

AFFECTIVE ENCODING AND DECODING:
A TEST OF A CIRCULAR MODEL
OF EMOTIONS

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PREFACE

The purpose of this study is to propose a circular, hierarchical model of emotions. This conceptualization is to be tested by having one group of subjects enact dimensional descriptions of feeling states and to have a second group of subjects judge the presence of each of eight emotions in each enactment. Decoding subjects are expected to evaluate each enactment by identifying the correct emotion and exhibit a specific order in their judgments.

The author wishes to express his thanks to his chairman and the members of his committee, Dr.s Don Fromme, Larry Brown and Ken Sanvold, for their generous co-operation, understanding and patience throughout this long process. Special gratitude is expressed to Dr. Barbara Stewart for her support and statistical expertise.

It has been said that all of life is contained in the struggle for some goal rather than the goal itself. Nowhere has it been more dramatically exemplified than in the preparation of this manuscript. Thank you, Elliot, for the countless ways you have expressed the belief, acceptance, and humor that was so vital and helpful.

Finally, my gratitude is expressed to my wife, Sarah, for her many sacrifices over the years which have made this moment possible.

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

A review of the major lines of thought and research on emotions shows a long history and an overwhelming number of heterogenous theories covering psychological, biological, physiological and social sources of emotion. The list of researchers of emotions reads like a who's who in science: Spinoza, Darwin, William James, Wundt, Titchener, Allport, Schlosberg, Hebb, and many, many more. Thus the study of emotions in man is not suffering from a paucity of interest or conceptualizations. Quite the contrary, there are so many conceptualizations of emotions that it becomes difficult to use the word emotion with much specific meaning without a lengthy discussion. This diversity of theories and models suggests that the topic of emotion is much too broad, complex and variable to be accounted for adequately by present approaches.

Conceptualizations of emotions have been categorized according to the inferred structure of their expression and recognition. Frijda (1969) proposed three categories: categorical, dimensional, and heirarchical.

Categories

Categorical approaches infer a number of distinct, independent emotions which are measured on discrete criteria. The product of this approach is typically a list of unipolar emotions and/or a delineation of observable criteria which differentiate emotions. An example of an early categorical approach is provided by Charles Darwin (1872) who listed approximately thirty emotions which he organized into eight general categories. His criteria for distinguishing emotions was primarily facial expression and movement. A different position was taken by Titchener (1900) who maintained that the feeling states of pleasant and unpleasant were the only pure states and that anything else called emotions was really some combination of feeling and sensation. Titchener's line of reasoning has not been carried further through categorical approaches, but has some relevance to hierarchical approaches which will be discussed later.

More recent research utilizing a categorical conceptualization of emotion has followed the example provided by Darwin. The goal of this research has been the identification and labeling of emotions, as well as searching for the overt criteria with which to differentiate between the various emotions previously identified. For instance, Allport (1924) suggested that, in addition to an attitudinal dimension, there were seven major types of emotions (pain, grief, amazement, fear, anger, disgust and pleasure) and that at

least 2,500 additional feeling states could be identified (Allport & Odbert, 1936).

Darwin's (1872) emphasis on facial expressions and the principle of antithesis applied to emotions has also stimulated a great deal of interest and research in facial correlates of emotion. Facial expressions, according to Tompkins (1962), are genetically patterned responses and the affects they represent function as motivational systems. These facial patterns are responses to stimuli which, through proprioceptive feedback from the facial musculature, become the actual experience of affect, as in the James-Lange theory of emotions. These affects also become the motivators for additional behaviors. Hebb (1964) reasons similarly that emotions are inferred from behavioral states of oneself and/or others, and that these inferences are made according to the expectancies that are formed through input from others and prior experience with the environment. However, the facial expressions and inferred emotions are not independent of the context in which they occur. Frijda (1953) proposes that emotional expression indicates an individual's disposition toward a stimulus situation while knowledge of the context of the situation makes it possible to name specific emotions. Through a series of studies Frijda (1958, 1961, 1969) has shown that while facial expressions are the dominant cues used for identification of emotions by observers, such identification is by no means independent of the context of the situation. Thus facial expressions,

while perhaps innate, appear to make the most sense when they are observed in the social context in which they occur.

Further support for a categorical approach to emotions came from Tompkins and McCarter (1964) who used untrained subjects to act out or judge facial expressions. Eight primary emotions were used (Tompkins, 1962) and the judges correctly identified, between 60 per cent and 92 per cent of the time, the affect from photographs. Also, Ekman, Sorenson, and Friesen (1969) have used this same approach to test the generality of emotions and emotional recognition. Their subjects were members of both literate and preliterate (stone-age) societies, and after adjusting their methodology for these two groups, obtained essentially the same rate of success of recognition of emotion for both groups.

Obviously, then, the categorical approach has achieved some important successes and provides a useful conceptualization of emotions. But the question of what influences and controls the expression of any specific emotion is still not answered. Dimensional conceptualizations of emotions appear to deal more with this question.

Dimensions

Dimensional conceptualizations of emotions propose that emotions are composed of a finite set of elements that occur in varying degrees and in varying relationships with one another. As such this approach makes it possible to discuss the similarities, progressions and differences between emo-

tions (Frijda, 1969). As discussed earlier, Titchener (1900) considered the feeling states of pleasant and unpleasant to be the only pure emotions while all else was made up of combinations of factors. Even though Titchener himself was arguing for a categorical conceptualization of emotion, it is quite possible to restate his conceptualization in support of a dimensional approach where pleasant and unpleasant form one bi-polar dimension. Three dimensions were proposed by Wundt (1907): pleasant-unpleasant, arousing-subduing, tension-relaxation. Schlosberg (1952), using a scale of emotions developed by Woodworth (1938), found clear support for two dimensions of emotions: pleasant-unpleasant and attention-rejection. He was later to propose a third dimension, a level of activation described as sleep-tension (Schlosberg, 1954), which was substantiated by Engen, Levy and Schlosberg (1957), and all three dimensions were replicated cross-culturally by Triandis and Lambert (1958). Abelson and Schlosberg (1963) using photographs attempted to replicate Schlosberg's three dimensions but instead concluded that the dimensions of attention-rejection and level of activation are probably redundant.

Not much work from a dimensional conceptualization was carried out after Schlosberg's work until Osgood developed his semantic differential technique in the early fifties. Osgood and Suci (1955), while trying to discover some method of dealing with the meaning of words, derived three

basic dimensions of evaluation, potency and activity. The semantic differential also can be used to evaluate emotion names, thus linking categories and dimensions. Further use of the semantic differential for research on emotions was made by Block (1957), who used a list of fifteen emotions and achieved essentially the same results as Osgood and Suci. Thus, dimensional conceptualizations were established as a useful approach with meaningful techniques for use in research.

More contemporary research has continued to substantiate clearly Schlosberg's pleasant-unpleasant dimension and a second dimension equivalent to Osgood's (1966) level of activation. The presence and meaning of additional dimensions is suggested by much of the literature. With the existence of two dimensions clearly evidenced, interest has shifted somewhat to the discovery of possible additional dimensions. Some of these are: control-intensity (level of activation), attentional activity, and submission-condescension (Dittman, 1972; Schlosberg, 1954; Frijda & Philipszoon, 1963). Dittman (1972) using judgments of segments of motion picture film found in addition to the two established dimensions of pleasant-unpleasant and activation, two additional dimensions, one of trust-mistrust and another that could not be clearly defined. In the research literature the use of four dimensions has been occurring more frequently in recent years; for example see Frijda and Philipszoon (1963), Osgood (1966), Frijda (1969), and Dittman (1972).

