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**LA THÈSE A ÉTÉ
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A Structural and Process Analysis of Emotions

by

Kerry Lawson

Thesis submitted to the School of Graduate Studies
of the University of Ottawa in partial fulfillment
of the requirement for the Doctor of Philosophy
Degree in Clinical Psychology

Ottawa, Canada, 1986

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Abstract

The emotions of Interest and Boredom and the transition from the first affect to the second were used as a case example to demonstrate a theoretical and methodological approach to the study of emotions. Essentially, the approach maintains that affects are discrete subjective states that are composed of configurations of continuous dimensions. Emotions can be distinguished by the qualitative differences in these continua and quantitative differences along these structures. Transitions between emotions can be predicted by changes in these two areas.

The statistical model put forth to examine the structural aspects of the theoretical model was that of longitudinal factor analysis. Discriminant and regression analyses based on the factor analysis were used to examine the process or transition aspects of the model.

The methodology entailed presenting 150 first year university students to an in vivo situation in which they would initially rate themselves as Interested and later describe themselves as Bored. The data used were obtained from checklists of emotion terms and 15 semantic differential scales. The checklists were designed to cover a wide range of basic or prototypical emotions. The semantic differentials were selected on the basis of theory concerning common subjective structures of affect.

The results indicated that the discrete emotional states of Interest and Boredom shared the common dimensions of pleasure-displeasure, degree of arousal, dominance and degree of predictability. They were distinguished from each other by quantitative differences along the pleasure-displeasure, degree of arousal and degree of predictability continua. The results also indicated that it was possible to correlate the transition between these two states with differences in the dimensions common to them. However, since this type of data required knowledge of the post-transition state of Boredom, other types of data were put forth as being more amenable to a process analysis of affect. Overall, the results provided partial support for the theoretical rationale and demonstrated a viable methodology for developing and exploring a taxonomy of emotions.

List of Tables

Table	Page
1. Hypothesized Factors of Emotional Experience	41
2. Roseman's Hypothesized Structure of the Emotion System	73
3. deRivera's Model of the Emotions	92
4. Optimal Number of Factors for Interest and Boredom	132
5. The Factor Structure for Interest	133
6. The Factor Structure for Boredom	134
7. The Number of Common Factors for Interest and Boredom	135
8. The Difference between Means of Combined Measures of Affect	137
9. The Optimal Data for Predicting the Transition of Interest to Boredom	138
10. Discriminant Analyses	141
11. The Sequential Comparisons of the Discriminant Classifications	142
12. Postulated Common Subjective Structures of Affect	145

List of Figures

Figure	Page
1. Data Collection	120
2. Structural Analysis Flowchart	121
3. Process Analysis Flowchart	127

Table of Contents

Chapter	Page
Abstract	ii
List of Tables	iv
List of Figures	v
1. Introduction	10
Review of the Literature: Structural Model	11
Discrete Theories	11
Ekman	11
Izard	14
Plutchik	16
Tomkins	18
Critique of Discrete Theories	20
Interest and Boredom as Case Examples	23
Boredom	23
Interest (Izard)	25
Disgust (Izard)	26
Rejection (Plutchik)	27
Exploration (Plutchik)	27
Interest (Tomkins)	27
Disgust (Tomkins)	28
Dimensional Approach: Background Literature	29
Critique of Dimensional Approach:	
Background Literature	33
Dimensional Approach: Recent Literature	34
Osgood	34
Mehrabian and Russell	35

Averill	38
Critique of Osgood, Mehrabian and Russell, and Averill	39
Whissell	40
Critique of Whissell	43
Daly, Lancee and Polivy	44
Critique of Daly, Lancee and Polivy	47
Russell	48
Russell and Pratt	53
Critique of Russell	54
Integrated Approaches	57
Russell and Steiger	57
Critique of Russell and Steiger	61
Cognitive Approach	62
Scherer	63
Critique of Scherer	67
Roseman	69
Critique of Roseman	72
Smith and Ellsworth	75
Critique of Smith and Ellsworth	80
Summary of Dimensional Approach	82
Structural Model	85
Structural Hypotheses	86
Chapter	
2. Review of the Literature: Process Model	88
Izard	88

deRivera	90
Critique of Izard and deRivera	91
Evaluation Theories	93
Arnold	93
Lazarus	94
Plutchik	97
Critique of Plutchik	99
Critique of the Evaluation Theories	100
Reversal Theory (Apter)	101
The Concept of Stability	101
The Concept of Reversal	102
The Concept of Arousal	103
The Anxiety-avoidance and Excitement-seeking Systems	106
Critique of Apter	109
Summary of the Literature: Process Model	112
Process Hypotheses	113
Chapter	
3. Methodology	115
Subjects	115
Apparatus	115
Induction procedures	115
Induction set # 1	116
Induction set # 2	118
Induction set # 3	118
Data Collection	118
Data Analysis	119


Structural Analysis	120
Lisrel VI	125
Process Analysis	126
All Possible Subsets Regression (P9R)	129
Stepwise Discriminant Analysis (P7M)	130
Results	131
Structural Hypotheses	131
Process Hypotheses	137
Discussion	142
References	157
Appendices	178
Appendix 1	178
Appendix 2	179
Appendix 3	180
Appendix 4	181
Appendix 5	182

Chapter 1

Introduction

The development of a comprehensive theory of emotion will involve addressing this phenomenon with at least four descriptive and explanatory systems. One of these is the neurophysiological approach. A second will concern itself with behavioural aspects. These will include motoric and facial-expressive components. A third will deal with the subjective experience of emotion and a fourth will describe the relational aspects of this phenomenon. This will entail how the person relates to himself and to the external world.

The primary purpose of this thesis is to demonstrate a methodology for the analysis of the the subjective or experiential structure of emotions. It does so largely within a framework of general experimental psychology. That is, it does not include the various psychoanalytic and existential-humanistic approaches to emotion. What is offered is a rational-empirical model of the structure of emotional experience rather than a purely phenomenological description of emotion or an inferred motivational process. As such, it can be labelled a general psychological approach to the conscious experiencing of emotions. The secondary purpose of this thesis is to provide a working model that attempts



to integrate two major approaches to affect. These have been labelled the dimensional and the discrete orientations. The third purpose is to explore some notions of the transitions between emotions, based on the structural analysis of these states.

The format of this thesis in addressing these concerns is to present and critique theorists and researchers who represent the various schools of thought in the area of emotions. The critiques are done in light of the model presented in the summary and the hypotheses sections of this thesis. The theoretical model is subdivided into two parts; the structural and the process analyses. The areas examined within the context of the former are the discrete, dimensional and integrative approaches to affect. The areas examined within the context of the latter include the evaluative, network and structural phenomenological approaches to affect.

Review of the Literature: Structural Model Discrete Theories

Ekman

Ekman (1982) has noted that some theorists have postulated a set of basic emotion categories, or primary affects. Each of these categories includes a

set of words denoting related emotions, which may differ in intensity, degree of control, or in other ways, in denotative meaning. Although the principle of inclusion is not always explained, the words within a category are held to be more similar than the words across categories. Some category theorists have further hypothesized interrelationships among all or some of their emotion categories, which allow representation of their categories within a geometric model and a delineation of certain dimensions that differentiate among the categories.

Research on the issue of emotional categories has included various studies on facial behaviour. These consist of investigations by Woodworth (1938), Plutchik (1962), Tomkins and Carter (1964) and Osgood (1966). These investigations differed on various methodological considerations. These included the number of different stimulus persons (one to fifty); number of different emotions posed (10 to 40); number of stimuli (19 to 200); number of emotion words or categories given observers (8 to 100); method of deriving emotion words or categories (pilot study, theory, past literature); and evidence for author's categories (observer agreement, cluster analysis, factor analysis).

Ekman (1982) reviewed these studies and examined those results that were consistent across these five experiments. He noted that, despite the span of time over which this research was conducted and the very different theoretical viewpoints of the investigators, the results were, by and large, stable and reliable. "All investigators proposed a happiness category (the only variation being Osgood's two categories for happiness), all proposed a surprise category, and all produced an anger category. There is further agreement among all other investigators, with the exception of Woodworth; they found an Interest category and combined disgust and contempt into one category. Work by Izard (1971) and by Ekman and Friesen (1975) seem to show conclusively that disgust and contempt are indeed separable, as Woodworth proposed. The only major disagreement is that Woodworth combined fear and suffering into one category, and all other authors kept fear as a separate category, proposing another category for words similar to sadness (Ekman, 1982, p.42)."

In summary, seven basic categories of emotion have been found: happiness, surprise, fear, anger, sadness, disgust/contempt and Interest. However, as Ekman notes "this is not necessarily an exhaustive list, even for posed behaviour, but it appears to be the minimal list. More categories may be found in experiments that allow

observers free choice of response but show them facial behaviour in motion from spontaneous situations (Ekman, 1982, p.45)."

Izard

Izard claims that although emotion theorists and researchers differ in many particulars, there are some important principles that serve as common denominators. The basic principle, which Izard labels the principle of differential emotions, states that "there are a number of discrete emotions that can be differentiated in terms of their neurophysiological underpinnings, their facial patterns and their experiential/motivational characteristics (Izard, 1977, p. 101)." Izard's differential affect model postulates that there are ten basic or fundamental emotions. These are believed to be Interest, joy, surprise, distress, anger, disgust, fear, shame, guilt and contempt.

Izard (1977) suggests that affects are basically motivating experiences that have immediate meaning and significance for the person. He argues that when neurochemical activity via innate programs generates patterned facial and bodily activities, and the feedback from these processes is translated into conscious form, the product is a discrete emotion which

is both a motivating and meaningful cue - producing experience. From a phenomenological perspective, positive emotions are said to have inherent characteristics which tend to increase a person's sense of well-being. They also instigate and sustain approach toward and constructive interactions with appropriate situations, people or objects. Negative emotions are believed to be experienced as noxious, difficult to tolerate and tend to generate avoidance or nonconstructive interactions.

The author points out that various theories or approaches identify discrete affects and the rationale for studying them. For example, frustration is treated as an intervening variable within the S-R model. Mowrer (1960) acknowledged the existential reality of the subjective phenomena of fear and anger and integrated them systematically into his two-factor learning theory. Arnold (1960) has argued that there are a number of distinct emotions, each with its own unique neurophysiological basis and experiential structure. Gellhorn (1964) suggested that different affects exist and that one of the most useful ways of differentiating between them was through striate muscle activity, particularly facial expression. Izard also notes that Jacobsen (1927, 1967) has emphasized the role of striate muscle activity in various affects.

Lazarus and his coworkers (Lazarus and Averill, 1972; Lazarus, Averill and Opton, 1970) have acknowledged the reality of different emotions and have stressed their differentiation on the basis of response characteristics. In addition, the work of Allport (1924), Ax (1953), and Funkenstein (1955) has added significantly to the development of the principle of differential emotions.

Plutchik

Plutchik (1980) posits that the concept of basic emotions should meet the following criteria: they should "1) have relevance to basic biological adaptive processes; 2) be found in some sense at all evolutionary levels; 3) depend for definition on particular neural structures or body parts; 4) not depend for definition on introspections (although they may be included); 5) be defined in terms of goal-directed behavioural data (Plutchik, 1980, p. 139)." As the author notes it is implicit in this orientation that affects are considered as adaptive mechanisms in the struggle for individual survival at all phylogenetic levels. He proposes that there are eight basic adaptive patterns that can be found at all levels of evolution, do not depend on particular neural structures, do not rely on introspections, and are

defined in terms of behavioural interactions between environment and organism. Plutchik argues that these represent the functional bases of affect applicable to all organismic levels.

As Plutchik notes, the language used to define these archetypical patterns is a functional one in that they imply a goal or an aim. They all have the function of separating prey from predator and of increasing the probability of an organism's survival. Another language that is used to describe emotions is the subjective or introspective language, i.e.; words used to describe inner-feeling states, such as angry, happy, sad or curious. Plutchik suggests that it is a somewhat restricted language in that it is only available to humans who have had certain kinds of social experiences. However, he also proposes that this phenomenological language is capable of providing more subtle communication and finer permutations and combinations than can the other languages used to describe affect.

Plutchik (1980) hypothesizes that a relationship exists between certain functions and certain affects. For reproduction, there is joy; for incorporation, acceptance (trust); for protection, fear; for orientation, surprise; for reintegration, sadness; for

rejection, disgust; for destruction, anger; and for exploration, there is anticipation. Thus he postulates there are eight basic emotions consisting of joy, trust, fear, surprise, sadness, disgust, anger and anticipation.

Tomkins

Tomkins (1978) views affect as the primary innate biological motivating mechanism, more urgent than drive deprivation and pleasure and more urgent even than physical pain. In fact, he argues that drives must be assisted by affect as an amplifier if it is to function as a motive at all. In other words, the affect system "is the primary motivational system because without its amplification, nothing else matters ___ and with its amplification, anything else can matter. It thus combines urgency and generality. It lends its power to memory, to perception, to thought, and to action no less than to the drives (Tomkins, 1978, p. 202)."

It does this by being similar to that response, but also different. It is an analog amplifier. Affect, by being analogous in the quality of the feelings from its specific receptors, as well as in its profile of activation, maintenance, and decay, amplifies and extends the duration and impact of whatever triggers the affect. By being immediately activated and thereby

co-assembled with its activator, emotion makes good things better or bad things worse, by conjointly simulating its activator in its profile of neural firing and by adding a special analogic quality which is intensely rewarding or punishing.

Tomkins distinguishes nine innate affects. The positive emotions are as follows: first, Interest or excitement; second, surprise or startle. The negative affects are the following: first, distress or anguish; second, fear or terror; third, shame or humiliation; fourth, contempt; fifth, disgust; sixth, anger or rage.

Tomkins accounts for the differences in emotion activation by three general variations in the density of neural firing, i.e. stimulation. The theory posits three discrete classes of activators of affect, each of which further amplifies the sources that activate them. These are stimulation increase, stimulation level and stimulation decrease. Thus there are three distinct classes of motives: affects about stimulation that is on the increase, about stimulation that is steady, about stimulation that is on the decrease. With respect to density of neural firing, or stimulation, the human being is equipped for emotional arousal for every major contingency. If internal or external sources of neural firing suddenly increase, a person

will startle or become afraid, or Interested, depending on the suddenness of the increase in stimulation. If internal or external sources of neural firing reach and maintain a high, constant level of stimulation, which deviates in excess of an optimal level of neural firing, that person will respond with anger or distress, depending on the level of stimulation. If internal or external sources of neural firing suddenly decrease, the person will laugh or smile with enjoyment, depending on the suddenness of the decrease in stimulation. There are both positive and negative emotions (startle, fear, Interest) activated by stimulation increase; only negative affects are activated by a continuing, unrelieved level of stimulation (distress, anger); and only positive emotions are activated by stimulation decrease (laughter, joy).

Analogic amplification is based upon one of these three distinctive features rather than all of them. Thus, enjoyment amplifies by simulating decreasing gradients of neural stimulation. Interest, fear and surprise amplify by simulating increasing gradients of neural stimulation. Distress and anger amplify by simulating maintained levels of stimulation.

Critique of Discrete Theories

The phenomenological language that Izard uses to define emotion states emphasizes the uniqueness of each affect. Consequently, the similarities between emotions are overlooked. A structural analysis of each affect would demonstrate not only the communalities between the subjective experiencing of each state, but also their uniquenesses. This can be achieved by using measures of subjective experience such as semantic differentials. These scales are bipolar in construction and thus lend themselves to an analysis of similarities and differences. Furthermore, by utilizing semantic differentials one can not only detect qualitative relationships between emotions, but quantitative relationships as well. In other words, as the structural hypotheses state in more detail, there may be semantic differential scales that are common to all emotions; still others that may be unique to some affects, and irrelevant to others.

Plutchik states that emotions can be defined phenomenologically, but proceeds to provide functional and behavioural definitions. He then provides a label for the subjective state that is believed to be associated with these other aspects. The utilization of a methodology such as semantic differentials will go a long way in providing explicit experiential definitions of affective states. This methodology, on

which this thesis relies in part, has been used by a number of researchers as will be discussed in the section on the dimensional approach to emotions.

Tomkins' model, like that of Plutchik's, suggests that there are phenomenologically discrete affects, but he too has defined them in a non-subjective language. In his case, he used a neurophysiological lexicon. However, this thesis attempts to address this limitation by using semantic differential scales to rate certain emotions and then conduct factor analyses in order to determine the subjective structure unique or common to these states.

There is a good deal of overlap between the theories of Plutchik, Izard, Tomkins and Ekman concerning the issue of basic emotions. All agree upon the existence of the affects of joy, fear, surprise, sadness, disgust, anger and Interest. There is partial agreement on the emotions of shame and contempt, but only individual support for guilt and trust. However, as Ekman noted, it is likely that there are more basic emotions than the ones that have, at this point in time, received consensual validation. For the purposes of this thesis, the affects mentioned above are to be combined into a network of eleven discrete emotions. These are: joy, trust, fear, surprise, sadness,

disgust, anger, Interest, shame, guilt and contempt. This is done to provide subjects with a fairly comprehensive list of emotions from which to choose. This diminishes the possibility of a forced choice which may contaminate the analyses of individual emotions.

