA Physiological Total Score	419	16.12
Age	840	32.30

Subject Sex, Age, Educational Level and Marital Status

Subject	Sex	Age	Educational Level Completed	Marital Status
1	Female	50	Grade 12	Married
2	Male	22	Sophomore(college)	Single
3	Male	38	B.F.A.	Separated
4	Female	23	B.S.	Married
5	Female	26	M.E.D.	Single
6	Male	22	Junior(college)	Single
7	Female	53	Prof. Certificate	Widow
8	Female	22	Junior(college)	Single
9	Female	23	Junior(college)	Divorced
10	Male	25	Junior(college)	Single
11	Male	27	B.S.	Married
12	Female	42	B.S.	Separated
13	Male	32	Ph.D.	Married
14	Female	34	M.E.D.	Remarried
15	Female	37	B.S.	Divorced
16	Female	46	M.A.	Divorced
17	Female	46	M.S.	Married
18	Male	26	M.S.	Remarried
19	Female	48	Ph.D.	Divorced
20	Male	41	M.S.	Single
21	Male	24	B.S.	Engaged
22	Male	31	M.A.	Widowed/Remarried
23	Male	21	Sophomore(college)	Single
24	Male	30	M.A.	Divorced
25	Female	58	Grade 12	Married
26	Male	36	M.E.	Married

APPENDIX F

SUMMARY STATISTICS

t-Test of Correlation Coefficients

Presented in Table 2

r	t
-.26	1.320
-.01	.049
-.14	.693
-.45	2.469*
.59	3.582**
-.28	1.429
.60	3.675**
.91	10.745**
.04	.196
.08	.394
.19	.948
.85	7.903**
-.08	.393
-.11	.542
-.06	.295
-.05	.245
.02	.098
.12	.592
-.46	2.528*
.03	.147
-.04	.196

n = 26

df = 24 two-tailed

* = $p < .05$

** = $p < .01$

Correlation between PFA Total Score and Physiological Score for each PCT Item

Item Number	r
1	-.5004*
2	-.3480
3	-.2188
4	-.4802*
5	-.1208
6	-.3541
7	-.4184
8	-.2180
9	-.3573
10	-.1288
11	-.2630
12	.2522
13	-.0873
14	-.3473
15	-.1208
16	-.1368
17	-.3640
18	.0859
19	-.1030
20	.0804
21	.0333
22	.1180
23	-.3507
24	-.3383
25	-.4050
26	.1470
27	-.2127
28	.1689
29	.0915
30	-.2877
31	-.1042
32	-.0854