Hierarchies

Frijda (1969) proposed a hierarchical conceptualization of emotions which combines both categorical and dimensional elements such that categorical emotions are independent but may be related through the common influence of various dimensions. If elements (emotions) may be related through the common influence of whatever dimension are used, then there may be elements (emotions) which are related by the absence of a common influence of the dimensions involved. This characteristic of mutual-exclusiveness was seen to be present in Darwin's (1872) principle of emotional antithesis such that one might conclude that for each emotion there is an opposite emotion. This relation between two emotions, mutual exclusiveness of dimensional influence, is the basis of the bi-polar dimension proposed in this study.

Thus while Schlosberg's work was discussed under dimensional models, because of its subsequent influence on dimensional conceptualizations, and because of his simultaneous use of categories and dimensions, it seems more accurate to consider it a hierarchical approach. Schlosberg (1941, 1952) observed that data gathered by Woodworth (1938) for developing a scale of emotions could be described more completely if the elements of the scale were arranged in a circular fashion.

Plutchik (1962) proposed a circular model of primary emotions which he derived from a circular model of behavior

patterns. He reasoned that basic emotions have relationships of similarity or opposition which can be demonstrated in a correlation matrix and which must be illustrated in a circular fashion (Plutchik, 1972, 1974). It was also proposed in his 1974 paper that a combination of two opposite emotions should produce conflict, an idea consonant with a bi-polar conceptualization.

Much of what is discussed under categorical and dimensional approaches is useful in a hierarchical conceptualization. Most emotions are informally considered as being discrete and independent, while considering emotions dimensionally provides a means of working with their interrelationships. The research methodology used by both approaches further points out the artificiality of a continued dichotomy of categorical versus dimensional conceptualizations. Both Frijda (1969) and Dittman (1972) have reviewed the methodology used in the two approaches and in the majority of cases the methodology is very similar. The most prevalent technique is to have judges rate the kind and degree of emotion displayed in the face by live enactment, photographs or motion picture films. Other methods used have been the analysis of words (Osgood, 1966), physiological-social manipulations (Schacter & Singer, 1962), specific facial display areas (Ekman, Friesen & Tompkins, 1971), voice (Scherer, 1972), and vocalization components (Scherer, Koivumaki & Rosenthal, 1972).

The validity of the enactment and recognition of emotions through facial displays, as opposed to situational manipulations to produce affect, has been contributed to by Fromme and Schmidt (1972) who found that enactment of affect produced essentially the same types and degrees of behavior as would be expected in real life situations. Specifically, Fromme and Schmidt asked subjects to approach an assistant and act out four different affects. It was found that personal space (distance), eye contact and rate of approach reflected differences in the emotion being enacted. The conclusion of this research is that it is possible to obtain reliably differentiated non-verbal behaviors from affective role-playing.

CHAPTER II

THE PRESENT STUDY

The expression of emotion serves a functional role, aiding survival before it serves any adjunctive role (Darwin, 1872). Man has found a use for emotions in a communicative or expressive sense which is usually actualized through facial manipulations, voice and gesture (Woodworth, 1938). It can be argued that emotions must be considered from both a biological and a social perspective if we are to gain a comprehensive understanding of emotions. It is the purpose of this study to suggest a model of emotion which integrates both of these perspectives.

One idea common to all fields of physical science is that of basic units or building blocks. Specific structures or phenomena are made up of smaller units and, conversely, these structures or phenomena become elements of something more inclusive. At the present there is no rationale which argues against including emotions in such a building block conceptualization. If this is so then there should be some set of emotions that constitute a basic or primary set with definite social, physiological or behavioral antecedents, and there is much indirect evidence for just such a set of emotions. Dittman (1972) discusses the methodology of

categorical concepts of emotion as that of trying to obtain samples of emotions that are not mixes of other emotions. Although they may be labeled differently, categorical methodologies have been proposing eight emotion categories with surprising frequency. For instance, Plutchik (1962) uses eight emotions and eight behaviors, Allport (1924) discusses eight major emotions, Izard (1971) uses eight basic emotions and the four dimensions of Frijda and Philipszoon (1963) are bi-polar dimensions which yield eight possible facets. Dittman (1972) summarized the number of dimensions appearing in the literature and found that three dimensions is most frequent with a fourth dimension frequently appearing.

The organization of these categories and dimensions is frequently expressed as circular. Plutchik (1962) derived his circular emotions model based on a list of bi-polar emotions isolated by virtue of their apparent relationship to universally adaptive behaviors. Such circular models are frequently used in the area of interpersonal behaviors. At present, then the literature suggests the potential usefulness of a circular, hierarchical model which combines both categorical and dimensional ideas. The model used in this study is one that has been proposed by Fromme (unpublished manuscript) in which two independent dimensions and two derived dimensions are arranged in a circular fashion and yield eight emotion categories.

The Model

The models in the literature cited thus far differ from that proposed in this study on at least one major characteristic. The models of Osgood (1955, 1966), Schlosberg (1954), Frijda and Philipszoon (1963), and others, all use dimensions which are essentially psychological. They utilize phenomenological, introspective data and data from emotion naming and recognition studies to discover the psychological dimensions of the expression and recognition of emotions. The model proposed by Fromme consists of two, independent physiological and two, derived behavioral dimensions. The two independent dimensions are assumed to be physiological and functional at birth or shortly after, while the two derived dimensions are assumed to be behavioral and the result of interactions between physiological, maturational, cognitive, and social elements.

The Physiological Dimensions

The two physiological dimensions are termed: A. Ergic and B. Hedonic; they are represented by innate physiological systems which mediate the individual's responsivity to proximal stimulation. As maturation continues, the individual's behavioral repertoire increases and, with the physiological dimensions, the social-behavioral dimensions of C. Potency and D. Evaluation appear. The derivation of the behavioral dimensions will be discussed more fully below.

The Ergic Dimension

The sympathetic and parasympathetic nervous systems are the basis of physiological responsiveness and control. These systems operate in opposition to one another and a situational dominance of one over the other produces marked differences in the behavioral outcome.

Historically, the interest of researchers in the physiological correlates of emotion have centered on sympathetic arousal and its behavioral concomitants. However, we know from both physiologists and psychologists that the parasympathetic system plays an equally important role in the experience of emotion.

The Ergic dimension is similar but not equivalent to Schlosberg's (1954) sleep-tension dimension in that sleep-tension does involve sympathetic arousal but it also involves functions of the ascending reticular activating system (Pribram, 1971; Grossman, 1967). This dimension shows some similarity to Frijda and Philipszoon's (1963) control-intensity dimension. Their intensity speaks for the presence of some sympathetic activity such as demonstrativeness, aggression and tension; while their control speaks for the results of parasympathetic activity such as composure and relaxation.

Gellhorn (1958), noting that proprioceptive stimuli has some relation to excitation of the posterior hypothalamus, curarized cats and observed a reduction in the responsiveness of the sympathetic division of the hypothalamus and to

a diminution of states of excitation. He concluded that hypothalamic reactivity, cortical arousal, muscle tone, and sympathetic discharge were positively related. In further discussions, Gellhorn (1968) suggested that there is a dynamic relationship between ergotropic, sympathetic activity which centers in the posterior hypothalamus and trophotropic, parasympathetic activity which centers in the anterior hypothalamus. It is just such a relationship between the sympathetic and the parasympathetic nervous systems which is assumed to be operating in the Ergic dimension proposed in this study.