Interest and Boredom as Case Examples

In order to demonstrate a methodology to examine and compare affective states, the simplest comparison i.e., two emotions will be used. For the purposes of this thesis, the emotional states of Interest and Boredom have been selected as case examples to be examined and analyzed. These were selected primarily on the basis of experimental expediency. After several pilot studies, it became apparent that on an individual basis it was least difficult to provoke the experiencing of Interest and Boredom in most subjects.

Interest is considered by most discrete theorists to be a basic affective state and several definitions are provided below. Boredom, on the other hand, does not appear on these authors' lists. This is probably due to its being considered (if it is considered at all) as a low intensity form of disgust (Plutchik, 1962, p.82). Disgust is considered to be a basic discrete emotion and several definitions of this affect are presented below.

Boredom is explicitly considered as a discrete emotional state by researchers in the field of industrial psychology (O'Hanlon, 1981) and psychoanalysis (Esman, 1979). An examination of a definition from one of these investigators makes clear the relationship between Boredom and disgust.

Boredom

O'Hanlon (1981) defines Boredom as an unique psychophysiological state. He argues that it is comprised of a set of interrelated emotional, motivational and cognitive components. The physical factors that cause Boredom are complex, but always include exposure to constant or repetitious sensory stimulation. There are said to be two processes which are associated with the affective state of Boredom. One process is initiated by monotonous stimulation which results in the inhibition of cortical arousal (habituation). The second process has been labelled as effort. This is visualized as a compensatory process that is elicited to restore arousal to an optimal level. It is considered to be an unrewarding, voluntary activity that diminishes over time. When effort is no longer able to counteract habituation, cortical arousal is postulated to decline below the point necessary for supporting acceptable performance (and presumably Boredom is maximized).

O'Hanlon (1981) suggests that there are several generally accepted characteristics of Boredom. (1) It occurs as a reaction to task situations where the pattern of sensory stimulation is nearly constant or highly repetitious. (2) Degrees of Boredom reported by different individuals in the same monotonous environment vary greatly. (3) An emotional component of Boredom includes aversion to monotonous elements of the situation that are identified by the individual as the source of the feeling. (4) Boredom is highly situation-specific and is immediately reversible when the situation changes to any large extent.

It is clear that the aversive characteristic of Boredom motivates individuals to reject the monotonous elements of a particular environment. In addition, the monotony also induces low cortical arousal. Thus, the affective state of Boredom involves a low intensity form of rejection. Rejection, in turn, appears to be a core element of the emotional state of disgust.

Definitions of the affective states of Interest and disgust by the discrete theorists Izard, Plutchik and Tomkins are as follows:

Interest (Izard)

Izard believes that "some emotion or combination of emotions exist in ordinary states of consciousness at all times and that the most frequently involved affect is Interest (Izard, 1977, p. 211)." It is thought to occur in combination or in conflict with one or more of the other emotions and it constantly interacts with perceptual-cognitive processes. It is suggested that, to the extent a person is free of negative affect and survival needs, he is able to act in relation to the positive motivational impetus of Interest and Interest dominated cognitions. Thus, this emotion is said to be an extremely important motive in the development of skills, competencies, and intelligence and is considered to be essential for creativity.

At the subjective phenomenological level, Interest is thought to be a feeling of wanting to investigate, become involved, to extend or expand the self by incorporating new information and having novel experiences with the object or person that has stimulated the Interest. In intense Interest, the person feels animated and enlivened. Even when relatively immobile, the Interested individual is thought to have the feeling that he is alive and well.

Disgust (Izard)

Differential emotions theory claims that in some ways disgust is similar to anger. However, it is not seen as being potentially as dangerous as this emotion. The subjective experience of disgust is defined as the feeling of being 'sick at the stomach' with a bad taste in one's mouth. One desires to reject, remove or get away from the object of disgust. If disgust is very strong, it may actually cause one to be 'sick at the stomach' by creating nausea. The following describes the archetypical dimensions that Plutchik would consider to be relevant for the emotions of Interest and Boredom.

Rejection (Plutchik)

This represents a kind of riddance reaction. It is the prototype of behaviour involved in getting rid of something harmful that has already been incorporated. It may take two forms, such as expelling feces or vomiting.

Exploration (Plutchik)

This refers to "the more or less random activities organisms use to explore their environment. The form of these activities depends a great deal upon the type of sensory endowment of the organism, some animals utilizing their tactile sense much more than others.

Birds, who have excellent distance receptors, explore large portions of their environment at a glance. Exploratory activity is prototypic of what humans call curiosity and play (Plutchik, 1980, pp. 144-145)".

Interest (Tomkins)

Any stimulus with a relatively sudden onset and a steep increase in the rate of neural firing will innately activate a startle response. If the rate of neural firing increases less rapidly, fear is activated, and if the rate increases still less rapidly, Interest is innately activated.

As Tomkins (1982) notes Interest is a necessary condition for the formation of the perceptual world. External events must be perceived in some detail, but they must also be perceived in their unity. Interest must steer a middle course between extreme distractibility from one aspect of an object to some other aspect of an adjacent object, and extreme stickiness and compelled attention to the same object. Attention must stick long enough both to achieve detail and to move on to some other aspect of the object, not to every competing stimulus in the field. In order to make such graded and differential sampling possible, there must be the continuing support of Interest to the changing sampling of the object.

Disgust (Tomkins)

Disgust is considered by Tomkins (1982) to be an innate defensive response which is auxiliary to the hunger, thirst and oxygen drives. Its basic innate function is clear; if food has been taken into the mouth, it may, if disgusting, be spit out. If it has been swallowed and is toxic, it will produce nausea and be vomited out through the mouth.

If disgust was limited to this function Tomkins would not define it as an emotion but solely as an auxiliary drive mechanism. He argues, however, that this affect acts as a signal and a motive to others as well as to the self of feelings of rejection. It readily accompanies a wide spectrum of entities that need not to be tasted, smelled or ingested. Disgust seems to be changing in status from drive-reducing acts to acts that have a more general motivating and signal function, both to the individual who emits it and to the one who sees it.

Dimensional Approach: Background Literature

As Izard (1972) notes, the dimensional approach has roots in Spencer's concept of a pleasantness-unpleasantness (P-U) continuum and in his early enunciation of the concepts of activation and

adaptation level. Wundt extended this thinking and proposed that emotional experience varied along the dimensions of pleasantness-unpleasantness, excitement-quiet, and tension-relief. Woodworth (1938) suggested that "pleasantness and unpleasantness correspond to the attitudes of acceptance and rejection, excitement and depression to the momentary level of muscular activity or readiness for activity, tension and relaxation to the degree of muscular tension (p. 241)." Izard (1972) notes that although Woodworth used discrete emotion concepts like surprise, fear and disgust, he represented the emotions as segments of a single continuous linear scale. This paved the way for the theoretical elimination of discrete emotion concepts and for thinking of the dimensions of subjective experience in nonemotional terms. From there, it was an easy step from the conceptualization of subjective experience as functions of organismic processes to describing them by concepts such as activation and pleasantness. These concepts and a number of others specified by subsequent research have been variously thought of as dimensions of emotional expression, dimensions of emotional experience or dimensions of behaviour in general.

Izard (1972) underlines this point by noting that Duffy (1941, 1957, 1962) and Lindsley (1951, 1957) used

a concept of neurophysiological activation in an attempt to explain behaviour in general, including that which is typically labelled as emotional. He points out that Schlosberg (1941, 1952, 1954), Frijda and Philippszoon (1963), and Abelson and Sermat (1962) delineated dimensions of facial expression and considered these as dimensions of affect. Osgood (1966, 1969), Block (1957), Davitz (1970) and Nowlis (1970) developed dimensions of verbal expression and treated them as indices of emotion or emotional expression. In other words, these dimensions can be seen as structures that constitute emotional experience and behaviour. This thesis uses these dimensions to effect a structural analysis of individual emotional states.

As Izard (1972) points out, bipolar factors related to pleasantness or evaluation and intensity have appeared as the predominant explanatory factors in every study of the dimensions of emotion. They have occurred despite variation among stimulus modes that have included facial expression, emotion concepts, self-reports of mood, and self-reports of emotion-laden critical incidents. They have appeared despite varied response modes such as a single P-U scale, a single scale rating the global similarity between two facial expressions, a set of diverse emotion terms, a set of

semantic differential scales, an a priori set of bipolar dimension scales and free responses. They have also appeared in cross-cultural studies of Greek and American subjects, Dutch subjects, and different American populations.

The need for more than two dimensions has been the subject of much debate and very little agreement. Abelson and Sermat (1962) used a global similarity rating and only 13 photographs and they found no additional dimensions. On the other hand, Frijda (1970) used 40 substantive scales and 130 photographs and found three additional dimensions. Davitz (1970) derived his dimensions from a 5565 item checklist of emotion terms used by subjects who were evaluating critical incidents in their lives. He developed a third relatedness dimension which contained three clusters of items. These he interpreted as moving toward, moving away and moving against. Izard (1972) argues that this dimension has some definite similarities to Schlosberg's (1954) attention-rejection dimension, Frijda and Philipszoon's (1963) attention-disinterest dimension, and Nowlis' (1970) positive and negative social orientation dimension. Frijda (1970) proposed an emotional intensity - emotional control or indifference dimension where control seemed to mean a visible effort to keep from expressing an emotion

facially. Nowlis (1970) specified a control - loss of control dimension, where control was exemplified by the term concentration and loss of control by anxiety. White's (1959) concept of competence might be another dimension. Davitz (1970) pointed out the similarity between White's concept and three clusters of the Davitz checklist items that reflect feelings of enhancement, incompetence or dissatisfaction and inadequacy. Frijda (1970) described a somewhat similar dimension of self-assured/insecure.

In his own research, Izard (1972) constructed a self-report scale (the dimensional rating scale) with which he hoped to tap the subjective experience of emotion. He chose scales which he believed explored the dimensions of pleasantness, tension, control, impulsivity, extraversion and self-assuredness. He discovered that the dimensions of pleasantness, tension, self-assurance and impulsiveness were the most discriminating dimensions.

Critique of Dimensional Approach: Background Literature

There are two major limitations in the studies discussed above in relation to a structural phenomenological analysis of emotions. First, none of the studies investigated "in vivo" (i.e. directly experienced) affects. Instead, they researched

emotional behaviour, facial-expressive behaviour, verbal ratings of emotion terms and ratings of situations which subjects were asked to imagine. This thesis addresses this issue by involving subjects in a "live" ongoing situation and then requiring them to rate their affective experience directly and immediately. Thus the subjects generating the data will be much closer to the emotion states they are attempting to describe than in the studies described above.

Secondly, these investigations have studied a wide range of affective phenomena across a large number of emotional states. Perhaps because of this, there has been a great deal of difficulty in deriving dimensions common to all affective states. That is, dimensions which are common to unique emotions or relatively small subsets of emotions may be "washed out" by an analysis across a large number of affects. This thesis concentrates on only two emotions (Interest and Boredom) and each one is investigated individually. Thus there is no attempt to discover universal factors which ignore the qualitative differences between emotion states.

Dimensional Approach: Recent Literature

Osgood

Osgood (1976) agrees with Izard that the primary concern of the recent literature in the dimensional approach to emotions has been the number and nature of dimensions required to account for variance in judgements of emotionality. He observed that Schlosberg changed his position to move from two (1952) to three (1954). Triandis and Lambert (1958) found three sufficient for their data; Frijda and Philipszoon (1963) and Harrison and Maclean (1965) include analogues of Schlosberg's three among their four; and Gladstones (1962) also reports three, with the third factor weak and ambiguous. On the other hand, Nummenmaa and Kauranne (1958) found only two sufficient, as did Abelson and Sermat (1962) and Ekman (1965). Osgood (1976) has found that at least three dimensions were required in analyses which included a model based on distance measures; in a factor analysis of label-usage by judges; and in factor analyses of expressions by actors. This third dimension was initially defined by Osgood (1966) as control. One pole was defined by annoyance, disgust, contempt, scorn and loathing, and the opposite pole by dismay, bewilderment, surprise and excitement.

Mehrabian and Russell

Other researchers have also attempted to replicate and build upon the literature just discussed in order to derive the structure of emotional experience. Typically, they have used such techniques as factor analysis and multi-dimensional scaling. One pair of researchers to do so have been Mehrabian and Russell (1974).

Mehrabian and Russell argue that studies of intermodality associations, synesthesia, physiological responses to stimuli, and the semantic differential suggest that there exists a limited set of basic emotional responses to all stimulus situations. They hypothesize that the judgemental responses of evaluation and activity on the semantic differential correspond to the emotional responses of pleasure and arousal respectively. They also argue that the judgemental response of potency corresponds to the emotional reaction of dominance (versus submissiveness). That is, low stimulus potency is said to elicit a feeling of dominance, while high stimulus potency is thought to elicit a submissive feeling. They suggest further that variations in pleasure, arousal and dominance constitute the common core of human emotional responses.

Mehrabian and Russell (1974) believe that terms describing a diversity of emotional reactions to situations may be defined in terms of these three basic dimensions. For example, "the feeling of Boredom or fatigue may be described as one that is low on pleasure, arousal and dominance. On the other hand, excitement may be characterized as an emotional state of high pleasure, arousal and dominance. Anxiety and stress rate high on arousal, but low on pleasure and dominance. Relaxation, contentment and comfort rate high on pleasure and dominance, but low on arousal (Mehrabian and Russell, 1974, p.17)."

These writers define pleasure - displeasure as a feeling state that can be assessed with self-report measures, such as semantic differentials, or with behavioural indicators, such as smiles, laughter, and in general, positive versus negative facial expressions. As they note, the latter can be reliably scored on a dimension of pleasantness, which is independent of both their aroused quality and dominance - submissiveness.

They define arousal as a feeling state that is most directly assessed by verbal report. They provide data which suggests that by using verbal reports of subjects, an unitary factor for characterizing a

person's arousal level can be readily identified. They also note that there is evidence showing a combination of physiological indices of arousal is highly correlated with a verbal self-report measure of arousal state and Thayer (1967; 1970) is cited in this regard.

Dominance - submissiveness is defined as a feeling state that can also be assessed from verbal reports using the semantic differential. This dimension is believed to be the inverse of the judged potency of the environment. Behaviourally, dominance is defined in terms of postural relaxation (i.e., body lean and asymmetrical positioning of the limbs) and is said to be independent of pleasure and arousal (e.g., Mehrabian and Russell, 1970; 1972).

Mehrabian and Russell conducted a series of experiments in order to develop verbal measures of the three emotional dimensions. Subjects were presented with a random selection of situations and were asked to describe how they would feel in each one by using semantic differential adjective pairs. The resulting matrix of correlations was factor analyzed and a principal component solution was obtained. Pleasure, arousal and dominance accounted for 27%, 23% and 14% of the total variance, respectively. The pleasure factor correlated -0.07 with arousal and 0.03 with the

dominance factor; arousal correlated 0.18 with dominance.

Averill

Averill (1975) provided more evidence regarding the dimensions of affect. He obtained semantic differential ratings of 558 emotion terms which he considered to be a relatively complete sample of commonly used English words that denote emotions. Factor analysis of these ratings yielded dimensions identical to Osgood's evaluation and activation, but also yielded two dimensions related to potency or control (although labelled uncontrol by Averill) and depth of experience. Control described terms such as confident, cruel and composed as opposed to terms such as helpless, terrified and spellbound. The depth-of-experience factor contrasted serious profound emotions such as spiritual and loving with more shallow affects such as giddy, peevish or coy.

Critique of Osgood, Mehrabian and Russell and Averill

In attempting to establish the structure of emotional phenomena Osgood, Mehrabian, Russell and Averill have implied that all emotions can be characterized by a finite number of dimensions. The implication that emotions or labels for emotions differ

only by quantitative differences along these factors is misleading. It leads to the notion that the concept of discrete emotions can be dispensed with and replaced by continuous affective dimensions. The concern for common factors overlooks the unique factors relevant to perhaps only one emotion or a subset of other affects. Uncovering these factors would ensure the discreteness of emotions, yet allow them to be systematically related to other emotions through common factors. In short, one can integrate the dimensional and discrete approaches to affect by undertaking an analysis of the common and unique dimensions that constitute the subjective experiencing of emotions. This thesis attempts to do so in an analysis of the affective states of Interest and Boredom.

The scales that subjects used to rate Interest and Boredom have been drawn from the researchers discussed above. These include Russell and Mehrabian (1974), Averill (1975), Miron, May and Osgood (1975) and Frijda (1969). They have been selected on the basis of the factor solutions derived in these studies, and on the research by Russell (1978).