*$p < .05$

APPENDIX G

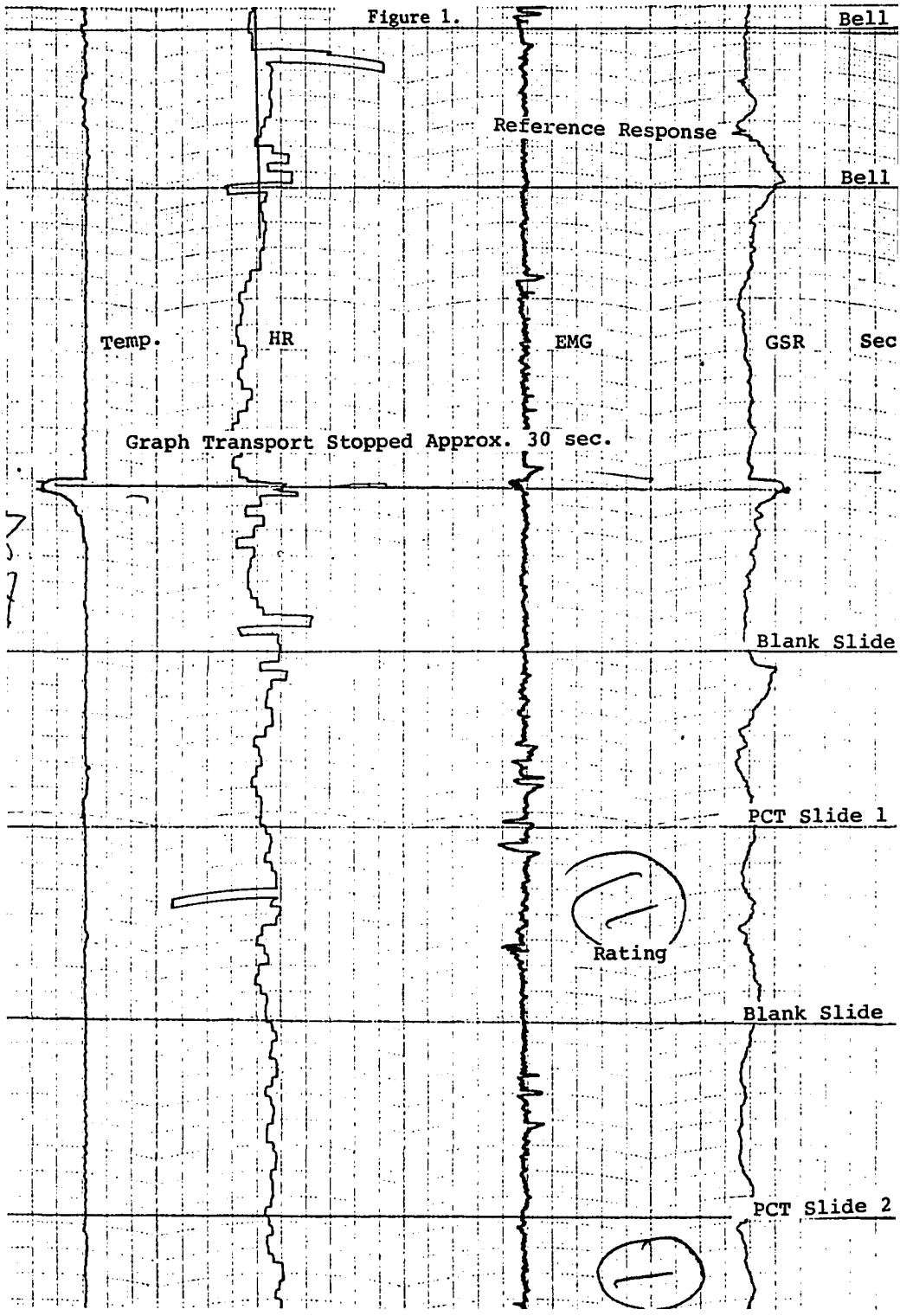


Figure 1.
Bell
Reference Response
Bell
Temp.
HR
EMG
GSR
Sec
Graph Transport Stopped Approx. 30 sec.
Blank Slide
PCT Slide 1
Rating
Blank Slide
PCT Slide 2

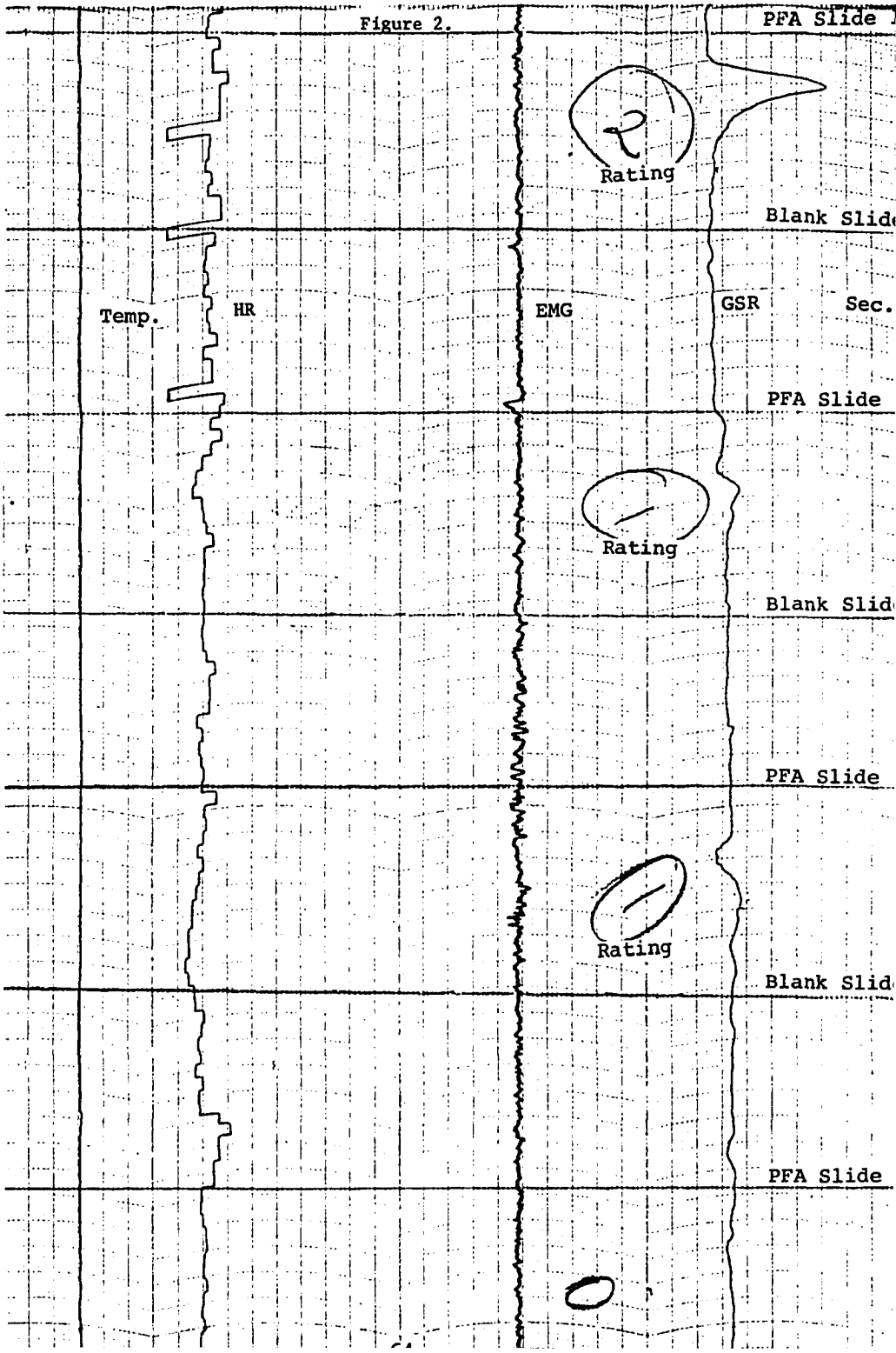


Figure 2.
PFA Slide
Rating
Blank Slide
Temp.
HR
EMG
GSR
Sec.
PFA Slide
Rating
Blank Slide
PFA Slide
Rating
Blank Slide
PFA Slide

Figure 3.