The Hedonic Dimension

The second dimension proposed here also derives substantial support from previous physiological research. Olds and Milner (1954) serendipitously discovered that animals stimulated once in the medial forebrain bundle would continue to stimulate themselves. This information has been used extensively in further research on cortical centers of pleasure and pain. Olds and Olds (1963) concluded from electrode placement studies that all of the hypothalamus and the medial forebrain bundle are involved in a reward system. They also observed that an aversion system did not seem to be as clearly defined as the reward system, but did exist at diffuse points through the thalamus, dorsal tegmentum and periventricular areas. The periventricular structures of the brain have also been discussed as having

essentially the same pain sensing abilities as the skin surface (Pribram, 1971). As Pribram further points out, it is not unreasonable to expect pain sensors in the brain since these structures develop from the same origins as does the skin.

Behavioral psychologists have capitalized heavily upon the pleasure-pain dimension in their use of it to associate the qualities of either approach or avoidance to specific cues. This use of pleasure-pain to derive environmental control over individual behavior clearly demonstrates the differential effects of each upon subsequent behavior. Also from Darwin's evolutionary perspective, survival of a species is in part determined by an individual's sensory accuracy and responsivity such that those who can accurately experience and respond to pleasure and pain survive while those who can't, perish.

The Behavioral Dimensions

In discussing the two behavioral dimensions it is necessary to outline their derivations. Each individual is born with what may be termed wired-in response systems, e.g., touch, sight and sound, which are available for responding to environmental stimuli. As such the individual is equipped to process limited amounts of sensory information received from his or her environment. Although this capacity is quite limited, to begin with, sensory abilities develop rapidly within the first six months (Mussen, Conger & Kagen,

1969). By the sixth month the majority of the development of sensory capacities has been attained and the child is responsive to most environmental stimuli. In fact, Marquis (1931) has obtained classically conditioned behaviors from infants whose ages ranged between two and nine days. The implication of this is that from a very early age infants are able to learn in a classical conditioning situation.

To learn in a classical conditioning situation, the infant must be able to perceive the stimuli involved and, necessarily, has to experience the consequences of these stimuli. This means that environmental stimuli must occur, initially, in close proximity to the child so as to be discernable. Then, in order for these stimuli to acquire differential values, the child has to experience the consequences of these stimuli in some fashion or another.

The child's first experiences of the consequences of environmental stimuli produce either predominantly sympathetic or parasympathetic reactivity. If the stimulus is non-threatening, then parasympathetic functions occur, but if the stimulus is threatening, then sympathetic functions take over. Combined with this specificity of nervous system function the child experiences either pleasurable feelings or painful feelings. Therefore, when the child is relaxed or non-defensive (parasympathetic) and is experiencing pleasurable feelings, the model presented here suggests that a tendency to approach will result. Conversely, when the child is tense or threatened and is experiencing

some form of pain, physical or psychic, a tendency to escape is expected to be the resultant behavior.

It is a proposition of this model that this initial reactivity to environmental stimuli is an unconditional response. With repeated experience the individual comes to anticipate the consequences of environmental stimuli and this anticipation itself will come to elicit either approach or avoidance behavior. Thus the behavior of approach or avoidance become conditional responses to the conditional stimulus of anticipation. In other words the association between environmental stimuli and their consequences produce anticipation and this anticipation comes to elicit anticipatory behavior of approach or avoidance. Neal Miller (1937) has convincingly demonstrated the presence of approach and avoidance tendencies to be associated with the expectancies of pleasure and punishment. Thus there is some research data supporting the idea that the anticipation of consequences is associated with the responses of approach or avoidance.

The Evaluation Dimension

The dimension of Evaluation is best described as consisting of the elements of approach and avoidance. This is a behavioral dimension which is derived from both physiological and maturational influences. Generally, individuals will have a tendency to approach those objects or situations which produce pleasure and will have a tendency to avoid those producing displeasure or pain.

Schlosberg (1954), using a semantic differential task, found strong support for a pleasant-unpleasant dimension. When this dimension is translated into behavioral terms, the resulting description is equivalent to the evaluation (approach-avoidance) dimension being proposed in this study. Dittman (1973) reviewed seventeen dimensional studies of emotion and observed that fourteen of these studies reported the dimension of pleasant-unpleasant as being the most substantial and clear-cut of all dimensions identified. Thus, of all of the four dimensions proposed here, the Evaluation dimension is expected to be the most dominant and identifiable dimension in the data to be collected.

The derivation of the fourth dimension, Potency, proposed here follows the same general pattern as that of Evaluation. When an individual experiences tension in combination with pleasurable feelings, the model proposed here suggests a resulting tendency toward dominant behavior. This dominant behavior may be thought of as either inter-personal or intra-personal dominance, or both. Conversely, when an individual experiences domination of parasympathetic activity ("relaxed") in conjunction with physical or psychological pain, the resulting behavioral manifestation is expected to be submission. Again, this submission may be thought to occur at either an inter-personal or intra-personal level, or both. With increased maturation and social development an individual may be expected to anticipate situations involving tension and pleasure by assuming

a dominant role. Conversely, an individual is expected to anticipate situations involving pain and parasympathetic dominance with a submissive role.

Frijda and Philipszoon (1963) defined a second dimension in their data as naturalness, submissiveness versus artificiality and authoritarianism. Osgood (1955, 1966) identified a dimension he termed potency in a study of the identification of fourth enacted emotions. This dimension was expanded by Osgood and Suci (1955) with the label of potency and control and seems similar to the Frijda and Philipszoon dimension mentioned above. Irrespective of the terms used by the authors above, the dimension they described may be explained essentially as a potential to direct or be directed, that is dominance-submission.

Potency

The second derived, behavioral dimension consists of the factors of dominance and submission. Frijda and Philipszoon's (1963) dimension of submission-condescension is interpreted by this author as the psychological description of the social-behavioral roles of dominance and submission. Osgood's potency and control (Osgood & Suci, 1955) also are interpreted as psychological descriptions of the behaviorally defined dominance-submission dimension used in this study.