They define the factors of pleasure, arousal, dominance (Mehrabian and Russell, 1974), depth of feeling (Averill, 1975; Frijda, 1969) and spontaneity

(Osgood, Miron, May, 1975; Averill 1975). This last factor has been labelled variously as uncontrol, (Averill 1975), control (Osgood, 1976), and stability (Osgood, Miron and May, 1975). The specific variables comprising each factor are listed in Table 1.

Whissell

Whissell (1981) instructed students to generate a list of emotion terms selected from Webster's new world dictionary. The subjects generated a list of close to 700 words. Words were drawn in a random fashion and those with 75 per cent agreement were included in the test sample which consisted of 50 items. Twenty-three subjects were provided with semantic differential scales for the odd words in the list and 26 for the even words. The eleven scales used were: blue-yellow, slow-fast, pleasant-unpleasant, friendly-unfriendly, relaxed-tense, comfortable-uncomfortable, enhancing-demeaning, black-white, competent-incompetent, impersonal-personal and tender-tough.

Three factor analyses (principal factors, varimax rotation) were performed on the mean scale ratings for the 50 words. All words were analyzed together and then divided into odd and even replications. Further factor analyses were performed for four individual subjects; two being randomly selected from each group.

Table 1

Hypothesized Factors of Emotional Experience

<u>Factor</u>	<u>Semantic Differential</u>	<u>Author</u>
Pleasure	pleased - annoyed	MR
	unsatisfied - satisfied	MR
	happy - unhappy	MR
Arousal	aroused - unaroused	MR
	calm - excited	MR
	frenzied - sluggish	MR
Dominance	influential - influenced	MR
	autonomous - guided	MR
	controlled - controlling	MR
Depth of	deep - shallow	A
Feeling	artificial - natural	F
	indifferent - involved	F
Spontaneity	predictable - unpredictable	OMM
	deliberate - spontaneous	A
	intentional - involuntary	A

MR = Mehrabian & Russell

A = Averill

OMM = Osgood, Miron, & May

F = Frijda

The underlying factors of pleasure and activation appeared in all factor analyses. In the most general analysis, they explained 86 per cent of the variance in scale means, which increased to 92 per cent when the personalness (personal-impersonal) factor was included. For individual subjects, the power of explanation ranged from 66 to 75 per cent.

Whissell (1982) replicated her first study and employed 14 naive subjects in further semantic ratings of the 50 emotion terms. Seven subjects rated the first 25 words on the list and seven the last 25 words. Three factors were extracted. Pleasure proved to be the largest factor and accounted for 63 per cent of the variance. Arousal was associated with 17 per cent of the total variance. The third factor, with an eigenvalue less than 1.00, was labelled toughness (loading highly on the scale tender-tough). It explained 9 per cent of the variance. Separate factor analyses for the first and second sets of words agreed on the presence of the pleasure and arousal factors. However, the third factor was identified as either toughness (in agreement with the second analysis) or personalness (in agreement with the ratings of the experienced subjects).

Critique of Whissell

There are a number of criticisms of Whissell's paper in relation to this thesis. First, although the study is a phenomenological investigation it examines words that denote emotions, rather than the direct experience of affects themselves. This thesis attempts to address this limitation by investigating the subjective experience of people in an "in vivo" situation designed to provoke certain emotions. Thus the subjects are much closer to the phenomenon they are being asked to label and rate. One is therefore more confident that the factor structure one derives is representative of emotional experience, and not the semantic representation of that experience which may be different.

Secondly, Whissell's study confirms the ubiquitous presence of the pleasure and activation dimensions. This is expressed in structural hypotheses (2) to (5).

Thirdly, it offers support for the presence of two additional factors. The personalness and the toughness dimensions. The tough-tender continuum appears to be similar to the dominance factor used in this thesis. This is believed to be composed of the scales of influential-influenced, autonomous-controlled and controlled-controlling. The personal-impersonal dimension appears to be similar to the depth-of-feeling

factor used in this thesis. This is postulated to be constructed of the deep-shallow, artificial-natural and indifferent-involved semantic differentials. Of course, this similarity should be verified empirically by correlational and factor analyses.

Daly, Lancee and Polivy

Daly, Lancee and Polivy (1983) note that researchers who attempt to create a multidimensional picture of emotion tend to adopt a circular or circumplex model (Russell, 1980). They postulate that the shape of the map should be conical (Plutchik, 1980; Schlosberg, 1941), in that a third dimension, the intensity or depth-of-experience factor has been overlooked due to theoretical reasons and methodological difficulties.

The authors suggest that theories of emotion have implicitly argued that some emotion is felt at all times (Schachtel, 1959). They argue that there may be times, however brief, when individuals do not experience emotion or are not able to identify or describe an emotional state. Empirical evidence of neutral states may then produce a mechanism for the elucidation of a depth-of-experiencing dimension that may range from no report of emotion to an extremely emotional experience. Consequently, these researchers

included neutral adjectives in a series of multidimensional scalings of emotionally related adjectives. These were chosen by (a) female subjects who used them to describe their own experience of emotion and (b) clinical raters who judged written transcripts of subjects' verbalizations during emotional reactions.

The results of the research by Daly, Lancee and Polivy supported their hypothesis that a three-dimensional solution best represented the structure of affective experience. They found that the third dimension of depth-of-experiencing could be extended from a circular pattern or base of emotions adjectives as to create a conical configuration. This dimension was viewed as monopolar while the first two were seen as bipolar.

These authors noted that the adjectives used in their studies did not follow the depth-of-experiencing dimension in a random fashion, but fell on the surface of a cone at different heights according to the intensity of emotion they described. Adjectives around the base of the cone were the most intense, whereas those near the tip were much less intense. Descending from the tip to the base of the cone in a narrow line, intensity increased, whereas the other two dimensions remained constant.

Based on their findings, these researchers maintain that a variety of distinct emotions are proposed to be anchored by a single neutral point in which each emotion increases intensity in descent along the conical structure. If active states are arranged to occupy a position at 0 degrees around the circular base, then passive states would be opposite this at 180 degrees, pleasant states would be at 90 degrees and unpleasant states would be at 270 degrees. Daly, Lancee and Polivy believe that their model supports the views of Izard (1972), Ekman et al (1972) and Tomkins (1962) who propose distinct emotional states or entities while retaining the organizational properties of circular models proposed by Schlosberg (1941), Plutchik (1980) and Russell (1980).

Critique of Daly, Lancee and Polivy

The evidence for a depth-of-experiencing dimension has direct relevance to this thesis. It appears to be very similar to and thus provides support for the depth-of-feeling factor used in this investigation. This postulated dimension is thought to be composed of the deep-shallow, artificial-natural and indifferent-involved scales.

The idea that there are more than two factors that constitute emotions is supported by this thesis.

However, this paper holds the position that it is unlikely that other factors beside pleasure and arousal, such as depth-of-experiencing will be common to all affects. In other words, this thesis hypothesizes that emotions can be distinguished from each other not only on the basis of differences in location in a common space, but also because of differences in structure (ie., number of dimensions). These ideas are contained in structural hypotheses (3) and (6).

Russell

Russell (1978) argues that some similarity can be seen in the concepts of potency, dominance, control and other labels applied to this factor obtained in various studies. These included trustful - untrustful (Dittman, 1972) and authoritarian - submissive (Frijda, 1969; Frijda and Philipzoon, 1963). He points out that the appearance of convergence across various studies and methodologies is based largely on the naming of dimensions rather than on any empirically demonstrated relationship. He suggests further that the controversies within the various lines of research point to the need for alternative methodologies. It is suggested that the multidimensional scaling of emotion-

denoting terms provides one such alternative in delineating the structure of affect.

Russell cites Bush (1973) who obtained a large sample of terms by selecting from a set of 2186 feeling denoting adjectives. Bush (1973) then used Carroll and Chang's (1970) multidimensional scaling technique, INDSCAL, to scale the resulting set of 264 adjectives. Three dimensions were found to be interpretable. Dimension 1 as pleasant - unpleasant; and dimension 2 as level of arousal or activation. The third factor was much less reliable but Bush did relate it to level of aggressiveness and to the potency dimension of the semantic differential.

It was noted that Bush demonstrated that his first two INDSCAL dimensions correlated as highly as their reliabilities allowed with successive-interval scales of pleasantness and levels of activation that he constructed. Bush was unsuccessful, however, in constructing an independent successive - interval scale for level of aggressiveness. Averill (1975) is mentioned as showing that his two factors of evaluation and activation were also as highly correlated with Bush's successive - interval scales as their reliabilities allowed.

Russell (1978) tested the apparent convergence of the three affective dimensions across various methodologies. He correlated Bush's (1973) three INDSCAL dimensions, his two successive - interval scales (Bush, 1972), three of Averill's (1975) semantic differential dimensions, and the three dimensions of pleasure, arousal and dominance obtained by Mehrabian and Russell (1974) in their studies of verbal self-report. He also utilized canonical correlation and principle component analysis to examine the relationship between these various instruments.

Russell showed that pleasure - displeasure is the correct interpretation of the first dimension obtained in the studies mentioned above. He argues that this finding supports the view that a variety of sources of evidence are pointing to a common description of the meaning of emotion terms and that pleasure - displeasure is one of the major dimensions within this domain.

This study also showed a convergence on arousal as the second dimension of affect. A second study, which provided three separate multi-dimensional scalings, demonstrated that arousal was obtained in all of them and that it was highly correlated with the arousal/activation dimensions generated in other methodologies.

Russell observes that beyond these two factors, the structure of emotional terms (and thus emotional experience) becomes more difficult to interpret or to replicate. He suggests prior research points to some combination of dominance, potency, aggressiveness and control as a third dimension of affect. Russell's (1978) second study provided support for such a dimension, which was correlated most closely to Averill's dimension of uncontrol. In all three sets of words studied in this second investigation, evidence for this dimension was obtained both by visual inspection and by empirical correlation. Each set of words also produced support for the existence of more dimensions and some evidence for two specific continua: depth of experience and the locus of causation of the emotional state. Depth of experience received empirical support using a set of unpleasant words and was of marginal significance with respect to a set of pleasant words. Locus of causation, operationalized as internal - external causation, received some support in relation to a set of pleasant words.

Russell observed that the dimensions beyond pleasure and arousal such as control/dominance/potency, locus of causation and depth of experience appear to refer to the antecedents or consequences of the emotional

experience. He proposes that control/dominance/potency refers to judgements about the course of future events, particularly about who is to control them. Locus of causation is said to refer to judgements about the antecedents of the emotional state. Depth of experience is also thought to be a judgement about the future impact of the current experience. For example, a shallow or frivolous feeling is said to be caused by something inconsequential, and is expected to have little impact on a person. A deep or profound feeling is said to be caused by something of consequence and is expected to have significant implications. Russell argues that since they concern the person's knowledge, or beliefs, about the causes and consequences of his or her emotional state, these dimensions beyond pleasure and arousal can thus perhaps be best discussed from a cognitive orientation. In this context, Lazarus (1966), Lindsay and Norman (1977), Pribram (1967) and Schachter (1964) are cited. He adds that these dimensions would not be unique to emotions, but instead could be conceived as dimensions of general information processing.

Russell points out that not all emotion terms convey meaning on each of the cognitive dimensions. For example, the term ignored indicates an external social cause to an unpleasant state. On the other hand,

unhappy fails to specify a cause. Other terms are said to denote even more specific causes. 'Guilty, for example, is said to signify a violation of some rule. Russell suggests that this hypothesis helps to explain the inconsistent results from prior research on the dimensions beyond pleasure and arousal, since different emotions would not all be expected to include various cognitive dimensions.

Russell and Pratt

In the Russell and Pratt (1980) paper, Russell had entrenched his view on the emotions and had concluded that two factors were adequate to characterize affective meaning. Subsequent factors were to be interpreted as more perceptual-cognitive than affective in nature. More precisely, the dimensions of pleasant-unpleasant and sleep-arousal are assumed sufficient to represent the emotional, but not the perceptual-cognitive component of the meaning of affective terms.

This distinction raises the issue of where to draw the distinction between the emotional and the cognitive dimensions underlying the meaning of affective terms. Russell and Pratt maintain that the two dimensions of pleasure-displeasure and degree of arousal denote the internal emotional state per se. All other dimensions are cognitive in that they denote beliefs about

antecedents, consequences or other such properties of the emotional state.

Given that the "emotional component" of emotion consists of two factors, Russell and Pratt argue that the proposed structure for affective meaning appears to fulfill the requirements of a circumplex. Russell (1980b) extended his notion of a circumplex ordering of affect in a series of investigations. He scaled 28 emotion denoting adjectives in four different ways. These included Ross' (1938) technique for a circular ordering of variables; a multidimensional scaling procedure based on perceived similarity among the terms; a unidimensional scaling on hypothesized pleasure-displeasure and degree of arousal dimensions; and a principal-components analysis of 343 subjects' self-reports of their current affective states. The evidence suggested that the interrelationships between these 28 terms could be represented by a spatial model in which the affective concepts fall in a circle in the following order: pleasure (0 degrees), excitement (45 degrees), arousal (90 degrees), distress (135 degrees), displeasure (180 degrees), depression (225 degrees), sleepiness (270 degrees), and relaxation (315 degrees).

Critique of Russell

Scherer (1982) provides a cogent argument against the distinction Russell makes between "emotional" and "perceptual-cognitive" continua of affect; i.e., the implication that pleasure and arousal are "true" factors of affect while the additional dimensions are not. He points out that in terms of evolutionary history, the flexibility of the behavioural adaptation of organisms to their environment is largely due to the emotion system. Emotions "decoupled" the behavioural reaction from the stimulus event by replacing rigid reflex-like stimulus-response patterns or innate releasing mechanisms. In the course of the evolution of the higher species, Scherer argues there was a need for increasingly complex information processing together with greater flexibility of behavioural inventories. As a result, a mechanism which allowed for an adequate adaptation of the organism's behaviour to both internal and external stimulation would be highly adaptive.

This was achieved by the process of emotion. In organisms capable of emotion, rigid releasing mechanisms were replaced by cognitive evaluation processes for stimuli and events. Reflex-like reactions were replaced partly through physiological activation, providing the energy required for an adequate response and partly through the preparation of

behavioural plans with probability of occurrence but with a certain latency. This mechanism provided the possibility for constant reevaluation of complex stimuli and situations without much time delay since preparation of the behavioural reaction takes place as part of the emotion process.

The first stimulus evaluation postulated by Scherer is an evaluation of the novelty or unexpectedness of a stimulus. This check is said to occur very quickly, since the survival of an organism may depend on a quick reaction to and therefore an increase in arousal for an unexpected event. This information-processing continuum or perceptual-cognitive dimension appears to be related to Russell's arousal factor. However, Russell views this factor as one of his intrinsic emotional dimensions.

The second stimulus check in Scherer's model has to do with the evaluation of the inherent pleasantness of unpleasantness of a stimulus which causes the organism to experience pleasure or distress. This perceptual-cognitive continuum is related to Russell's dimension of pleasure; the second of his intrinsic emotional factors.

Scherer goes on to describe three more perceptual-cognitive dimensions which he believes to be crucial in

the generation of emotions. However, it is evident that Russell's two core dimensions of affect can be described in perceptual-cognitive or information-processing terms. Furthermore, as Scherer suggests, it is quite probable that emotion prepared the ground for the evolutionary development of cognition and problem-solving in primates by providing time to think about a stimulus before doing something about it. Scherer suggests that it is probably erroneous to assume, however, that cognition has been superimposed as a more advanced mode of human functioning. As Scherer argues, contrary to the platonic distinction between cognition, emotion and conation, there is likely no clear separation between cognition and emotion. Thus a distinction between intrinsic emotional factors and perceptual-cognitive factors may well be unnecessarily arbitrary.

Integrated Approaches

Recently other researchers in the area of emotions have begun to talk about integrating the dimensional and discrete approaches. This thesis is in agreement with this basic position and consequently the results and theorizing of these investigators bear direct relevance to it. Most of these papers stem from a cognitive approach to emotions. However, the study by

Russell and Steiger (1982) comes from the dimensional approach to affect and it is a particularly interesting one in that it seems to indicate a dimensional theoretician developing a more integrative perspective.

Russell and Steiger

In the Russell and Steiger (1982) paper, it appears that Russell had adopted a more integrative approach towards the discrete and dimensional schools of emotion. As the authors pointed out, a typological taxonomy assumes that terms such as fear, anger, sadness and happiness denote discrete and prototypically different emotion types. As they note, the taxonomy is typically in the form of a list of separate affects, with each entry on the list usually defined by a cluster of quasisynonyms. The interrelationships among entries are usually left unspecified or are treated implicitly as independent or mutually exclusive of each other.

Russell and Steiger (1982) suggest that a dimensional taxonomy of emotions treats all emotion categories as varying quantitatively from one another. They argue that the interrelationships between these discrete affective states may be represented as distances within a bipolar space. Furthermore, this

space would contain all the possible emotion-descriptive categories.