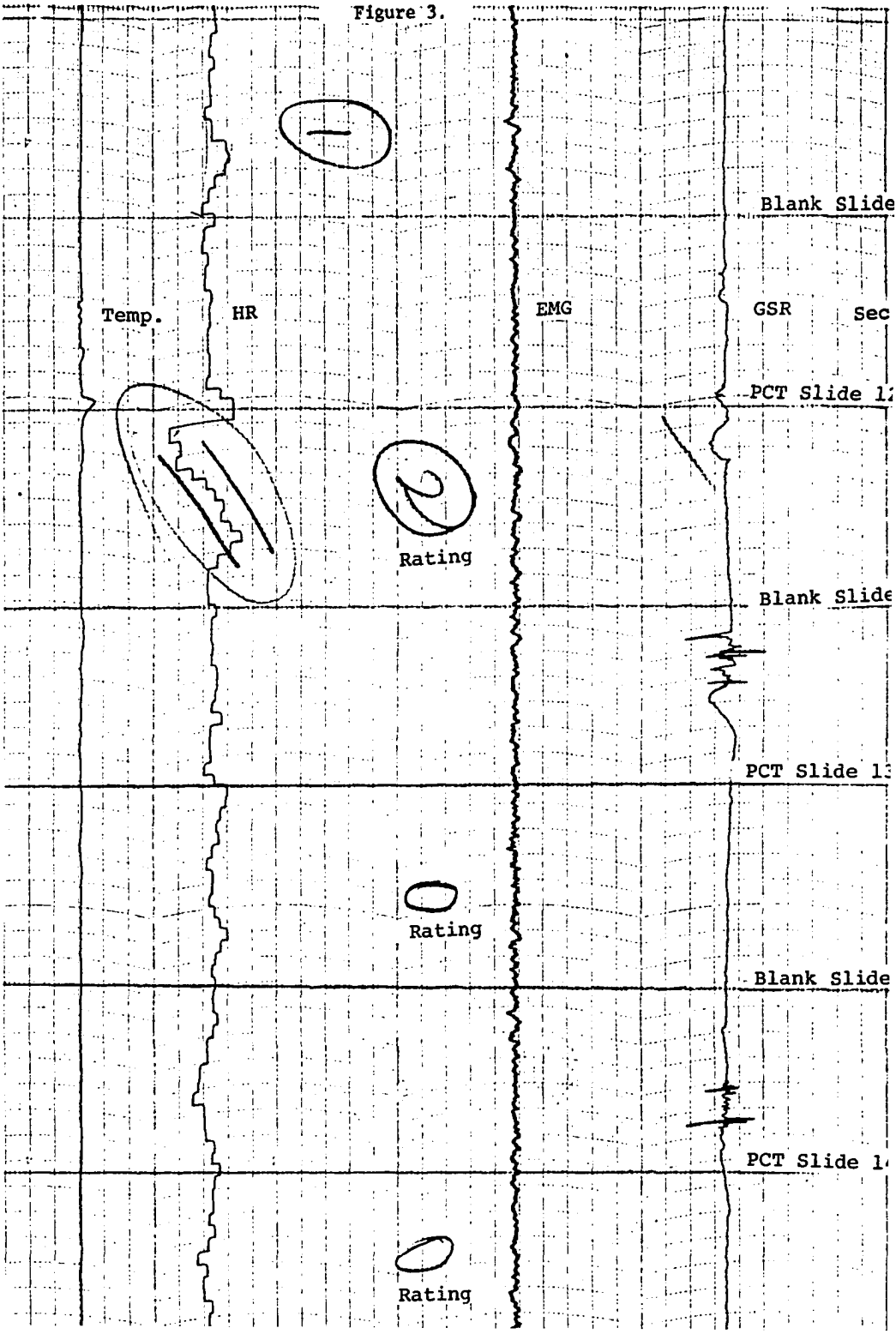

Blank Slide
Temp.
HR
EMG
GSR
Sec
PCT Slide 12
Rating
Blank Slide
PCT Slide 13
Rating
Blank Slide
PCT Slide 14
Rating

Figure Captions

Figure 1. Polygraph chart (2.5 mm/sec) showing examples of reference response and physiological response ratings to PCT items.

Figure 2. Polygraph chart (2.5 mm/sec) showing examples of physiological response ratings to PFA slides.

Figure 3. Polygraph chart (2.5 mm/sec) showing examples of physiological response ratings to PCT items.