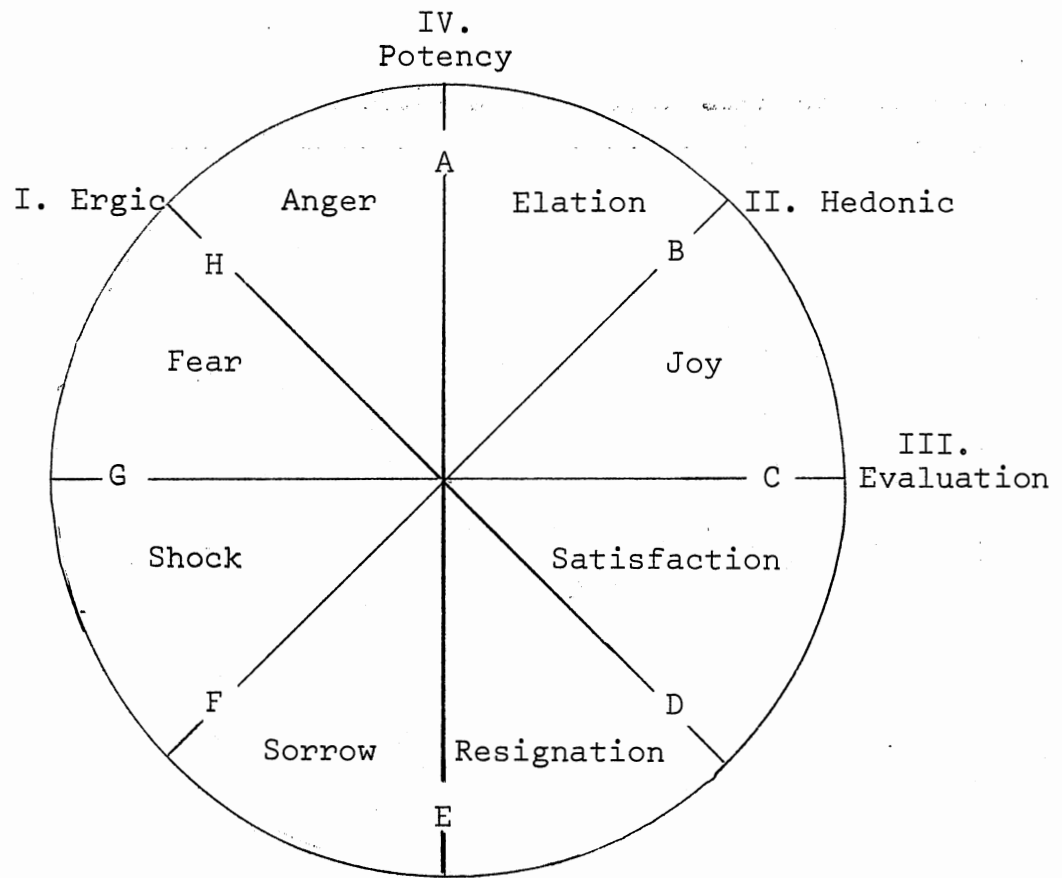
Since emotions usually occur in some type of social context, it is reasonable to assume that the social milieu

produces limitations and expectations upon each of its members. A most common expectation is that of mastery. Those having achieved mastery of something are allowed to dictate to those who have not. Those who have not, cannot or will not achieve mastery will be expected to assume a submissive role. Frequently those in a submissive position will attempt to achieve mastery in some other fashion such as rationalization or performance in another area. Taking an evolutionary viewpoint again, dominance and submissiveness become a mechanism for the strongest and the less strong members to co-exist with a minimum of intra-group conflict.

It is seen, then, that the four dimensions used in this study are slightly similar to those found elsewhere, but do differ in using both physiological and behavioral dimensions which in fact could be used to describe these previous results.

Circularity

The most meaningful arrangement of the four dimensions of Ergic, Hedonic, Evaluation and Mastery for demonstrating their oppositions and interrelations is circular (Figure 1). This arrangement has been used extensively in models of interpersonal behavior, as mentioned earlier, and more recently has been used for emotions by Schlosberg (1941) and Plutchik (1962). As to the question of order, it is possible to consider the developmental sequence for an answer. Bridges (1932) developed a scheme of emotional



- | | | |
|--------------------|----|----------------|
| A. Dominance | -- | E. Submission |
| B. Pleasure | -- | F. Pain |
| C. Approach | -- | G. Avoidance |
| D. Parasympathetic | -- | H. Sympathetic |

Figure 1. Circular Model of Emotions

development which suggests a progression in the acquisition of emotional responses (Figure 2). It is possible, at this point, to hypothesize the appearance of first the physiological dimensions and then the behavioral dimensions (Figure 2). More specific information as to the actual appearance of each dimension must wait for the implementation of research aimed at this question.

The emotion categories were derived intuitively with consideration of the four dimensions, adjacent emotions and opposite emotions. It is possible to illustrate a translation from dimensions to emotion categories by assuming that all four dimensions must be represented in any emotion category. More specifically, the physiological dimensions are experienced as feeling states. These feeling states occur in response to anticipation or a combination of both. The behavioral dimensions serve as behavioral strategies or responses to the feeling states. It should be kept in mind that a specific emotion state is a function of both experience and anticipation in the sense that reason and logic operate in service of our feelings and emotions (Fromme, personal communication). The implication of the above statements is that an emotional experience is a combination of feeling and thinking (anticipation) in which all four dimensions are present to some degree.

The translation from dimensions to emotional categories was made on the rationale that all four dimensions are represented, that the amount of influence of the two physiolo-