They argue that in factor-analytic studies of subjects' ratings of their own emotional states, the equivalent of a discrete typology would be a list of independent, unipolar factors, with each factor defined by a cluster of items (quasisynonyms) and forming a simple structure. It was noted that most such studies yielded results that were interpreted as support for the typological approach. Studies cited included Borgatta (1961), Clyde (1963), Curran and Cattell (1973), Izard (1971), McNair and Lorr (1964), and Nowlis (1965). However, as Russell and Steiger noted, the intercorrelations among the unipolar factors obtained in these studies were generally greater than zero.

These researchers point out that the evidence for a bipolar dimensional taxonomy of emotions has stemmed from various sources. This has included factor analyses of judgements of facial expressions and they refer to investigations by Abelson and Sermat (1962), Cliff and Young (1968), Green and Cliff (1979), Royal and Hays (1959) and Shepard (1962) in this regard. The semantic differential studies of Osgood (1966; 1969) and Russell and Mehrabian (1974) are also mentioned.

They note that a similar bipolar dimensional structure also emerged when the meaning of emotion-denoting terms was explored through multidimensional scaling techniques. Researchers such as Block (1975), Bush (1973), Lundberg and Devine (1975), Neufeld (1975, 1976), Russell (1978, 1980) and Stone and Coles (1970) are cited. They observe that bipolar pleasure and arousal dimensions were consistently found in these studies.

Finally, Russell and Steiger argue that the conclusion from earlier factor-analytic studies of a list of unipolar factors has been challenged on methodological grounds. They suggest that several studies have yielded evidence more supportive of a dimensional taxonomy once these methodological issues had been taken into consideration. Russell (1979, 1980), Russell and Mehrabian (1974, 1977) and Svensson (1977) are cited in defense of this point.

Russell and Steiger point out that although they are typically construed as competing, the typological and dimensional approaches are perhaps better thought of as complimentary levels of analysis. By grouping together sets of quasisynonyms, the typological approach can be used to bring order to the wide gamut of emotion-denoting terms. These have been estimated to number

over 2000 by Wallace and Carson (1973). These writers go on to suggest that the dimensional approach focuses on the interrelationships among these clusters of discrete emotion terms. It can be used to generate an empirically derived structure for any implicit assumption that emotion types are independent or mutually exclusive. Russell and Steiger postulate that instead, emotion categories can be related in such a way that any list of emotions could be accounted for by a simple underlying space consisting of a small number of bipolar dimensions.

Russell and Steiger (1982) investigated the relationship between the taxonomic and dimensional approaches to affect. The McNair, Lorr and Droppleman's profile of mood states (1971) was selected as a list of emotion categories and was examined in two studies for the interrelationships among its categories.

To examine intraindividual relationships, 45 subjects rated the emotional state posed in each of 32 videotape segments. To examine interindividual differences, self-reports of emotional states by 343 subjects were used. The results showed that emotion categories are systematically interrelated and can be accounted reasonably well by a space of three bipolar

dimensions. These were pleasure-displeasure, arousal-sleep and dominance-submissiveness.

Critique of Russell and Steiger

The development of Russell's thinking from 1978 to 1982 demonstrated a progression from a dimensional orientation to a more integrative approach to emotions. In this regard, this thesis is in agreement with the latter line of thinking. However, it differs in the number of dimensions held to account for the interrelationships between discrete affects. Russell holds to a model of two common factors (although even his research indicates the possibility of three or more) while this thesis hypothesizes that there are at least two universal factors and probably more common factors within particular subsets of discrete affects. This paper is also in agreement with Russell in that the two universal factors are believed to be pleasure and arousal. However, since this thesis hypothesizes that there are other factors, it conceives of differences as being in part based in differences of factor structure. Russell's model only distinguishes between affects in terms of their differences in location within a common affective space. This paper includes the notion and goes beyond in that both factor structure and spatial location are thought to be important in differentiating between emotions.

Cognitive Approach

The work of Scherer (1982), Roseman (1984) and Smith and Ellsworth (1985) belong to the cognitive approach to affect. As such, they make use of the concepts of attribution and evaluation in their theorizing and research. For the purposes of this thesis, attributions are considered to be cognitive representations of the causes of external and internal events. Evaluations are considered to be characteristics or dimensions that can be generated directly from these events or the cognitive representations derived from them. This thesis considers evaluations to be affective structures as opposed to attributions which are believed to be cognitive structures. However, cognitive theoreticians often make use of both of these in their analyses of emotional states. This often leads to differences between the cognitive and the phenomenological viewpoints concerning these affective states.

Scherer

Scherer defines affect and emotion as a psychological construct consisting of several aspects or components. These are specifically: cognitive appraisal or evaluation of stimuli and situations;

physiological activation or arousal; motor expression; motivational tendencies, consisting of behavioural intention or behavioural readiness; and finally subjective feeling state. Emotion is further conceptualized as a process rather than a steady state. This process is thought to be characterized by sequential intraorganismic information processing and extremely complex interactions between the various components mentioned previously.

Scherer postulates that one of the major functions of emotion is the constant evaluation of external and internal stimuli in terms of their relevance for the organism and the behavioural reactions which may be required in response to those stimuli. He assumes that this evaluation process consists of a very rapidly occurring sequence of hierarchically organized stimulus processing steps. In other words, Scherer postulates that the evaluation of any incoming stimulus is established by a sequential series of specific checks in terms of relevant dimensions of its meaning for the organism.

The first stimulus evaluation check (SEC) is believed to be an evaluation of the novelty or unexpectedness of the stimulus. It is thought that this first check is at least partly independent of

higher cortical functions. Thus, a startle reaction to a sudden noise may be the immediate result of a very basic novelty check. For less sudden and extreme stimulation there may be higher cortical functions involved in checking the stimulus against expectations in memory. Scherer points out that this first evaluative check is clearly involved in emotions such as Boredom and surprise.

The second SEC is postulated to be the evaluation of the inherent pleasantness or unpleasantness of a stimulus which leads the organism to experience pleasure or distress. As Scherer notes, the pleasantness/unpleasantness evaluation is one of the major aspects of all studies of emotional meaning or expression. This type of appraisal is central to a great number of theories of affect.

The third SEC is believed to be the evaluation of the goal relevance of the stimulus. This refers to the appraisal of the extent to which the introduction of that particular stimulus or event will further or hinder the attainment of a specific goal high in priority for the organism at that particular point in time.

Scherer suggests that if the result of the goal relevance SEC indicates an interruption of ongoing

plans, fear or anger may be the consequence. A Stimulus which furthers goal attainment will lead to a state of contentment. If the organism's expectations are exceeded, joy will be the result.

The fourth SEC is a check of the extent to which the organism is capable of coping with a stimulus in terms of its goal/plan structure. It is assumed that the basis for this evaluation is often a causal attribution of the origin of a particular stimulus or event. Without the determination of the causes of events, an appraisal of the coping potential of the organism is said to be difficult, if not impossible. If the organism can cope with a particular stimulus or event without endangering its existence or a major goal, the result is anger. If coping potential is insufficient, fear will result.

Scherer suggests that for humans there is an additional SEC. This SEC is said to consist of a comparison of stimuli, particularly of one's own actions or the actions of others and their results, with social norms and various aspects of self-concept. For example, shame or guilt may be the consequence if one's own behaviour does not conform to social norms or if it is not compatible with one's self-concept.

Scherer compares his model of the emotions with the discrete theories advanced by Tomkins (1962) and Izard (1977). He suggests that his notion of emotional states being the complex result of a series of stimulus evaluation checks is well suited to explain the great number of highly differentiated emotional states which people seem to experience and be able to describe verbally. He also argues that because particular types of outcomes of the stimulus evaluation process seem to reliably reoccur for many species, this provides a basis for the idea that there are a number of discrete emotions which are modal outcomes of the stimulation evaluation processes. These modal affective states are believed to be startle, displeasure, surprise, joy, anger, shame/guilt and contempt.

Critique of Scherer

There is difficulty in relating cognitive theories such as Scherer's to a structural phenomenological model in that there is a lack of theoretical or empirical correspondence between cognitive dimensions and subjective dimensions. Cognitive dimensions were not necessarily developed to describe the conscious subjective state of an individual. However, it is not unreasonable to assume that some subjective structures reflect or are equivalent to some cognitive structures.

Thus the theorizing of cognitive researchers may provide clues as to potential phenomenological continua.

With respect to Scherer's model, his first SEC of novelty appears clearly related to the dimension of arousal used in this thesis. The second SEC is clearly equivalent to the subjective factor of pleasure. The third SEC appears to be related to the depth-of-experiencing factor. In other words, an emotion is experienced deeply or intensely to the extent that the event provoking that affect hinders or furthers the attainment of a specific goal. The fourth SEC is clearly related to the factor of dominance; i.e., the ability of the organism to master or control events in the environment. Thus, in relation to this thesis, four of Scherer's five dimensions appear similar to the factors used in this thesis. The SEC of social norm comparison does not seem to correlate to any of the factors utilized in this paper. Perhaps future investigation will generate a phenomenological dimension that corresponds to this evaluation mechanism.

Besides the theoretical support that some of Scherer's cognitive dimensions provide for this paper, there is an idea of his which is central to this

thesis. This is the notion of modal configurations of dimensions leading to or comprising discrete affective states. The theoretical model of this investigation is in general agreement with Scherer's conceptualization and structural hypotheses (1) through (8) are elaborations of this notion.

Roseman

According to Roseman's (1984) revised theory, there are five cognitive dimensions or sets of appraisals of events, that determine whether an emotion will occur and which discrete affect it will be. Particular combinations of these cognitions, or different patterns of appraisal, give rise to sixteen basic emotions. These include surprise, hope, fear, joy, relief, sorrow, discomfort, disgust, frustration, liking, pride, disliking, anger, shame, guilt and regret.

A fundamental assumption of this model is that all affects have a motivational basis. In other words, people experience emotions about events of relevance to active motives or preferences. Roseman labels the first dimension of his theory "motivational state". It distinguishes between two basic types of preferences: rewards and punishments. Insofar as these preferences are instrumentally pursued as goals, they can be classified as appetitive versus aversive motives. The

discrete affect that will be experienced in response to a stimulus event depends in part on whether the primary motivations of relevance to that event are represented as rewards (positive) or punishments (negative).

The second dimension has been labelled as "motive consistency/inconsistency". In other words, events are said to be appraised to ascertain their consistency or inconsistency with a motive and these lead to positive emotions. "Bad" events are those inconsistent with a motive, and these lead to negative emotions. For example, with respect to the emotional state of "joy, the motivational state is reward, consistency with which involves its presence or increasing closeness. For relief, the motivational state is a punishment, consistency with which involves its absence or increasing distance. For sorrow, the operative motivational state is a reward, inconsistency with which involves its absence or decreasing closeness. For distress, the operative motivational state is a punishment, inconsistency with which involves its presence or decreasing distance (Roseman, 1984, p.26)".

The third cognitive dimension in this model is that of power i.e., the evaluation of strength/weakness a person has with respect to others and her world. The emotional states of distress, sorrow, fear, disliking

and guilt are said to arise partly from the evaluation of one's weakness in a situation and frustration, anger, and regret, partly from the assessment of one's strength.

The fourth hypothesized cognitive dimensional determinant of discrete affects is believed to be probability or certainty/uncertainty. "The probability dimension distinguishes between events perceived as definite and events perceived as possible; events that are psychologically certain versus events that are psychologically uncertain. According to the theory, joy, relief, distress and sorrow will be felt to the extent that motivationally relevant events are seen as certain. People who perceive that it is merely possible (uncertain) that a rewarding state is (or will be) present or that a punishing state is (or will be) absent, feel hope rather than joy or relief. People who perceive that it is possible that a punishment is (or will be) present, or that a reward is (or will be) absent, feel fear rather than distress or sorrow (Roseman, 1984, p.21)".

Roseman's fifth hypothesized cognitive determinant of discrete emotions is agency. This continuum is said to distinguish among circumstantially or impersonally caused events, events caused by other people and events

caused by oneself. The affects of joy, relief, hope, distress, sorrow, fear and frustration are said to be "event" emotions. That is, no human agent is identified as causing the event that is provoking the affective state. If a person other than oneself has been identified as causing punishing events or preventing rewarding ones, the theory predicts that an individual will feel "dislike" toward that person if that person is evaluated as being more powerful, and anger if that person is evaluated as being weaker than oneself. If one perceives oneself as responsible for an event, the theory predicts that one will experience pride if the event is positive. If the event is negative and the person feels weak in relation to it, this is said to lead to shame or guilt. If the person evaluates himself as being powerful, she will feel regret.

The relationships between the cognitive dimensions and the discrete emotions as postulated by Roseman are presented in Table 2.

Critique of Roseman

The question of what is the relationship between cognitive constructs and phenomenological dimensions arises again in relation to Roseman's theory. Roseman clearly states that the cognitive appraisals lead to or

Table 2

Roseman's Hypothesized Structure of the Emotion System

Motivational State	Motive Consistency	Agency	Probability	Power	Emotion
positive		circum- stance	unknown		surprise
positive	consistent	circum- stance	uncertain	weak	hope
positive	consistent appetitive	circum- stance	certain	weak	joy
positive	consistent aversive	circum- stance	certain	weak	relief
positive	consistent	circum- stance	uncertain	strong	hope
positive	consistent	other			liking
positive	consistent	self			pride
negative	incon- sistent	circum- stance	uncertain	weak	fear
negative	incon- sistent appetitive	circum- stance	certain	weak	sorrow
negative	incon- sistent aversive	circum- stance	certain	weak	dis- comfort disgust
negative	incon- sistent	circum- stance		strong	frus- tration
negative	incon- sistent	other		weak	dis- liking
negative	incon- sistent	other		strong	anger
negative	incon- sistent	self		weak	shame, guilt
negative	incon- sistent	self		strong	regret

determine affective states. As mentioned previously, this leaves the issue of the structure of affective states unanswered. However, assuming that there is a correspondence between cognitive appraisals and phenomenological dimensions, the following relationships seem to exist.

Roseman's appraisal of motive consistency is clearly related to the subjective dimension of pleasure. The appraisal of power appears to be closely related to the phenomenological continuum of dominance. Both these factors are represented in this thesis. The appraisal of probability may be related to the spontaneity factor put forth in this thesis. This factor seems to get at the concept Roseman is referring to; i.e., psychological certainty versus uncertainty.

Roseman's appraisal of motivational state and his appraisal of agency appear to be more in the realm of perceptual-cognitive attributions than affective evaluations. The structure of agency seems to refer to the detection and isolation of external events that are attributed to be the causes of events. The concept of motivational state in Roseman's model appears to refer to the detection and isolation of internal events that are attributed to be causes of events. Both these

perceptual-cognitive attributions can lead to evaluations that comprise affective states. However, from the point of view of this thesis, these attributions are not considered to be emotional structures and therefore there are no scales which correspond to them in this paper.

Despite the differences between cognitive and phenomenological approaches to affect, they agree on one basic point. That is, configurations of cognitive appraisals (or emotional evaluations) lead to (or comprise) discrete emotional states. In other words, continuous dimensions are integrated in such a manner as to define discrete entities. Furthermore, examination of Roseman's model provides theoretical support for the hypothesis that not all emotions share the same of factors. Certain cognitive dimensions in Roseman's model appear to be irrelevant for a number of discrete emotions. For example, the certainty factor does not seem to pertain to the emotions of frustration, disliking, anger, shame, guilt and regret. The power dimension seems to be unnecessary for the affect of surprise. This implies that individual factor analyses of the states described in this cognitive model would generate different numbers of factors. Thus, emotions would be differentiated on the basis of factor structure and location within a common

affective space. This thesis agrees with this conceptualization and makes the implications of such thinking explicit in structural hypotheses (1), (6), (7) and (8).

Smith and Ellsworth

Smith and Ellsworth (1985) suggest that when considering the studies of facial expression, there is consistent evidence for three dimensions: pleasantness, level of activation and attentional activity. As noted previously, Osgood (1955) and Frijda (1969) also found evidence for a control dimension. The research on subjective experience differs from the facial research in that none of the studies found any evidence for the attentional activity continuum. According to Smith and Ellsworth this may be because people are likely to register the attentiveness of other people's faces, but are unlikely to discriminate among their own affective states in terms of attention. However, they argue that there is support for the factor of control stemming from several subjective experience studies.

Smith and Ellsworth point out that several phenomenological studies have found evidence that people discriminate between emotional states in terms of a depth-of-experiencing dimension. They cite Daly et al (1983), Russell (1978) and Frijda (1969) as

researchers who have generated factors that appear to rate affects along a "profound emotional experience to trivial emotional experience" dimension.