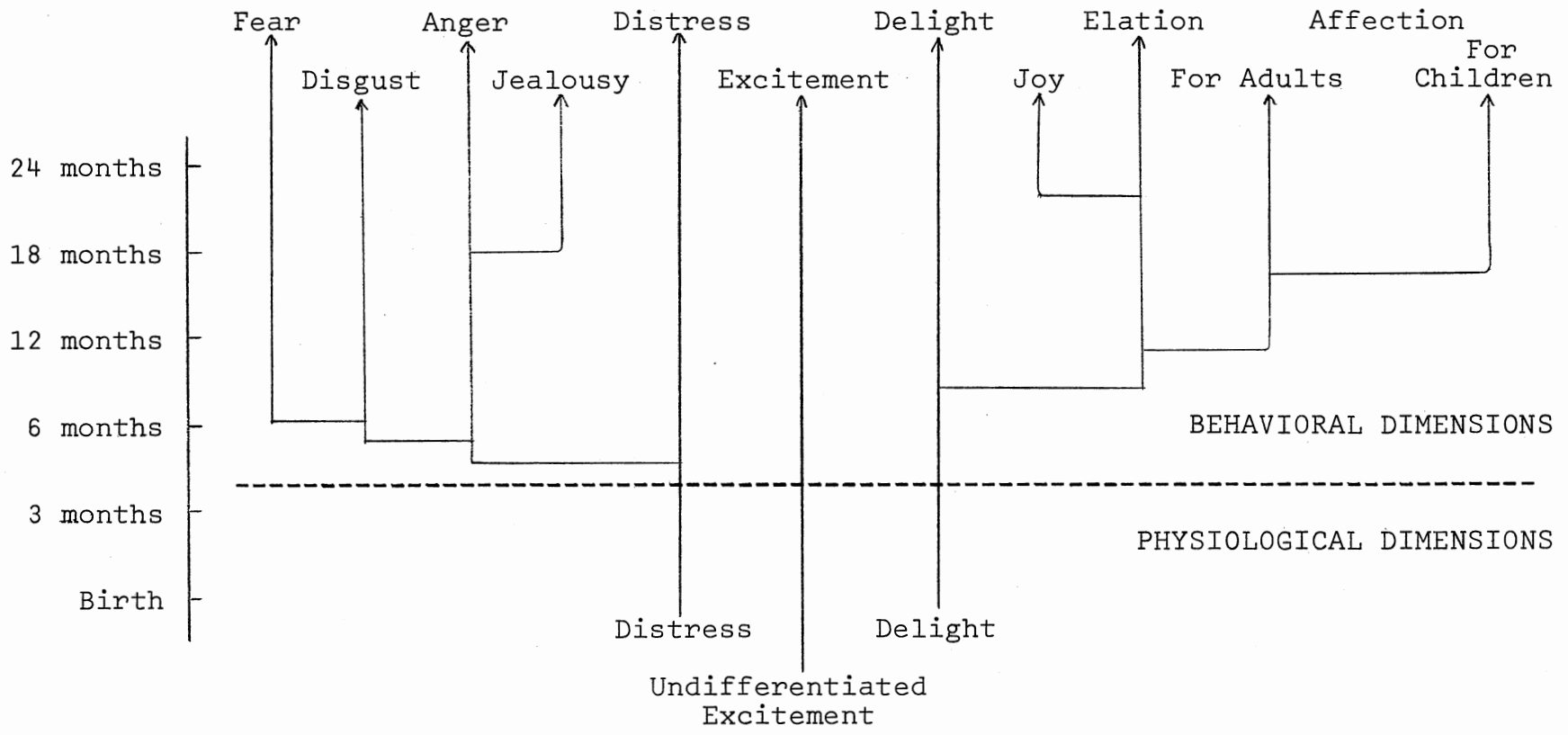


Figure 2. Adaptation of Bridges' Scheme of Emotional Development

gical dimensions is not equal and the two behavioral dimensions also have an unequal influence. The structure of the model presented here is circular or, in Schlosberg's (1941) words, a "recurring continuum." In a continuum there must be a means for a continuous progression from one point to another. In a recurring continuum this means that it must be possible to progress from one point, around the circle and arrive at the point of origin, presumably without invoking any special rules. If all four dimensions were not represented in any emotion state, one of the physiological dimensions must be more influential than the other for a given emotion state. The same holds for the behavioral dimensions. This is necessary because the occurrence of the same levels of the physiological dimensions, for example, would produce encompatable feeling states. That is, if sympathetic arousal (fight or flight preparedness) and pleasure were at the same level, the individual would be hard pressed to respond with pleasure to a stimulus that had he or she as equally prepared to be defensive or offensive. Therefore, the composition of any one emotion state consists of one physiological and one behavioral dimension which exert more influence on the emotional state than the other two dimensions. Again, because the model is a recurring continuum, the further away you move from a given emotion state, the less influence a given dimension will have on that emotion state. Observation of Figure 1 shows, for example, that the Anger state is bordered by Sympathetic

domination (Physiological) and by Dominance (Behavioral). These two are the major components of this emotion. The two dimensions next in proximity are represented by Avoidance (Behavioral) and Pleasure (Physiological) and these two are minor components of the Anger state. A similar method was used for the derivation of the remaining emotion categories.

Categories

The translation scheme outlined above yields a different pattern of dimensional influence for each emotion category. To avoid the confusion and misinterpretation involved in using emotion names, the alternative used was to construct emotion categories. The emotion words used in Figure 1 are for identification of each emotion category.

Through the use of the translation scheme, the emotion category described as consisting primarily of the elements of Approach and Parasympathetic domination and secondarily of the elements of Pleasure and Submission is defined as Satisfaction. The primary element of Approach suggests something that is rewarding or desirable that can be approached or gotten closer to without threat. The other primary element suggests the absence of tension and absence of a need to do something; that is, an accepting, relaxed attitude. The secondary elements of Pleasure and Submission suggest the potential for gratification and the absence of a need to dominate or control. The intuitive label selected for this emotion category was Satisfaction. The appropri-

ateness of this label is supported by the observation that satisfaction is the description of the feeling that occurs after the successful completion of some job, goal, or pursuit.

The adjacent emotion category of Joy is only one step away from Satisfaction where Pleasure becomes a primary element and Dominance becomes a secondary element, dropping Submissiveness and changing to a secondary status, Parasympathetic dominance. For example, a job is finished to our satisfaction and then we discover that we accomplished much more than we had anticipated or perceived. The intrinsic and/or material rewards increased and we are very happy. Likewise, finding out that we had not done quite as well as we wanted, we express disappointment and resignation. Notice that these outcomes all have in common the elements of approach and relaxation. If, instead, we were to be fired we would not be relaxed and predisposed to stay close to that situation or environment.

The logic of each emotion category and its position in the circle follows the general pattern described above. It is assumed that, with adequate understanding of the dimensions involved, an individual could spontaneously display the correct emotional expression which could be recognized by a naive observer.

The purpose of this study, then, was to have subjects display the emotion they feel is described by the dimensional description provided them, then have additional subjects

rate or decode these affective displays as to the degree to which emotion is presented in each of the enactments. The subjects were not trained in any way for their tasks and no situational description will be provided, elicited or encouraged. The encoding subjects were given relaxation exercises and provided thorough definitions of dimensions to be used. Although Frijda (1953) suggests that some situational context is important, it was felt that the addition of any contextual information would not appreciably increase the encoding task or decoding task, but would probably reduce the generalizability of the results obtained.

Sex of Subjects

Sex effects in the recognition of emotion have been discussed as being related to the differences between males and females of their level of expression of affect and electrodermal activity (Jones, 1935, 1960; Buck, Savin, Miller & Caul, 1972). Buck et al. (1972) discuss cultural influences in child raising that teach young boys to inhibit and mask emotion while such inhibitions are not widely placed on females. Their results indicate that females, as externalizers of affect, were more effective transmitters and receivers of non-verbal, emotional cues than were males.

Frijda (1963) suggested that contextual cues provided the means for adequately categorizing emotions. Along a similar line, Schacter and Singer (1962) concluded that emotional states were a function of physiological arousal and

cognition. The Buck et al. (1972) study forms a bridge between these two studies in that the stimuli used for eliciting affect were rich in contextual information but generally limited to human forms. As mentioned above, they found significant sex of subject effects. In this study, sex of the judges was considered to be potentially important in their success in decoding affective expressions in that if females were better perceivers and communicators of emotion, then their performance would be consistently better than that of male judges.

The hypotheses considered in this study were:

1. Enactments of dimensionally encoded emotions can be meaningfully categorized by naive judges.
2. The relationships among the eight emotions employed in this study are best described as circular.
3. Female judges should have better over-all performances than males.

CHAPTER III

METHOD

Subjects

Subjects were drawn from a pool of Introductory Psychology students. An initial pool of 50 students were given the Empathetic Fantasy Scale (Elms, 1966) and the eight subjects scoring as most empathetic were used as encoding subjects. The Empathetic Fantasy Scale was thought to provide good predictability of an individual's ability to enact emotions. Of the eight encoding subjects, two were dropped due to equipment failure. The final subject sample consisted of three male and three female encoders, and twenty-one male and twenty-one female decoders. Class credit, determined by the instructors, was given to each participating student.

Apparatus

The experimental room was twenty-three feet by eight feet with a one-way mirror measuring three feet by four feet. Encoding subjects were seated in front of the one-way mirror, with a distance of approximately three feet between the subject's nose and the camera lens. The camera, a Sony 3260, was placed on the opposite side of the mirror. Video-

tape recordings were made on two Sony recorders, AV 3600 and 3650. Each encoding subject's Neutral expression was recorded on one recorder, then played back through a Sony Special Effects Generator, SEG 1A, on a vertically split screen. As this played back on one half of the display screen, each of the enacted emotions was recorded on the other half. The net result of this procedure was a visual display in which one half of the picture was the subject's neutral expression and the other half was the enactment of emotion.

Decoding subjects were seated seven feet from the screen of a Setchell-Carlson, model 2100SD, 23-inch, black and white monitor in the experimental room.

Rating Format

Decoding subjects were provided a list and description of the emotion categories to be used for judgments. At this time the decoding subjects were given rating sheets for recording their judgments (Appendix C). These sheets were pre-recorded as to sex of enactor, emotion judged and identity of the enactor. One rating sheet was used for each enactment. On each rating sheet the eight emotions categories were listed with a Likert-type scale with seven options ranging from "Definitely" to "Definitely Not," with scores ranging from 1 to 7, respectively.

Procedure

Each subject of the encoding group was seated and given the following instructions:

I am doing a study to investigate the ability of people to act out feelings, with their face and upper body, appropriate to the description of characteristics provided. Each time an emotion is to be acted out you will be given four characteristics. You will be asked to act out eight different feeling states. Do you have any questions? Fine. We will start off with a relaxation exercise.

Immediately following these instructions, the subject was asked to tense all muscles for about 10 seconds and then relax. Next, they were asked to take a deep breath, hold it for about 5 seconds, and then exhale. This procedure was repeated three times. Finally, the subject was asked to close his eyes and was given 30 seconds in which to imagine a pleasant meadow scene (Fromme & Schmidt, 1972).

Then the following additional instructions were given:

Now remember, you are to combine the four characteristics given and act out one emotion. You will do this eight times. Do not be afraid of doing it wrong because each person has his own way of doing this and it is always correct for that person. Hold your expression until I say OK.

The eight descriptions were presented verbally from card forms in a randomized order (Appendix B). The duration of presentation of each card was approximately twenty seconds; sometimes longer in order to record at least fifteen seconds of each expression. Each subject's expressions were videotaped through the one-way mirror. Abbreviated relaxation exercises were presented before each enactment.

Decoding subjects were utilized in eight groups of size four and two groups of size five, for a total of forty-two subjects. Each group was given a brief introduction and explanation of the purpose of this study. Each subject of the decoding group was given the following information:

I am doing a study to investigate the ability of people to recognize emotions. You will be given a list of eight emotions and for each trial you will be asked to judge how much of each emotion is being portrayed. There will be a total of 16 trials.

There is no deception involved in this study. The material gathered in this research is for experimental purposes only and will be kept confidential. You have the right to withdraw your participation in this study at any time. I will be happy to give you feedback, answer questions, and show you the equipment when we finish. Do you have any questions at this time?

A task description, additional instruments and reminders (Appendix A) were given to the subjects. The presentation of the taped expressions was made at the rate of one every 40 seconds. Each expression was displayed for 30 seconds, followed by a 10 second blank screen. A warning tone was presented three seconds before each new expression. One randomization of emotion words was used for all judgments. After completion of the task, each group was given a debriefing.

The experimental design utilized in this study was a randomized block factorial with repeated measures on two factors. The analysis procedure used here generally follows that outlined by Kirk (1968). Exceptions to this are the use

of Jonckheere's non-parametric statistic (Hollander & Wolfe, 1973) and the Newman-Keuls test used for evaluating the expected ordering of judgments.

CHAPTER IV

RESULTS

The first hypothesis was supported by the results of the analysis of variance (ANOVA); the interaction between judgments and enactments was significant at the .05 level. Decoding subjects were able to apply the emotion categories provided them to the enacted emotion dimensions and make statistically significant judgments.

Additionally, the main effect for Judgments was found significant at the .01 level. Essentially, then, the decoding subjects were operating with some bias or set with respect to the emotion categories provided them. The results of the ANOVA are summarized in Table I.

Further evaluation of the Enactment by Judgment interaction was made by computation of simple main effects. In this analysis the effects of Enactments at all eight levels of Judgments were non-significant. Likewise, the effects of Judgments on all levels of Enactments were non-significant (Appendix D). In pursuing an explanation of the Enactment by Judgment interaction, observation of Table II revealed that the presence of two processes in the tabled mean judgments. Specifically, the judgments of Elation, Joy, and Satisfaction appeared to have a high degree of

TABLE I
ANALYSIS OF VARIANCE: SEX OF JUDGE,
JUDGMENT AND ENACTMENT, 2x8x8

Source	df		MS	F	
	U	C		U	C
Between Subjects					
Sex of Judge (A)	1		2.50	0.14	
Ss w. Grps.	40		17.32		
Within Subjects					
Enactment (B)	7	(1)	2.47	2.09	
A x B	7	(1)	0.36	0.30	
B x Ss w. Grps.	280	(40)	1.18		
Judgment (C)	7	(1)	48.44	15.67**	**
A x C	7	(1)	3.89	1.26	
C x Ss w. Grps.	280	(40)	3.09		
B x C	49	(1)	12.02	7.05**	*
A x B x C	49	(1)	1.36	0.80	
BC x Ss w. Grps.	1960	(40)	1.71		

Note: Conservative degrees of freedom computed with
Greenhouse-Geisser test.

U - Usual df

C - Conservative df

* $p < .05$

** $p < .01$

TABLE II
TABLE OF MEANS

Enactments	Judgments							
	Elation	Joy	Satisfac	Resigna	Sorrow	Shock	Fear	Anger
Elation	<u>4.46</u>	3.83	3.49	4.40	4.70	4.70	4.95	5.08
Joy	4.52	<u>4.18</u>	3.83	4.18	4.44	4.93	5.04	4.92
Satisfaction	4.39	3.87	<u>3.21</u>	4.24	4.87	5.42	5.12	5.12
Resignation	5.11	5.06	4.56	<u>3.64</u>	3.87	5.00	4.71	4.24
Sorrow	5.10	4.75	4.21	3.94	<u>4.31</u>	4.70	4.73	4.49
Shame	5.35	5.20	4.80	3.69	3.69	<u>4.57</u>	4.40	4.02
Fear	5.25	5.44	4.81	3.12	3.71	4.38	<u>4.50</u>	3.79
Anger	5.29	5.31	4.80	3.32	3.67	3.96	4.20	3.85

covariance. The remaining five judged emotions also appeared to have a high degree of covariance, but always opposite to the observed covariance of Elation, Joy and Satisfaction. For example, on the enactment of Anger, the average of the judgments of Elation, Joy and Satisfaction was 5.13 and the average of the judgments of the remaining five emotions was 3.80. This means that for the enactment of Anger, judges rated the three "positive" emotions as being much less present than the five "negative" emotions. Across all enactments, the three "positive" emotions were judged more present for the three "positive" enacted emotions and judged less present for the remaining five "negative" enactments. Thus, the direction of the judgments was appropriate on all enactments.

This was further explored through the use of Scheffe's procedures for contrasts (Kirk, 1968). The results of this analysis showed that Elation, Joy and Satisfaction, as a group, were judged significantly more present on the enactments of these three emotions and were judged significantly less present on four of the remaining five emotion enactments, than the judgments of the other five Judgment emotion categories.

The second hypothesis was supported by the results of the Jonckheere analysis; the judgments made by decoding subjects revealed the predicted step-wise ordering of ratings. In this procedure the cell means were arranged in table form (Table II) with the italicized (underlined)

values on the indicated diagonal representing the observed value of the predicted target emotion. This group of values comprised the target group of emotions. The values in the two diagonals on either side of the target group comprised the group of judgments which were one step removed from the target emotions. For example, the observed value of Satisfaction is 3.21. This means that for the enactment of Satisfaction, the mean judgment of Satisfaction was 3.21. In consulting Table II, the emotion categories adjacent to Satisfaction are Resignation and Joy. The group of emotion categories adjacent to the target emotions for each enactment comprise the one-step-removed category. This same procedure was used for the next-adjacent emotions until four step-wise groups of emotions were formed (Appendix E).