These authors place themselves within a third line of research; i.e., the cognitive approach. This theoretical framework assumes that emotional differences stem from differences in which people appraise their worlds. Smith and Ellsworth argue that the first appraisal individuals make is to decide whether to attend to a stimulus or not. They label this the level of attention continuum and claim it is similar to Scherer's (1982) novelty dimension. Borrowing from Roseman's (1984) theory, they suggest that there is a certainty factor. This concerns a subject's appraisal of how predictable/unpredictable events in her world will be. A third dimension is control. This appraisal concerns the individual's ability to cope with a particular situation and appears to be similar to Roseman's (1984) and Scherer's (1982) control dimension.

These two researchers include a pleasantness dimension in their model, but do not believe an activation continuum is necessary. They argue that intensity is not very important in discriminating between affective states. In addition, they posit that

there ought to be a "perceived obstacle" appraisal. This would involve an assessment of the degree to which a goal is being impeded by some event in a person's world. These writers also suggest that legitimacy and responsibility dimensions exist. These involve a person evaluating the degree to which a person caused an action to occur and the degree to which they are consistent with social or private norms. They appear to be similar to Roseman's legitimacy and Scherer's norm/self-concept continua. Finally, these researchers include in their model, an appraisal of anticipated effort. This is an appraisal of the degree to which a person must energize himself in order to complete an action. It is intended to replace the level of activation dimension not included in their theory.

In summary, Smith and Ellsworth hypothesized that people utilize a set of eight appraisals in evaluating their interactions with themselves, others and their world. These include pleasantness, attention, control, certainty, perceived obstacle, legitimacy, responsibility and anticipated effort. These dimensions are viewed as cognitive aspects of emotion rather than precursors that lead to an affective state.

To test their model, these researchers used a within-subjects design in which 16 subjects were asked to recall past experiences associated with each of 15 different emotions. These included happiness, sadness, fear, anger, Boredom, challenge, Interest, hope, frustration, contempt, disgust, surprise, pride, shame and guilt. For each emotional experience subjects first responded out loud to a series of questions designed to encourage them to describe the experience in as much detail as possible. They then rated the experience along the hypothesized cognitive dimensions.

Smith and Ellsworth used both principal components analysis (PCA) and symmetric individual scaling (SINDSCAL: Pruzansky, 1975) to generate their factor structures. Both analyses generated six factors that were similar and interpretable. The first dimension in both analyses was identified as the pleasantness dimension. The second PCA dimension and the third SINDSCAL dimension combined loadings from the responsibility and control scales. This responsibility/control factor reflected the degree of of one's own responsibility and control versus that of other people. The third PCA and fifth SINDSCAL factors represented the certainty dimension; the fourth dimension in both analyses was the attentional activity continuum; and the fifth PCA and second SINDSCAL

factors were interpretable as the anticipated effort dimension. The sixth factor in both analyses was defined as a situational control continuum. It reflected attributions subjects made about the extent to which affective situations are controlled by circumstances versus the extent to which they are controlled by a human agent. Based on the emergence of the situational control and the responsibility/control factors, Smith and Ellsworth argue that individuals not only distinguish between self versus others in responsibility and control, but also evaluated the extent to which the situation is caused by circumstances beyond anyone's control. In summary, these researchers found six cognitive dimensions that were posited to account for 15 discrete emotions. These were the factors of pleasantness, responsibility/control, certainty, attentional activity, anticipated effort and situational control.

Critique of Smith and Ellsworth

The model proposed by Smith and Ellsworth, like that of Roseman (1984) and Scherer (1982), integrates the dimensional and the discrete approaches to emotion. That is, configurations of continuous dimensions are believed to lead to or comprise discrete affective states. This thesis agrees with this basic notion and

this is expressed in the structural hypotheses. It differs in that it maintains there will be different numbers of common factors depending on the particular subset of (or individual) emotions being examined. Smith and Ellsworth have developed a six-dimensional model in which basic affects differ by their location in this emotion space. This paper hypothesizes that emotions will differ, not only on the basis of spatial location, but also on the basis of factor structure; ie., there will be qualitative as well as quantitative differences between emotions.

As Smith and Ellsworth point out, cognitive theorists tend to assume a close relationship between cognitive appraisal and subjective structure. To that extent, some of the cognitive dimensions appear to provide theoretical and empirical support for the factors represented in this thesis. Their first factor of pleasantness seems equivalent to the factor of pleasure. Their responsibility/control continuum appears to be similar to the factor of dominance. The third Smith and Ellsworth factor of certainty seems to be similar to the factor of spontaneity put forth in this thesis.

The fourth continuum generated by these researchers was the attentional activity dimension. As these

author's point out, no study of the subjective structure of emotions has generated this factor. It would seem to be a factor of appraising emotion in others, rather than a felt dimension of one's own experiencing. The anticipated effort dimension of these two researchers seems to be related to the arousal factor. However, the sixth dimension of situational control appears to be an attribution rather than an affective appraisal. Like Roseman's dimension of agency, this structure appears to measure individuals' assessment of the causes of events. This thesis assumes that these attributions can in turn lead to emotional evaluations such as those described above.

In summary, four of Smith and Ellsworth's dimensions correspond to the subjective factors of pleasure, arousal, dominance and spontaneity accounted for in this paper. Configurations of these and other phenomenological dimensions are believed to constitute discrete emotional states. Explicit and more detailed elaboration of this idea is contained in the structural hypotheses.

Summary of Dimensional Approach

The work of Russell (1980) and other researchers such as Osgood (1976) and Whissell (1981) indicate that the structure of emotions contains at least two

factors; those of pleasure - displeasure and level of arousal. A great number of studies have indicated that there exist additional dimensions, but that these dimensions are not as robust or universal as the first two. Russell (1978) made a number of observations concerning these findings which if extended, offer an integration of the dimensional and discrete approaches to affect.

The first idea is that there are two dimensions common to all emotions. These are the pleasure and arousal continua which Russell (1980) labels as "emotion per se" factors, while the additional he labels as perceptual - cognitive dimensions. Formally speaking, this notion can be construed as an axiom which states that all emotions will be characterized by the presence of these two factors. In relation to analysis of Interest and Boredom, this is expressed by hypotheses (2), (3), (4) and (5). In short, they posit that the representative affects of Interest and Boredom contain the continua of pleasure and arousal and that these are equivalent across the two emotions.

The second notion regarding the distribution of the perceptual - cognitive dimensions is the critical concept that may explain a great deal of the literature. If these additional factors are not

distributed equally among all affects, then the results of various factor analyses would be expected to differ depending on the sample of emotions that has been selected. Some studies would find only two factors; others would generate three or more, but vary in their interpretation of these extra factors.

In terms of the structure of individual affects this idea implies that each emotion can be characterized by a specific configuration of factors. Thus a particular emotion or subset of emotions can be differentiated from another affect or subset of affects by the number and type of dimensions that comprise them. Since each emotion is expected to have pleasure and arousal dimensions, it is assumed that the so called perceptual-cognitive continua will be the major basis on which affects can be distinguished. In relation to the comparison between Interest and Boredom, this is expressed by hypotheses (1) and (6). In other words, the representative emotions of Interest and boredom will contain dimensions beyond pleasure and arousal and that these will not be equivalent across the two affects.

The preceding two notions are intriguing in that they allow a resolution of the dimensional versus discrete issue. The structural analysis of emotions

assumes that the dimensions comprising each affect are continuous (Osgood, 1976; Mehrabian and Russell, 1974; Averill, 1975; Whissell, 1981; Daly, Lancee and Polivy, 1983; Russell, 1978; Russell and Pratt, 1980; Russell and Steiger, 1982; Scherer, 1982; Roseman, 1984; and Smith and Ellsworth, 1985). Yet the configurations of these continua are relatively unique and thus are able to define basic or prototypical emotions (Ekman, 1982; Izard, 1977; Plutchik, 1980 and Tomkins, 1978). This results in discrete defineable emotion states that can be differentiated on the basis of common and unique factors.

This thesis does not assume that each emotion is characterized by a completely different configuration of factors. At least two of them, pleasure and arousal, are believed to be universal. This implies that there are subsets of affects which share the same quantity and quality of dimensions. The differentiation between emotions within a given subset would then be based on their positions along these factors. With respect to Interest and Boredom the literature indicates that they differ along the pleasure and arousal dimensions. This is expressed in hypotheses (7) and (8). That is, Interest is posited to be more pleasurable and more arousing than Boredom. However, it is unknown whether these two emotions will

share any other dimensions. Consequently, it is assumed that these two emotions are maximally different. This is expressed in hypothesis (6).

Structural Model

As noted by Osgood (1976) there is a great deal of agreement concerning the first two factors defining emotions. These have been labelled as evaluation (or pleasure) and arousal (or intensity). However, researchers have encountered a great deal of difficulty in establishing the reliability and validity of factors beyond these first two. In attempting to explain this problem, Russell (1978) suggested that not all emotions shared these tertiary factors. Thus any attempt to uncover tertiary dimensions common to all affective states may be frustrated by the unique nature of individual, or perhaps small clusters of, these affective states.

Russell's notion is particularly intriguing as it suggests a way of integrating the dimensional and discrete approaches to emotion. By extending this idea, one can conceive of affects as well-defined states that are composed of configurations of dimensions. This notion suggests that discrete or prototypical emotions as defined by Izard (1977) and Plutchik (1980), can be identified and differentiated

on the basis of (1) factor structure and (2) the combined mean of the variables loading on the factors common to the emotional states.

As mentioned previously, two of these factors should be common to all emotions. These are the dimensions of pleasure (Mehrabian and Russell, 1974; Russell, 1978). All other factors would be common to a subset of emotions or unique to a particular affect.

Structural Hypotheses

In terms of a structural analysis of two emotions, these hypotheses can be expressed in the following manner. For the purposes of this thesis, these emotions are Interest and Boredom.

H(1): Each emotional state can be characterized by a factor solution of at least three factors.

H(2): One factor of Interest and Boredom can be identified as the pleasure dimension.

H(3): One factor of Interest and Boredom can be identified as the arousal dimension.

H(4): The pleasure factor of Interest is equivalent to the pleasure factor of Boredom.

H(5): The arousal factor of Interest is equivalent to the arousal factor of Boredom.

H(6): All other factors are not equivalent.

If these structural hypotheses are supported, it can be said that the dimensions of arousal and pleasure are common to the emotions of Interest and Boredom and that

there are other dimensions unique to each. In other words, the two continua supported by the literature will be confirmed by this methodology and theoretical perspective. Furthermore, the additional factors will confirm the ability of this approach to identify and distinguish between various emotions.

Averill (1975), Plutchik (1980) and Smith and Ellsworth (1985) provide evidence and theory to suggest that Interest is quantitatively higher in arousal and pleasure than Boredom. In terms of a structural analysis, this implies that there should be significant differences between the means of the combined variables derived from the variables loading on these two factors. In other words, ~~Interest and Boredom~~ can be differentiated not only by factors unique to each emotion, but also by differences in location along common dimensions. These hypotheses can be expressed in the following manner:

H(7): The mean of the combined variable derived from the variables loading on the pleasure factor of Interest is greater in degree than the mean of the combined variable derived from the variables loading on the pleasure factor of Boredom.

H(8): The mean of the combined variable derived from the ~~variables~~ loading on the arousal factor Interest is greater in degree than the mean of the combined variable derived from the variables loading on the arousal factor of Boredom.

in general, the failure of the analyses to confirm the structural hypotheses will greatly undermine the utility of this methodology in identifying and distinguishing affective states and in the theoretical approach put forth to integrate the dimensional and discrete approaches to emotion. More specifically, failure to confirm hypotheses (1) through (5) is a failure to replicate very robust findings in the literature. Inability to confirm hypotheses (6) through (8) would be a failure by this methodology to distinguish between emotions. Together they would weaken the theoretical power of the integrative approach to reconcile the various schools of thought regarding affect.

Chapter 2

Review of the Literature: Process Model

If we examine two emotional states that are experienced by the same person and are closely associated in time, then a comparative analysis of these structures is, in effect, a process analysis. In the literature on emotions, this type of analysis has only been hinted at in a speculative fashion. The theoretical differences between the discrete and dimensional approaches to affect have largely focused on the structure of emotional phenomena. However, in the "network theories" of Izard (1977) and deRivera (1977) as well as the evaluation theories of Arnold, Lazarus and Plutchik there are some indications about what can be expected concerning transitions between emotional states. Again it should be noted, barring Derivera's theory, that these theories fall within general experimental psychology. As such, various phenomenological and psychoanalytical theories regarding emotional transitions are excluded. The notions mentioned above are to be addressed by utilizing regressions based on the longitudinal factor analysis of Interest and Boredom.

Izard

One of Izard's (1977) principles of emotions is that of emotion patterning. That is, stimuli often elicit more than one emotion and that one emotion can elicit another. On the basis of this axiom he suggests that, given his ten basic affects, one can derive 45 dyadic transitions in which one emotion elicits another. Going one step further, he argues that there are 120 triadic sequences of emotions.

Some hypothetical examples of these transitions include Darwin's (1872) observation that the affect of attention (Interest) may graduate into surprise and surprise into "frozen astonishment" resembling fear. Tomkins (1962) has argued that the stimulation gradients which activate Interest, fear and startle (surprise) represent a hierarchy, with the gradient for eliciting Interest being the least steep and that for startle the steepest.

Izard (1977) observes that the apparent polarity between some pairs of emotions serves to define dyads of emotions. Joy and sadness, anger and fear, are often considered as opposites. Other possible polar opposites are Interest and disgust, shame and contempt.

Izard notes that certain other emotions other than the pairs of polar opposites also tend to have fairly regular relationships. For example, Interest may

oscillate with fear as, an organism explores some unknown (potentially exciting, potentially dangerous) object or situation. Contempt may graduate into or oscillate with joy and excitement to produce something like Lorenz's (1966) "militant enthusiasm".

deRivera

deRivera (1977) believes that it is possible to describe a network of 24 emotions by conceiving the particular emotions as phenomenological movements in an interpersonal space. A particular emotion is delineated by specifying its position in this matrix of object (person) relations. Any position is specified by four features of the matrix: (1) Whether the person or implicit other (person) is the subject of the movement, (2) Whether the movement is toward or away from the other or the self, (3) Whether the movement alters the position of the self or the other, and (4) Whether the movement occurs along the dimensions of belonging, recognition or being.

These terms are defined in deRivera's model by the following postulates.

1) There are two basic forms of subjectively felt "toward" movements. The positive movement toward the other that moves the self to the other and the movement of the other to the self.

2) There are two basic forms of subjectively felt "away" movements. The negative movement away from the other that removes the self from the other and the movement of the other from the self.

NB) In both postulates, it is assumed that there is a self and an other (or implied other).

3a) The dimension of belonging occurs when there is a transformation of the person's relation to the other in the sense that the person makes the other's concerns his own or in some manner disowns the concerns of the other.

3b) Another fundamental human relation is the dimension of recognition. To positively recognize means to identify, to know again, to acknowledge a person as a member of a special group, to honour or admit to some privileged status. To negatively recognize is to deny these recognitions.

3c) A third dimension of human relations is that of being. Quite apart from whether or not we belong to or recognize another, we may grant or deny that the other exists or does not exist.

The relationship between these phenomenological movements or dimensions and discrete affective states is presented in Table 3.

deRivera notes that one implication of this network model is that it may be easier to move from one emotion to another when only one feature of an affect is changed. For example, he observes that the emotional state of a person who is depressed may alter so that the person feels either anger or extreme confidence. The network suggests that anxiety may also be a possible alternative state, but fear and security are less likely since they involve a change of two features and love is least likely as an alternative since it involves a shift of three features. deRivera qualifies this suggestion by noting that it may be much easier to reverse certain features than others.

Table 3
deRivera's Model of the Emotions

<u>Movement Toward</u>	<u>Dimension</u>		
	<u>Belonging</u>	<u>Recognition</u>	<u>Being</u>
person moves toward other	love	esteem	acceptance
other moves toward person	security	humility	serenity
person moves other towards him	desire	admiration	wonder
other moves person toward him	confidence	pride	joy

<u>Movement Away</u>	<u>Belonging</u>	<u>Recognition</u>	<u>Being</u>
person moves other away	anger	contempt	rejection
other moves person away	depression	shame	sorrow
person moves away from other	fear	horror	dread
other moves away from person	anxiety	guilt	panic

Critique of Izard and deRivera

The theories of Izard and deRivera offer some conjectures on the subject of transitions between emotional states. Izard (1977) explicitly acknowledges the concept of emotion patterns and sets a format for the examination of these transitions. deRivera (1977)

speculates that the change between affects may be related to a change in one or two dimensions, defining these states. With respect to this thesis, this change can occur in two major ways. There may be a change along a particular dimension or a change in dimensional structure. That is, there may be a change in the mean value of a combined variable derived from the variables loading on a common factor or there may be a change in the loading of variables on a particular factors. These notions will be examined in light of a longitudinal analysis of two emotional states as described in the structural hypotheses. However, neither theory is explicit about which change in structure will result in or correlate with a transition between which particular emotions. The following theories go beyond this and offer some specific notions as to the relationship between the structure of affect and changes between emotions.