This arrangement, then, produced the expected ordering of judged emotions and their observed values, and from this arrangement the Jonckheere statistic was computed (Hollander & Wolfe, 1973). This procedure essentially computes all of the pair-wise Mann-Whitney U's on the data arranged in this step-wise fashion, and then computes a large sample Mann-Whitney U on this group of pair-wise U's. This analysis yielded a critical value of 3.34 ($p < .005$).

A further test for individual ordering was made using the Newman-Keuls test (N-K). This procedure was carried out by arranging the observed judgments in ascending order for each enactment, and calculating a separate N-K for each enactment (Appendix F). The results of this analysis identi-

fied six enactments on which judges rated the correct emotion most present or not significantly different than the incorrect emotion rated as most present.

The third hypothesis was not supported by the results of the ANOVA. A summary of the results of this analysis appears in Table I in which the factor of Sex of Judge was seen to be non-significant. Also found non-significant were all interactions involving Sex of Judge as a factor.

CHAPTER V

DISCUSSION AND CONCLUSIONS

The hypothesis that dimensionally encoded emotions could be meaningfully interpreted by naive judges was partially supported. This finding is consonant with previous research using several different approaches, all of which had subjects identify or recognize emotions from facial expressions (Abelson & Sermat, 1962; Engen, Levy & Schlosberg, 1958; Frijda, 1958, 1961, 1969).

There was a significant interaction between Judgments and Enactments, giving support to the hypothesis that dimensional encoding and categorical decoding of affect through facial expression is possible. The decoding subjects were able to recognize the categorical emotions in the facial displays of dimensionally encoded emotions and attempted to convey this in their judgments.

Further analysis of this interaction revealed that there was no one enactment or categorical emotion judged to be present more than another. This result was contrary to what was expected in that it was an expectation that judgments would be made in which the correct emotion category would be identified with the appropriate enactment.

Consistent with a hierarchical conceptualization, the task set before the decoding subjects was to decode the dimensionally encoded emotion into a categorical recognition. It is assumed that this is only possible if the encoding was complete. If not, then the decoding subjects would presumably decode what was available and report this result within the limitations of the structured rating alternatives. Thus the non-significance of the expected simple main effects was concluded to be the result of "experimental noise" which masked the expected effects. This "noise" is thought to have originated in the encoding subjects' task of enactment of dimensional descriptions of emotions such that there was an incomplete encoding of all information. This is also considered to be the source of the decoding judges' bias, observed in the results of the ANOVA, and is discussed more fully below.

The post hoc contrast between Elation, Joy, Satisfaction and Resignation, Sorrow, Shame, Fear, Anger revealed the presence of two processes in decoding judgments. In the terms of the model proposed here, this is seen as the Hedonic dimension in which Pleasure and Pain are the bi-polar elements. Thus it is concluded that the encoding subjects were only partially successful in enacting the full dimensional descriptions of emotions. As discussed in Chapter II, Dittman (1973) summarized the literature on dimensional aspects of emotions and found that fourteen of the seventeen studies reviewed ranked the dimension of Pleasant-Unpleasant

as the most substantial dimension identified. The partial success of the encoding subjects is clearly in agreement with previous research findings and was successfully transmitted to the decoding subjects. The decoding subjects, then, showed much inconsistency in attaching a categorical label to each enactment but were clearly distinguishing the encoded Hedonic dimension. It is thought that this inconsistency produced a bias in judges' ratings and resulted in the significant main effect observed for Judgments.

The partially successful performance of the encoding task discussed above may be more clearly understood in the context of the hierarchical model proposed here. Specifically, the hierarchical model proposes that there is a relationship between the dimensional and categorical descriptions of emotions, and that this relationship develops over a period of time as a function of maturation and socialization. Therefore, it is appropriate to consider the possibility that recognition/evaluation of specific emotions occurs in successive stages. For instance, the recognition of a particular emotion may be accomplished by first categorizing the emotion as positive or negative and then using more specific physical and contextual cues to proceed to actual recognition. From the discussion in Chapter II of the model presented in this study, it is possible to conceptualize a progressive development of the dimensional basis for emotions; the initial development of the two physical-maturational dimensions and then the development of the two

behavioral dimensions. This is seen as the general procedure employed in the process of recognition; the assessment of information relative to the survival/physical well-being of the individual, then assessment of the social/contextual meaning of the cues present in the stimulus presentation. It is the conclusion of this author, then, that the encoding subjects encoded primarily the Hedonic dimension in their enactments, which was communicated consistently to the decoding judges. The decoding judges then consistently reflected this one dimension in their ratings but were unable to differentiate clearly the categorical emotions in the facial enactments.

The hypothesis that the group of emotion categories and dimensions used in this study can be best described by a circular model was supported. Subjects, as a group, rated the correct emotion categories more favorably than the emotion categories one step removed, as discussed in Chapter IV. With each successive step away from the correct emotion category the ratings became higher, signifying that there was a consistent ordering of judgments. Thus, regardless of the correctness of subjects' choices for emotion categories, their rating of categories adjacent to the correct one were successively higher with each step away from the correct emotion. The extremely high significance obtained in this analysis is taken as strong evidence for the appropriateness of a circular system of emotions structured in a hierarchical model.

Results of a further analysis of this ordering of judgments showed that on six of the eight enactments the correct emotion was either correctly judged most present or was not significantly different from the emotion rated most present. This was seen to be the consequence of the judges' confidence in their ratings in that when the correct emotion was not rated most present, the number of emotions found to be non-significantly different increased in number. This was taken as a serendipitous measure of the judges' attempt to provide a greater range for error. From Appendix F it can be seen that of the six enactments on which non-significance between the emotion rated most present and the correct emotion were obtained, only on two of these did judges successfully choose the correct emotion. An explanation for this poor hit rate was discussed earlier in the form of poor encoding of the dimensions of emotions, resulting in constriction of the range of facial enactments.

The hypothesis that Sex of Judge was an important factor in the decoding of emotions was not supported. Since this factor was not statistically significant, further analysis was not computed. The computed F-ratio was so small that it is doubtful that there was a meaningful effect due to the sex of the judge.

The primary problem in the methodology of this study appears to be the quality of the enactment of dimensional descriptions of emotion. The significant main effect for Judgment indicated a major bias in the decoding subjects'

ratings. Specifically, decoding subjects rated Satisfaction as being most present in the three "positive" emotion enactments and rated Resignation as being most present on four of the five "negative" emotion enactments. This was concluded to be the result of the encoding subjects' failure to produce sufficiently different facial expressions which would allow accurate discrimination. A second point suspected of contributing to the difficulty of the decoding subjects' task was the structure of the task itself. Specifically, judges were presented with the enactment of one emotion and asked to evaluate how much of each of the eight emotions was in each enactment. Thus the task before the judges was primarily one of evaluation. One might hypothesize that had the decoding subjects' task been one of recognition, with 2nd and 3rd choices, the results would have been more positive and clear cut.

Summary and Conclusions

The results of this study provided marginal support for the hypothesis that enactments of dimensional descriptions of emotions could be differentiated using a categorical system of emotions. Furthermore, strong support for a circular structure of emotions was obtained, as well as supporting the value of a hierarchical model in the study of emotions. Methodological areas perceived as needing more clarification and substantiation were the quality of the stimulus presentation and the complexity of the judges' task.