Evaluation Theories

The notion of appraisal or evaluation is common to many theories of emotion. This concept is important to a process analysis as it is intimately involved with the nature of various emotions. Presented below is a brief summary of the theories of Arnold, Lazarus and Plutchik.

Arnold

As Strongman (1978) points out, Arnold's theory of emotion has been developing for more than thirty years (e.g., 1945, 1960, 1968, 1970). It has been presented as a synthesis of phenomenology, cognition and physiology. The cognitive aspect of this theory relies to a great extent on the construct of appraisal. Arnold claims that we immediately, automatically and almost involuntarily evaluate anything that we encounter. As long as no other appraisals interfere, this leads us to approach anything appraised as 'good', to avoid what is 'bad' and to ignore what is 'indifferent'. Furthermore, when we have a good object we may well reappraise it and on the basis of this alter our behaviour. Thus, Arnold views appraisal as complementing perception and producing a tendency towards action. When this tendency is strong, it is labelled an emotion, although to Arnold all appraisals have the status of affective experiences.

Lazarus

R.S. Lazarus is another theoretician who adopts a cognitive orientation to affective phenomenon. However, his treatment of the evaluative dimension of emotion is somewhat different than that of Arnold's. Lazarus (1966, 1968; Lazarus et al., 1970) suggests

that we have dispositions to search for and respond to particular stimuli. He claims that it is these dispositions that shape our interaction with the environment. Our cognitive appraisal of these stimuli produces emotional responses. Furthermore, since stimuli change constantly and we are continuously attempting to cope with them, our cognitions alter as do our emotional reactions.

In this theory, there are three types of appraisal: primary appraisal, which is the cognitive process of evaluating the significance of an encounter for one's own well-being; secondary appraisal, which is the process of evaluating an encounter with respect to coping resources and options; and reappraisal, which occurs as new information is obtained. Appraisals of harm, loss, threat, or challenge produce negative emotions. Benign-positive appraisals result in positive emotions.

The concept of primary appraisal in Lazarus' theorizing refers to the cognitive process of evaluating the significance of a stimulus for one's well-being. Questions such as 'Am I okay or in trouble?' are answered at this point. It comes in three forms: judgements that the stimulus is (1) irrelevant, (2) benign-positive, or (3) stressful. A

stimulus evaluated as irrelevant is one that is considered to have no personal significance and therefore one that can be ignored. A benign-positive evaluation is a judgement that the stimulus is beneficial or desirable. Stressful (i.e. negative) appraisals involve judgements of harm-loss, threat or challenge. All three involve some negative evaluation of one's present or future state of well-being, but challenge provides the least negative (or most positive) judgement.

Harm-loss refers to damage already sustained. These include loss of significant relationships or social roles, blows to self-esteem or incapacitating injury or illness. Threat is said to refer to the same type of damage, but involves an anticipation of the future; of what has not yet happened. It is suggested that harm-loss and threat can occur as alternating or concurrent themes as the person appraises and reappraises harm that has occurred and threats to the person that may be consequences of the harm.

The distinction between challenge and threat rests on whether the person focuses on the potential for mastery and gain or on the potential for harm. Challenge involves a judgement that the demands of a transaction can be met and overcome.

Lazarus "posits the existence of a secondary appraisal. The essential difference between primary and secondary appraisal is in the content of what is being evaluated. Secondary appraisal refers to the person's ongoing judgements concerning coping resources, options and constraints. In other words, if primary appraisal answers the question "Am I okay or in trouble?", then secondary appraisal answers "What can I do about it?".

Reappraisal is the third step in the evaluative process outlined by these two authors. It refers to changes in a person's evaluative judgements and is a feedback process that adopts two forms. The first involves new information or new insights about the changing person-environment relationship and its significance for well-being. The other, defensive reappraisal, represents cognitive maneuvering to reduce distress rather than to assess accurately the troubled person-environment relationship with a view to changing it. What was initially appraised as harm-loss or threat is reappraised to be nonthreatening or desirable.

Plutchik

Borrowing from Magda Arnold's (1960) work, Plutchik (1980) also posits that all affects presuppose

evaluations of stimulus events as 'good' or 'bad'. These appraisals are said to be intuitive and they initiate approach or avoidance tendencies depending upon which evaluations have been made.

He argues that a 'good' or 'beneficial' judgement may lead to one of four possible responses. One class of reaction to a 'good' object is to explore it; another is to orient to it; a third is to eat it; and a fourth is to mate with it (if appropriate). Each of these consequences represents a different type of positive evaluation and the actions associated with each type of judgement represent distinct categories of basic or prototypical emotions.

A similar line of reasoning is put forth for those events which are evaluated as 'bad'. One type of reaction is to withdraw from them; a second is to cry for help; a third is to fight them; and a fourth is to vomit them out (if they have been ingested).

In addition, Plutchik posits that the languages of emotion suggest the notion of polarity. He claims that, for example, fear and anger are bipolar. Other polarities are said to be joy and sadness, acceptance and disgust, expectancy and surprise. Plutchik notes that the concept of polarity implies the concept of similarity, as bipolarity represents a point of maximum

dissimilarity on a given continuum. This in turn implies that the eight primary affects can be arranged in terms of their relative degrees of similarity. He posits that the hypothetical ordering of emotions is that of a circumplex on which the basic emotions of joy, acceptance, fear, surprise, sadness, disgust, anger and anticipation are roughly equidistant (1980, p. 156).

In the author's words, "the ideas that have been presented thus far can be represented by means of a three - dimensional model. This structural model of the emotions would arrange the eight basic affective dimensions like the sections of half an orange, with the terms that designate each emotion at maximum intensity at the top. The vertical dimension would represent intensity or level of arousal and range from a maximum state of excitement to a state of deep sleep at the bottom (Plutchik, 1980, pp. 157-159)."

Critique of Plutchik

Although this model states that the evaluation process is an antecedent of an affective response, it also seems to imply that the emotions can be rated with respect to similarity on this basis. Plutchik posits that a positive evaluation may lead to one of the emotions of Interest, surprise, joy or trust; a

negative evaluation may lead to one of either anger, fear, disgust or sadness. However, in an implicit acknowledgement that the affects cannot be completely differentiated along this dimension, he resorts to the notion of similarity. From the orientation of this paper, the other dimensions involved in the similarities between affects are the so called perceptual-cognitive dimensions. In other words, there are certain additional cognitive dimensions that help to account for the postulated circumplex ordering of the emotions.

Critique of the Evaluation Theories

The basic idea of the Arnold, Lazarus, and Plutchik models is that evaluation or appraisal leads to or forms part of emotional states. That is, negative evaluations lead to negative affects; positive appraisals lead to positive emotions. This conceptualization suggests that a change or a transition between emotional states is a direct result of a change in this dimension. Thus if a person is experiencing a positive affect such as Interest, then a change in the evaluation dimension from positive to negative should result in the person experiencing a negative emotion, such as Boredom. In other words if one is considering a transition between affective

states, then these theories suggest looking at the change in the evaluation or appraisal dimension, particularly for those emotions that are related in a bipolar fashion.

Interest is believed to have a positive hedonic tone, while Boredom is said to have a negative hedonic tone (Izard, 1977; Plutchik, 1980). Thus it would appear that these two emotions differ along the evaluation or pleasure dimension. This is expressed in process hypotheses (1) to (4).

Reversal Theory (Apter)

Outside of the sphere of the literature on emotion, there is a theorist who has a great deal to say about the process of transition between affective states. Apter (1982), who views himself as a theoretician in the realm of motivation, has developed a theory that has a great number of points of connection with the structural approach to emotions. He has labelled his model Reversal Theory and what follows is a brief synopsis of that theory.

The Concept of Stability

Reversal theory leans heavily upon and extends the idea of homeostasis. Many psychological processes display homeostatic properties, but Apter (1982) feels

that many psychological systems are more appropriately interpreted as 'multistable' than as homeostatic; which is to say that for many psychological variables there are a number of value ranges which constitute areas of stability for the variables concerned.

The simplest form of multistability is 'bistability', where there are two areas of stability or equilibrium rather than the single one involved in homeostasis. It is this form of multistability which is used as an explanatory concept in reversal theory. If the values of the variables which fall within the limits of homeostasis are defined as the 'preferred state' of the system or the 'preferred level' of the variable, then in the bistable system there are two such preferred states or levels, as against one in the homeostatic system.


The Concept of Reversal

When two preferred levels are interpreted as being opposite to each other, then switching from one of these to the other can be thought of as a reversal from one to the other. This process of reversal is one which is asserted by reversal theory to be involved in certain aspects of the dynamics of all conscious experience. It is, in fact, the central explanatory concept of the theory.

The change in preferred level occasioned by a reversal may involve the action of a different system that is responsible for regulating the preferred level. That is, it is possible to talk of a reversal not only from one preferred level to another of the same variable, but also from one system to another. In this latter case there would be an overall bistable system composed of two alternative and opposing subsystems. The pairs of opposing systems of central interest to reversal theory are those which are referred to as 'metamotivational'. They determine different preferred states for the motivational variable of arousal.

The Concept of Arousal

As Apter notes "the concept of activation dates back to the 1930's with the work of Duffy (1934, 1941), who conceived of it as the degree of energy mobilization in the organism. However, it was not until the 1950's that the concept of arousal began to have its main impact on psychology, largely due to the impetus of the work of physiologists like Moruzzi and Magoun on the reticular activating system of the brain stem and its effect on neurophysiological arousal. At this stage the terms 'arousal' and 'activation' came to be used widely, through the influence of a number of writers (e.g. Hebb, 1955; Duffy, 1957; Malmö, 1958). In some



areas of psychology it replaced the earlier idea of 'drive', as a way of conceptualizing motivation in terms of a unitary variable which would represent the overall intensity of motivation in an organism at a given time (Apter, 1982, p.80)".

He notes further that "arousal in the reversal theory sense is defined not behaviourally or physiologically, but phenomenologically. By arousal in reversal theory is meant the degree of motivational intensity which an individual experiences in consciousness at a given time: the extent to which he feels 'aroused' in the everyday sense of the feeling 'worked up' or 'stirred up' (Apter, 1982, p.81)".

As Apter notes, "the concept of arousal has been associated closely in the literature on motivation with the idea that it has some optimal level, which is usually assumed to be intermediate in strength. According to this view the organism sometimes behaves in such a way as to increase arousal up to this optimum point when the arousal has become too low, and at other times in such a way as to decrease the arousal down to the optimum point when the arousal is too high. Influential formulations of this idea include those of Hebb (1955) who referred primarily to physiological considerations; Leuba (1955) who used the term 'optimal

stimulation' with reference particularly to behavioural data, and Schultz (1965) who wrote of the process of 'sensoristasis' through which, in his view, the organism maintains an optimal level of sensory variation. All such theories are homeostatic: the organism is postulated to behave in such a way as to attempt to maintain arousal at some single preferred level (Apter, 1982, p.82)".

As he further states, "in optimal arousal theories, the optimal position is usually conceived to be optimal not just in the sense that the behaviour of the system makes it the preferred level, but also because when this level is achieved, the organism is believed to perform better, as defined and measured in various ways, than at any other level. This idea gives rise to the well-known inverted u-curve, which it is claimed, relates arousal to performance. Thus as arousal increases from some minimal level, so performance improves up to an optimal point; but, as arousal continues to increase, so performance deteriorates thereafter. Evidence for this curve has been adduced by numerous experimentors such as Shaw (1956), Stennet (1957) and Wood and Hokanson (1965) (Apter, 1982, p.82)".

In addition, Apter argues that, the optimal level of arousal is also generally supposed to be the position on the arousal dimension at which the arousal is associated with the greatest degree of positive 'hedonic tone'; i.e. it is the position of most felt pleasure, or in behaviourist terms, the position which is the most reinforcing. As arousal diverges from this optimal intermediate position in either direction, so the feeling associated with it becomes less pleasant and may eventually become unpleasant. Apter points out that this has been stated with varying degrees of explicitness by various optimal arousal theorists such as Hebb (1955), Leuba(1955) and Fiske and Maddi(1961).

In these terms, the relation of arousal to hedonic tone can be described by means of an inverted u-curve and the situation in this respect is therefore also supposed to be homeostatic. Apter notes that if the optimal arousal idea in relation to performance can be traced back to Yerkes and Dodson (1908), the essentials of the idea in relation to hedonic tone can be traced back even further, to Wundt (1874) who produced a form of the inverted u-curve to show the relationship he believed to exist between hedonic tone and stimulus intensity. The best known recent formulation of this kind of view is that of Berlyne (1960, 1967, 1971). It is this relationship of arousal to hedonic tone, rather

than to performance, which is of interest from the point of view of reversal theory, since reversal theory is primarily concerned with the experience of motivation, although this may in turn have implications for performance.

The Anxiety-avoidance and Excitement-seeking Systems

In reversal theory, there are two metamotivational systems; the 'anxiety-avoidance' and the 'excitement-seeking' systems. Furthermore, the relationship between arousal and hedonic tone in these systems is said to be bistable rather than homeostatic. As with optimal arousal theory, it is assumed that there is a stable position for the variable of arousal (i.e. 'felt arousal') and that this is associated with positive hedonic tone (i.e. 'pleasure'). In other words, from the point of view of these arousal - regulation systems, there is a preferred state of arousal in both the cybernetic sense, which implies a stable state, and in the phenomenological sense, which implies pleasure. This is different from optimal arousal theory in which two arousal systems are being postulated, each with its own preferred level towards opposite ends of the arousal dimension. In this theory, two curves are needed (instead of one) to describe the relationship between arousal on the one hand and hedonic tone on the

other; one curve showing the relationship for one system and the other for the other system.

In one system, the higher the level of arousal the more pleasant it is felt to be, the preferred level being high. In this state low arousal, which is felt as 'Boredom' is avoided, but high arousal is sought and experienced as 'excitement'. In the other state the opposite is the case, since here the higher the level of arousal the more unpleasant it is felt to be. In this state high arousal, which is felt as 'anxiety', is avoided, but low arousal is sought and experienced as 'relaxation'.

In terms of arousal, therefore, these two hypothetical curves represent the situation in relation to an 'excitement-seeking' system and an 'anxiety-avoidance' system. At this stage, what might be called an 'x-curve' has been substituted for the inverted u-curve of optimal arousal theory.

Apter goes on to discuss the relationship between arousal and pleasure by arguing that the given level of hedonic tone "is brought about by a conjunction of either the excitement-seeking or the anxiety-avoidance state with a given level of arousal. One can of course interpret backwards from a knowledge of hedonic tone and the state which is currently operative to the

current level of arousal. However, Apter argues that this should not obscure the fact that arousal is an independent variable and hedonic tone a dependent variable, i.e. a given level of arousal determines, for a given metamotivational state, the hedonic tone and not vice versa. This is true, however, for only that part of the dynamics of the whole situation. He suggests that in a wider sense one may suppose that hedonic tone, through some feedback loop, plays a part in increasing or decreasing the level of arousal: if it is predominantly unpleasant then the organism will be expected to take some action to change the level so as to produce a more positive tone. In other words, a negative feedback cycle is involved.

Each of the two curves represent the way in which the two alternative metamotivational systems functions. Since the preferred levels of arousal are towards opposite ends of the arousal dimension, switches between these preferred levels and their related systems are referred to as 'reversals'. Furthermore, as Apter notes, one of the advantages of the reversal theory interpretation of arousal and affect is that it allows for four different arousal nouns (anxiety, excitement, Boredom and relaxation) to be accounted for. He suggests that everyday language makes a distinction between these two forms, pleasant and

unpleasant, of high and low arousal respectively and that this is a real distinction which people recognize and which therefore should be taken into account by psychologists.

Critique of Apter

The metamotivational system of relevance to this thesis is the excitement-seeking system. That is, it is this curve that describes the transition between excitement and Boredom. Excitement is held to be similar to Interest (Tomkins, 1982) in that both are considered to be characterized by positive hedonic tone and a high degree of felt arousal. Apter, like O'Hanlon (1981) and Plutchik (1962, 1980) considers Boredom to be characterized by negative hedonic tone and low arousal. Thus, for the purposes of this thesis, the transition of Interest to Boredom is held to be similar to the transition of excitement to Boredom.

Apter clearly believes that the transition of excitement to Boredom is closely linked to the changes in value of the arousal dimension. He argues that as arousal goes from a high value to a low value, and remains within the excitement-seeking metamotivational system, there will be a change in the phenomenology of the person. This will in turn be accompanied by a

change in labelling of the affective state i.e., from excitement to Boredom. Since Apter describes this transition in terms of an 'x-curve', this is obviously conceived as a continuous process. That is, as arousal changes in a decreasing monotonic fashion, the experience of excitement changes to Boredom. However, Apter does not explicitly state at which point this takes place, nor does he state the degree of change in arousal required for the transition to take place. However, in a linear process of the type that Apter implies, the initial level of arousal and the degree of change in arousal would be crucial in determining the change from Interest to Boredom. Furthermore, since two possibly independent variables are being used, an interaction of some form between these two factors must also be taken into account.