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APPENDIX A

INSTRUCTIONS TO DECODING SUBJECTS

On each page of the scoring set in front of you notice that there are eight emotions in the left column. You are to judge how much of each emotion is in a particular enactment. You record your judgments by using the scale in the top row. Simply mark an X in the box appropriate to the emotion and your judgment. You must judge all eight emotions for each enactment. There will be two expressions on the screen. The one on the right is a neutral reference point. The one on the left is the expression to be judged. You must work quickly.

Also in front of you there is a single page containing descriptions of the emotion-words you will be using when you make your judgments. Please read along with me (read emotion words and their definitions out loud). Keep this sheet in front of you for a reference in making your judgments.

Remember, you are to make eight judgments for each emotion displayed. You will have approximately 40 seconds to judge each presentation. A tone will be heard 3 seconds before the presentation of each new enactment. Because each person reacts differently there are no right or wrong answers, so do not hesitate to make your judgments. Are you ready?

APPENDIX B

DIMENSIONAL DESCRIPTIONS OF EMOTIONS (PRESENTED TO SUBJECTS FOR ENACTING)

Neutral:

Imagine you're in a situation in which you are feeling neither threat nor arousal, neither dominance nor pleasure, neither attraction nor relaxation, neither submission nor pain, just neutral.

Elation:

Imagine you're in a situation where you are mildly aroused, tense and ready to act. You are quite sure you can master, dominate and control the situation and you regard the situation with strong pleasure and enjoyment. You also find this situation somewhat attractive and desirable.

Joy:

Imagine you're in a situation where you feel some ability to master, dominate and control the situation. You regard the situation with strong pleasure and enjoyment and find this situation very attractive and desirable. You also face this situation feeling somewhat relaxed.

Satisfaction:

Imagine you're in a situation which you regard with mild pleasure and enjoyment. You find this situation very

attractive and desirable and you face this situation feeling very relaxed. You also feel there is not much you can do to alter this situation, that you will submit.

Resignation:

Imagine you're in a situation which you perceive to be somewhat attractive and desirable. You are very relaxed and feel there is absolutely nothing you can do to alter this situation, that you must submit. You also expect it to be somewhat painful and uncomfortable.

Sorrow:

Imagine You're in a situation in which you feel somewhat relaxed. You feel there is absolutely nothing you can do to alter this situation, that you must submit and you expect it to be very painful. You also perceive this situation to be somewhat menacing and threatening.

Shock:

Imagine you're in a situation in which you feel there is not much you can do to alter this situation, that you will submit. You expect this situation to be very painful and perceive it to be very menacing and threatening. You also feel mildly aroused, tense and ready to act.

Fear:

Imagine you're in a situation you expect to be somewhat painful and uncomfortable. You perceive this situation to be very menacing and threatening and you feel very aroused, tense and ready to act. You also feel some ability to master, dominate and control the situation.

Anger:

Imagine you're in a situation which you perceive to be some-
what menacing and threatening. You are very aroused, tense
and ready to act and you are quite sure you can master,
dominate and control the situation. You also regard the
situation with some mild pleasure and enjoyment.

APPENDIX C

EMOTION DEFINITIONS AND RATING SHEET

Description of Emotion Words

- Anger - a display of wrath, rage or fury.
- Elation - a display of ecstasy, euphoria or exaltation.
- Joy - a display of delight or happiness.
- Satisfaction - a display of contentment, well being or fulfillment.
- Resignation - a display of ambivalence, reluctance or acquiescence.
- Sorrow - a display of grief, misery or distress.
- Shock - a display of being dazed, frozen, stunned (this is not surprise).
- Fear - a display of fright, dread, apprehension (this is not surprise).

Judgment Rating Sheet

Enactment _____

Definitely	Probably	Perhaps	Neutral	Perhaps Not	Probably Not	Definitely Not
1	2	3	4	5	6	7

Emotion

1. Resignation							
2. Elation		1					
3. Anger							
4. Fear							
5. Sorrow							
6. Satisfaction		2					
7. Joy		3					
8. Shock							

APPENDIX D

TABLE III

SIMPLE MAIN EFFECTS ANALYSIS OF
VARIANCE FOR JUDGMENTS

Source	df	MS	F
Enactment			
Judgment - Anger	7	60.7	0.12
Judgment - Elation	7	48.1	0.10
Judgment - Joy	7	87.7	0.18
Judgment - Satisfaction	7	30.8	0.06
Judgment - Resignation	7	67.9	0.14
Judgment - Sorrow	7	119.2	0.24
Judgment - Shock	7	126.6	0.26
Judgment - Fear	7	65.0	0.13
Error (within)	328	495.4	
Judgment			
Enactment - Anger	7	165.4	0.12
Enactment - Elation	7	108.4	0.08
Enactment - Joy	7	55.0	0.04
Enactment - Satisfaction	7	163.0	0.12
Enactment - Resignation	7	91.4	0.07
Enactment - Sorrow	7	38.9	0.03
Enactment - Shock	7	118.0	0.09
Enactment - Fear	7	187.4	0.14
Error (within)	328	1326.0	

APPENDIX E

TABLE IV
STEPWISE ORDERING OF MEAN JUDGMENT VALUES

Target Emotions	Judgments of Emotions			
	1 Step Away	2 Steps Away	3 Steps Away	4 Steps Away
3.85	3.83	3.96	3.67	3.32
3.64	3.83	3.49	3.12	4.70
3.21	3.87	3.69	4.80	4.93
4.57	3.87	3.71	4.40	4.24
4.50	3.94	4.95	4.40	4.81
4.46	3.69	4.92	4.71	5.12
4.31	3.79	4.18	4.75	5.10
4.18	4.20	4.39	4.49	5.20
	4.52	4.87	4.80	
	4.24	4.21	5.21	
	4.56	4.73	5.04	
	4.70	4.02	5.42	
	4.40	5.31	5.12	
	4.38	5.06	5.11	
	5.08	5.00	5.35	
	5.29	5.25	5.44	

APPENDIX F

TABLE V

NEWMAN-KEULS ANALYSIS SUMMARY (A TEST FOR
ORDERING OF JUDGMENTS BY ENACTMENTS)

		q Values for Newman-Keuls							
Enactments		Elation	Joy	Satisfac	Resigna	Sorrow	Shock	Fear	Anger
5	Elation	.97	.34	----	.91	1.21	1.72*	1.46	1.59*
	Joy	.69	.35	----	.35	.61	1.10	1.21	1.09
	Satisfaction	1.18*	.66	----	1.03	1.66*	2.21*	1.91*	1.91*
	Resignation	1.90*	1.85*	1.35*	----	.66	1.79*	1.50*	1.03
	Sorrow	1.16	.81	.27	----	.37	.76	.79	.55
	Shock	2.14*	1.99*	1.59*	.00	----	1.36*	1.19*	.81
	Fear	2.13*	2.32*	1.60*	----	.59	1.26*	1.38*	.67
	Anger	1.97*	1.99*	1.48*	----	.35	.64	.88	.53

* $p < .01$

VITA

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Candidate for the Degree of

Master of Science

Thesis: AFFECTIVE ENCODING AND DECODING: A TEST OF A
CIRCULAR MODEL OF EMOTIONS

Major Field: Psychology

Biographical:

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