Apter explicitly states that hedonic tone (pleasure-displeasure) is dependent on arousal, 'at least within a given metamotivational system. Thus the level of, and movement of, hedonic tone (from positive to negative) is believed to mimic the level of, and movement of, arousal. This notion differs from the structural approach to affect in that these theories assume and empirically support the idea that arousal and pleasure are independent. In light of this evidence, it would be unwise to assume that arousal and not pleasure is

the critical variable in the transition between Interest and Boredom. For the purposes of this thesis, Apter's linear model will be used in conceptualizing the effect of both arousal and pleasure on the change between affective states.

There are a number of ways that one can conceptualize the change from an antecedent state to a consequent one. (I) The transition may be triggered by a particular level that is attained on a dimension in the antecedent state. For example, if a target value of 60 is attained on a semantic differential scale measuring the arousal level of the first state, this may trigger a change from Interest to Boredom. (II) The transition may be initiated by a change along a dimension in the antecedent state. For example, if a drop of 20 units occurs along a variable that measures the degree of pleasure in the first state, this may trigger a change from Interest to Boredom. (III) The transition may be initiated by a synergic action between level and change. For example, if a drop of 20 units occurs together with the attainment of a target value of 60 on a scale that measures the degree of pleasure in state one, this may trigger a change from Interest to Boredom. These notions are contained in process hypotheses (1) to (3).

Summary of Literature: Process Model

The theories of Izard (1977), Plutchik (1980), deRivera (1977), Lazarus (1968), Arnold (1970) and Apter (1982) offer some conjectures on the subject of transitions between emotional states. Izard (1977) explicitly acknowledges the concept of emotion patterns and sets a format for the examination of these transitions: deRivera (1977) speculates that the change between affects may be related to a change in one or two dimensions defining these states. This idea is contained in hypotheses (1), (2) and (3). Arnold, Lazarus, and Plutchik suggest that one such dimension is the factor of evaluation. This notion is expressed in hypothesis (4). A change in this dimension is said to lead to a different emotional state; often to one that is related in a bipolar fashion to the antecedent state. Apter (1982) clearly states that arousal is involved in this process. This concept is contained in hypothesis (4). Furthermore he states that the transition from excitement (Interest) to Boredom is linear. Together these ideas imply that the changes (i.e., decreases) in these common factor variables are important in predicting a transition between two emotions such as Interest and Boredom. Various linear models of such a process are expressed in hypotheses (1), (2) and (3). These concepts are expressed in a more formal manner as follows:

Process Hypotheses

Hypothesis (1): The initial values of the variables measuring pleasure and arousal are negatively correlated with the transition of Interest to Boredom. That is, the higher the initial value, the less likely the transition will occur.

Hypothesis (2): The difference scores derived from the variables measuring pleasure and arousal correlate positively with the transition from Interest to Boredom. That is, the larger the difference, the more likely the transition has occurred.

Hypothesis (3): The synergy scores derived from the variables measuring pleasure and arousal are negatively correlated with the transition from Interest to Boredom. That is, the greater the synergy value, (the initial scores multiplied by the inverse of the difference scores), the less likely the transition has occurred.

Hypothesis (4): The variables measuring pleasure and arousal are the best possible predictors of the transition from Interest to Boredom.

Disconfirmation of the process hypotheses can occur in two ways: (1) No variables at all will predict the transition from Interest to Boredom and (2) variables other than pleasure and arousal are better predictors of this transition. The first case will suggest that there are no 'internal triggers' with emotional processing that can elicit a change from one emotion to another. In other words, such a result would suggest that changes between affective states are due to external changes. That is, events other than emotional processes would be responsible for changes in affects. Presumably, most of these external events would occur outside of the person in his external world.

The second case will suggest that pleasure and arousal are not the core structures underlying emotional processing. This result would be in clear contrast to the literature on emotional structure where these dimensions are paramount. However, it may be that the other so-called cognitive dimensions such as certainty/spontaneity and control/dominance have a greater role to play in emotional changes than is suggested by the literature and commonsense intuition.

Chapter 3

Methodology

Subjects

One hundred and fifty subjects were selected from a total pool of 335 first year university students. They were anglophones and there was no restriction with respect to age or sex.

Apparatus

The subjects were presented with 2 decks of twelve 3" x 5" cards; each with a five letter anagram typed on the back. The list of these words and their respective 'median solved times' are presented in Appendix 1.

The subjects were required to use a booklet containing five pairs of pages. Each pair of pages contained a list of emotion terms (see Appendix 3) and 15 semantic differential scales (see Appendix 4). The scales have been randomized and counterbalanced. Each is continuous and 100 millimeters in length. Half of the booklets have the scales preceding the terms and vice-versa.

Induction Procedure

One of the aims of this thesis was to generate data on in vivo affective states; i.e., on emotions people were actually experiencing within a given situation. The induction procedure was designed to do this by generating two relatively common emotional states in sufficient numbers for a factor analysis. After a series of pilot studies the following procedure was developed to induce Interest and Boredom. Although the experimental situation has face validity in its ability to accomplish this; i.e., select interested volunteers and then have them do nothing for a period of time, the best proof of the validity of this procedure lies within the results of the factor analyses. Interpretable factor structures of the semantic differentials that can discriminate between data separated on the basis of self-reported emotional states lends powerful support to the claim that subjects were indeed interested and then bored by the induction procedure. As the results section demonstrates this was indeed the case.

The subjects were brought into a laboratory room and seated before a table. To the left were the two decks of anagrams and a box with two dummy electrodes exiting from it. In front was an intercom device. To the right was the research booklet and some pencils.

They were given a sheet containing the bogus rationale for the study (see Appendix 2). After reading that, the subjects were 'hooked-up' to the dummy electrodes. One was described as a GSR and the other as an EDR. Both of these were described as means of measuring the activity level of the body.

Induction Set #1

The subjects were instructed in how to use the decks of anagrams. These were described as the means for detecting insight or spontaneous problem-solving. They were told that they were to start with a deck that was identified by a number on the first card. They were then to flip over the first card and solve the 5-letter anagram. They had up to 20 seconds to indicate they had solved the puzzle by speaking into the intercom. If they were right, they would hear the word "correct". At that time they were to proceed to the next card and so on until the deck was completed and then await further instructions. If their response was incorrect (or there was no response) nothing would be said until 20 seconds had lapsed. At that time, they would be told the correct answer. They were then to proceed to the next card and so on until the deck had been finished (see Appendix 3).

Following that, the individuals were instructed in how to use the research booklet. The purpose of this was described by the experimenter in the following manner: "The difficulty in examining the relationship between insight and activity level is that the emotional state of the person gets in the way. What I have done to eliminate this problem is to design this booklet so that I can quantify the emotions and later on remove them from my data".

The subjects were then informed that at certain points in the experiment, they would be asked to label their emotional state. They were to select the term from the list of emotions that best described that emotion and to write it in the line beside the rubric 'Primary Emotion'.

They were also shown how to use the semantic differential scales. They were told that at points during the experiment they would be asked to rate how they felt by using all 15 scales. This would occur immediately before or after selecting the 'primary emotion'.

At this point in the instructions, the individuals were asked if there were any questions. If there were none, they were then asked to sign a consent form (see Appendix 5). Following that, the experimenter left the room and the experiment began.

Induction Set #2

After the subject had completed the anagrams and the second pair of pages in the research booklet, the experimenter entered the laboratory room. He then stated "the next step in the experiment is to achieve a state of low stimulation. In order to do that, I would like you to sit back, relax and take it easy. Unfortunately, this part of the experiment usually takes a rather long period of time".

Induction Set #3

After the subject had completed the third pair of pages in the booklet, the experimenter re-entered the laboratory room. He then stated "I would like you to tell me when you are bored. That will tell me when your stimulation level is low. So as soon as you are bored, just tell me over the intercom".

Data Collection

The subjects completed the first pair of pages of the research booklet after the first induction set had been presented, but before the anagrams were attempted. The second pair were completed immediately following the completion of the anagrams. The third couple were filled out ten minutes after the second induction set

had been presented. The fourth pair were completed after the third induction set had been communicated. If a subject reported Boredom within five minutes, then the fourth pair of pages were filled out five minutes after the report. If a subject reported being bored after five minutes, or did not report being bored at all, then the fourth couple were completed ten minutes after the third pair of pages were finished. The fifth couple of pages were completed five minutes after the fourth pair had been finished. An outline of the data

Figure 1

Data Collection

(1) If report of Boredom < 5 minutes,

I - B - anagrams - B - I - 10m - B - I - Boredom +5m - B - 5m - B
 1 1 2 2 3 3 4 5

(2) If report of Boredom > 5 minutes, or no report

I - B - anagrams - B - I - 10m - B - I - 10m - B - 5m - B
 1 1 2 2 3 3 4 5

I = induction set

B = research booklet

m = minutes

collection is contained in Figure 1.

Data Analysis

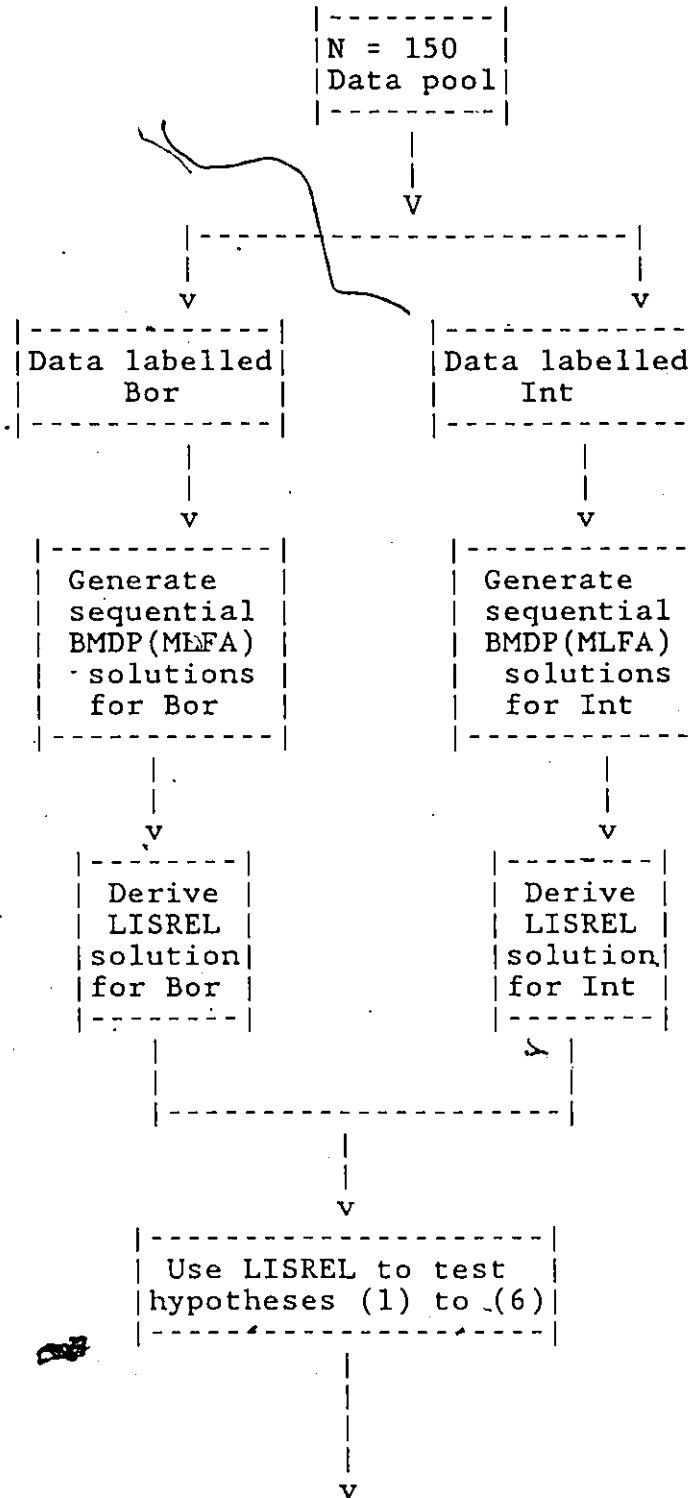
Once the data had been collected, they were categorized into structural and process analysis streams. The structural analysis was largely a series of comparative longitudinal factor analyses, while the process analysis utilized regression and discriminant analyses.

The data were coded on the basis of the emotional states selected by the subjects. In other words, those semantic differentials which were scored when the subject selected Boredom from the emotion-terms list were placed into the Boredom pool. Those scales which were scored when the subject selected Interest were placed into the Interest pool.

Structural Analysis

For the structural analyses, the data pool was divided into two categories; an Interest and a Boredom pool. These data sets were used to run a series of BMDP4M (MLFA) computer programs (Biomedical Computer Programs P-series, 1979). These factor analyses were used to overidentify the parameters for the LISREL VI (Joreskog and Sorbom, 1980) package.

Figure 2
Structural Analysis Flowchart



H(1): factor
solution
for each
emotion
> 2 factors

v

H(2): one factor
of Int and Bor
can be identified
as pleasure factor

v

H(3): one factor of
Int and Bor can be
identified as
arousal factor

v

Use LISREL to test
hypotheses

H(4): pleasure
factor of Int =
pleasure factor
of Bor

H(5): arousal
factor of Int =
arousal factor
of Bor

H(6): all other
factors are not
equivalent

v

 If structural hypotheses are supported, compute combined mean scores for variables loading on pleasure and arousal factors of Int and Bor



 Use BMDP3D to test hypotheses

 H(7): mean of combined variable derived from loadings on pleasure factor of Int > mean of combined variable derived from loadings on pleasure factor of Bor

 H(8): mean of combined variable derived from loadings on arousal factor of Int > mean of combined variable derived from loadings on arousal factor of Bor

Legend

Int = Interest

Bor = Boredom

BMDP(MLFA) = BMDP4M Maximum Likelihood Factor Analysis Program

LISREL = Linear Analysis of Structural Relations Program

BMDP3D = One-sample and Two-sample T-tests Program

The first MLFA solution was constrained to a one factor solution. This restriction was then

sequentially lifted one factor at a time. LISREL was used to compare the various factor solutions for both Interest and Boredom. When there was no significant increase in chi-square between the sequential factor solutions, the appropriate solution was derived, and hypothesis (1) was tested.

Hypotheses (2) and (3) were tested by examining the marker variables derived by Mehrabian and Russell (1974). The marker variables load highly on (i.e., define) the pleasure and arousal factors described in the literature.

The LISREL VI program was then used to test hypotheses (4), (5) and (6). LISREL provided chi-squares for the various factor solutions of Interest and Boredom. These were used to compare the degree of significance between each of these solutions. The model for each solution was then constrained so that the pleasure factors of each solution were held equivalent. Following this, the arousal factors of each solution were constrained as equivalent. The remaining factors were also constrained in a similar fashion. In all these LISREL analyses the error terms for each solution were allowed to correlate with each other.

To test the seventh and eighth hypotheses, the scores of those variables loading highest on the pleasure and arousal factors of Interest and Boredom were summed into combined measure scores. The means of these scores were then computed by the BMDP3D computer program. This also generated the appropriate T-tests and levels of significance.

LISREL VI

LISREL VI (Joreskog and Sorbom, 1980) was selected for the structural analyses, for as Lomax (1981) notes, the LISREL VI computer program and the LISREL model is extremely flexible. It can accommodate virtually any type of linear causal model. The LISREL model/program will make allowances for equation errors, measurement errors, correlated errors of measurement and models with reciprocal causation. It will accommodate confirmatory factor analysis, longitudinal analysis, simultaneous analysis in several groups, and covariance structure analysis. The LISREL VI program yields LISREL maximum likelihood estimates and their standard errors, the goodness-of-fit test and matrix of S - E residuals. It also provides tables describing the iterative procedure, a standardized solution and first-order derivatives of the fitting function used by Joreskog and Sorbom (1980). For a detailed description

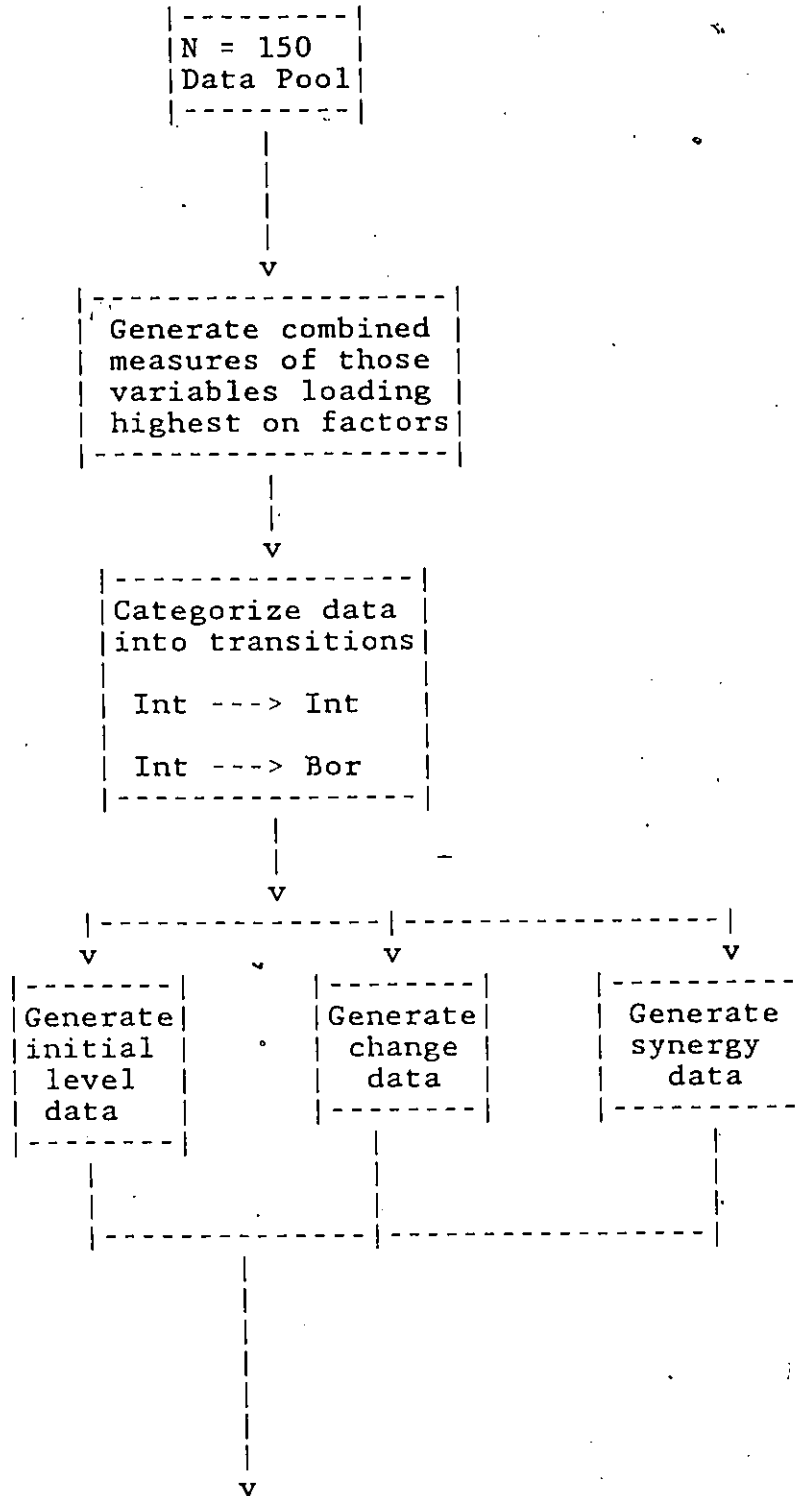
of the theory underlying the general LISREL model as well as its numerous applications one is advised to consult Lomax (1981) and Joreskog and Sorbom (1980).

Process Analysis

The focus of the process analyses was on the transition between the affective state of Interest to that of Boredom. Only the variables that had the highest loadings on the common factors were used in the process analysis. That is, the scores of the variables loading on the same factor were summed to generate a combined measure of that factor. These data were categorized into two classes; those subjects who initially started in Interest and changed to Boredom and those individuals whose initial state was Interest and who remained in Interest one "transition" later.

Three types of predictor variables were used. These included: (1) The scores of the variables in the initial state of Interest. These were labelled the initial level scores. (2) The scores of the variables in the second state (either Interest or Boredom) subtracted from the scores of the variables in the initial Interest state. These were labelled the difference scores. These data were loaded separately into the All Possible Subsets Regression Package (P9R).

Figure 3

Process Analysis Flowchart

Use BMDP9R
and BMDP7M
to derive
best set of
predictors
for transition
of Interest
to Boredom

Test
hypotheses
(1) to (4)

Legend

Int = Interest
Bor = Boredom
P9R = All Possible Subsets Regression Program
P7M = Stepwise Discriminant Analysis Program

This package generated the optimal set of variables that predicted the transition of Int ---> Bor versus Int ---> Int. These results were used to test hypotheses (1) and (2).

Once the initial level and the difference predictor variables were derived, the set of synergy predictor variables was generated. This was achieved by multiplying the appropriate initial level variable by the appropriate difference variable. The difference variable had been subtracted from a scalar value in order that the direction of the initial and the difference data were consistent. This set of variables was then loaded into the P9R program and a set of synergy predictor variables was produced. These

results were used to test hypothesis (3). Once all three analyses with P9R were completed the results were used to test hypothesis (4).

In addition to the regression analyses, a series of stepwise discriminant analyses using the BMDP7M package were conducted. The results of these analyses were used to examine the P9R results in a sequential fashion and to offer an estimate in terms of percentages of the degree of predictive power of the variables.

All Possible Subsets Regression (P9R)

The P9R package of the Biomedical Computer Programs P-series was selected for the regression analyses as it can investigate the relationship between a binary dependent variable and set of independent variables. The dependent variable was the occurrence or nonoccurrence of a consequent emotional state (e.g., Boredom or Interest). The independent variables were the semantic differentials of the precursor affective states (Interest). The P9R program identifies "best" subsets of predictor variables or can be used for multiple linear regression without selecting subsets. Best is defined in terms of the sampled R-squared, adjusted R-squared or Mallows' Cp. The output of most relevance to the hypotheses was the generation of those variables comprising the best linear regression and its respective squared multiple correlation.

Stepwise Discriminant Analysis (P7M)

The P7M package of the Biomedical Computer Programs P-series was selected for the discriminant analyses concerning the affective states of Interest and Boredom. The P7M program selects the variables that are used in the classification function in a stepwise manner. At each step the variable that adds the most to the separation of the Boredom and Interest groups is entered into the discriminant function. The output of most relevance to the hypotheses was the generation of the variables comprising the classification function and the respective classification tables. These output were then used in sequential chi-squares analyses to determine which type of variable was the best predictor of the transition from Interest to Boredom.

Results

Structural Hypotheses

The BMDP4M(MLFA) program was used to generate sequential factor solutions for the Interest and Boredom data. That is, the program was constrained to generate one, two, three, four and five factor solutions for each affective group. These solutions were then used to overidentify parameters in the LISREL VI package. LISREL was used to generate chi-squares for the degree of fit for each of these solutions. These chi-squares were sequentially subtracted from each other to produce a series of difference chi-squares with their respective degrees of freedom. The optimal factor solution was arrived at when there was no longer a significant difference in goodness of fit between solutions. The results of this sub-analysis are presented in Table 4.

The results indicate that the optimal solution for both Interest and Boredom was four factors. The factor solutions for these affective states are presented in Table 5 and 6. These are the LISREL VI solutions in which the factor loadings below .2880 are represented by zeroes. The value of .2880 was selected in order to facilitate the comparison of the various factors of Interest and Boredom. (It should also be noted that

Table 4

Optimal Number of Factors for Interest and Boredom

Number of Factors	Chi-square	df	Difference Chi-square
Interest(1)	337.61	99	-----
Interest(2)	243.92	96	significant
Interest(3)	192.60	93	significant
Interest(4)	181.06	92	significant
Interest(5)	181.06	92	not significant
Boredom(1)	447.49	99	-----
Boredom(2)	315.72	96	significant
Boredom(3)	241.14	93	significant
Boredom(4)	210.68	92	significant
Boredom(5)	281.99	92	not significant

NB: significant = $p < .01$

there was no decrease in degrees of freedom between the fourth and fifth factors of these emotions. This was due to constraining error terms in the LISREL solutions in order to generate convergent factor solutions). These constructed solutions produced a "chi-square to degrees of freedom ratio" below 10:1 and above 1:1

which is considered to be an adequate fit for the data (Schmitt, 1978). The maximum likelihood factor solutions on which these constructed solutions were based indicated that the explained variance for Interest was 41.7 per cent while the explained variance for Boredom was 48.7 per cent.

The marker variables for the pleasure factor are happy, satisfy and please while the marker variables for the arousal factor are arouse, excite and frenzy (Mehrabian and Russell, 1974). As Tables 5 and 6 demonstrate, these variables have the highest loading on factors (1) and (2) for both Interest and Boredom.

Table 5

The Factor Structure for Interest

	Factor 1	Factor 2	Factor 3	Factor 4
please	0.710	0.0	0.0	0.0
satisf	0.758	0.0	0.0	0.0
happy	0.792	0.0	0.0	0.0
arouse	0.0	0.643	0.0	0.0
excite	0.0	0.758	0.0	0.0
frenzy	0.0	0.669	0.0	0.0
influ	0.0	0.0	0.590	0.0
auton	0.0	0.0	0.554	0.0
control	0.0	0.0	0.650	0.0
unpred	0.0	0.0	0.0	0.288
spn	0.0	0.0	0.0	0.949
inten	0.0	0.0	0.0	0.0
involve	0.340	0.0	0.0	0.0
natural	0.394	0.0	0.0	0.0
deep	0.529	0.0	0.0	0.0

Thus hypotheses (2) and (3) are supported by the data.

Table 6

The Factor Structure for Boredom

	Factor 1	Factor 2	Factor 3	Factor 4
please	0.850	0.0	0.0	0.0
satisf	0.811	0.0	0.0	0.0
happy	0.770	0.0	0.0	0.0
arouse	0.0	0.766	0.0	0.0
excite	0.0	0.797	0.0	0.0
frenzy	0.0	0.671	0.0	0.0
influ	0.0	0.0	0.707	0.0
auton	0.0	0.0	0.663	0.0
control	0.0	0.0	0.590	0.0
unpred	0.0	0.0	0.0	0.608
spont	0.0	0.0	0.0	0.707
inten	0.0	0.0	0.0	0.0
involve	0.512	0.0	0.0	0.0
natural	0.402	0.0	0.0	0.0
deep	0.564	0.0	0.0	0.0

In addition, it seems that there are two other factors that are common to Interest and Boredom. The marker variables of influence, autonomous and control define the factor of dominance (Mehrabian and Russell, 1974). These have the highest loadings for factor (3) for both these emotional states.

The fourth factors for Interest and Boredom are defined by the variables unpredictable and spontaneous. These comprise two of the three variables believed to load on a spontaneity factor (Frijda, 1965). Therefore, it appears that the fourth factor for these affective states is spontaneity.

The variables of involve, natural and deep load moderately on the pleasure factor for both Interest and Boredom. In other factor solutions (Osgood, 1976; Frijda, 1969) these marker variables appear to define the factor of depth-of-experiencing. However for these two affective states it seems that this factor collapses onto the pleasure factor and does not define a separate dimension.

Hypotheses (3) to (6) were tested by using LISREL VI to sequentially constrain the pleasure, arousal, dominance and spontaneity factors across the two emotional states. The LISREL program generated an additive chi-square for Interest and Boredom with no constraints. This was used as the baseline for the comparisons with the constrained solutions. The

Table 7

The Number of Common Factors for Interest and Boredom

Name of Factor	Chi-square	df	Difference Chi-square
none	391.74	184	-----
pleasure	395.76	190	not significant
arousal	396.89	193	not significant
dominance	398.37	196	not significant
spontaneity	410.71	198	not significant

results of this subanalysis are presented in Table 7.

The results indicate that Interest and Boredom share the arousal and pleasure factors; ie, hypotheses (4) and (5) were supported. However, the analysis indicates that these two emotions also share the factors of dominance and spontaneity; ie., hypothesis (6) was disconfirmed.

The following structural and process analyses were undertaken with combined measure data. That is, the marker variables were combined into composite variables. The composite measure of pleasure was composed of the mean of the please, satisfy and happy variables. Arousal was constructed as the mean of the arouse, excite and frenzy variables and dominance was equal to the average of the influence, autonomy and control variables. Spontaneity was equal to the average of the variables of unpredictable and spontaneous. This was done in order to use the results of the structural analyses as a basis for testing the proceeding hypotheses. In this way the combined measures offered a better reflection of the behaviour of the structural factors than did the individual variables alone.

Structural hypotheses (7) and (8) were tested by the BMDP3D Difference Between Means package. The results of this subanalysis are presented in Table 8.

Table 8

The Difference between Means of Combined Measures of Affect

Factor (Combined Measure)	Marker Variables Comprising Combined Measure	Mean Difference	T-statistic	df
pleasure	please satisfy happy	20.0	13.0*	149
arousal	arouse excite frenzy	30.8	18.6*	149
dominance	influence autonomy control	-0.4	-0.3	149
spontaneity	unpredictable spontaneous	9.2	5.6*	149

*significant at $p < .001$

The results support hypotheses (7) and (8) in that the pleasure variable of Interest (composed of the highest variables loading on this factor) was greater than that for Boredom. This was also true for the composite variable of arousal.

The data for the composite measure of dominance and spontaneity are also presented in Table 8. Overall, the results indicate that Interest is experienced as being more pleasant, more arousing and more spontaneous than Boredom. The sense of dominance appears to be the same for both states.

Process Hypotheses

In order to test the process hypotheses the data from the research booklets, labelled Interest were categorized into transitions. That is, 65 cases of people starting in Interest and ending in Interest one measurement period later were grouped together with 71 cases of people starting in Interest and ending in Boredom one measurement period later. The composite measures of pleasure, arousal, dominance and spontaneity were used as the regression and discriminant variables. The results from the regression analyses are presented in Table 9.

The results presented in Table 9 do not support the first hypothesis. The initial level predictor variables of pleasure and arousal do not have a significant correlation with the transition from Interest to Boredom versus the 'transition' from Interest to Interest. The best subset of predictors only included the variable of arousal. It had a small negative relationship with this transition, but this did not reach the $p < .05$ significance level. The variable of pleasure was not even included in the regression equation.

Table 9

The Optimal Data for Predicting Transition of
Interest to Boredom

Type of Data	Best Subset of Combined Variables	Contri- bution to R-squared	Stan- dardized coef- ficient	Mult- iple corr- elation
inital	arousal	.026	-.160	.16*
difference	pleasure arousal	.051 .212	.256 .524	.68*
synergy	pleasure arousal	.047 .219	-.242 -.524	.67*
post	pleasure arousal dominance	.062 .269 .013	-.284 -.593 -.115	.77*

*significant at $p < .001$

The results indicate that hypothesis (2) was supported by the data; that is, the difference variables of pleasure and arousal had a positive correlation with the transition of Interest to Boredom. The synergy variables of pleasure and arousal also had a negative correlation with this transition and thus hypothesis (3) was supported by the data.

In terms of their relative importance it appears that the difference variables are the best predictors

of the change from Interest to Boredom in that their multiple correlation has the largest value. The initial data is much less effective at predicting this process while the synergy data is as effective as the difference data but not superior. The post data (the values of the variables in the second state after the transition has occurred) were also included in this analysis as a comparison for the other regressions. The post variables of pleasure, arousal and dominance had a negative correlation with the change of Interest to Boredom. Interestingly, the post data generated the largest multiple correlation of all the regressions.

The discriminant analyses as presented in Table 10 demonstrate the effectiveness these types of data have in separating Interest from Boredom.

The total correct classifications of the types of data were compared sequentially with each other to determine which form of the data was more effective in discriminating between the two emotional states. The variables for the discriminant analyses were taken from the best subset of predictors generated from the regression analyses. This subanalysis is presented in Table 11.

The analysis indicates that the difference data are the best discriminators between these two states. The

Table 10
Discriminant Analyses

Type of Data	Combined Measure Discriminant Variables	Correct classification		
		Boredom	Interest	Total
random		50.0	50.0	50.0
intial	arousal*	57.7	56.9	57.4
difference	arousal pleasure	80.3	92.3	86.0
synergy	arousal pleasure	85.9	80.0	83.1
post	arousal pleasure dominance	88.7	90.8	89.7

*variable forced into discriminant function

difference data, the synergy data and the post data are equivalent in their ability to separate the two affective states. The intial data are no better than chance in distinguishing between Interest and Boredom.

The results across the regression analyses are very consistent in that the variables of pleasure and arousal are the best predictors of the change of

Table 11

The Sequential Comparisons of the
Discriminant Classifications

Comparisons of types of Data	Chi-square	df	Significance
random versus initial	2.19	1	-----
random versus difference	51.84	1	p< .001
difference versus synergy	.699	1	-----
difference versus post	1.137	1	-----

emotional state. Only the optimal subset for the post data contains another variable; that of dominance. Thus overall it appears that hypothesis 4 was supported by the data.

Discussion

As noted previously, the first purpose of this thesis was to demonstrate a methodology for the analysis of the subjective structure of emotion. The second purpose was to provide a working model directed at integrating the dimensional and discrete approaches to affect. (As such it did not attempt to accommodate other theoretical approaches to emotion). The structural hypotheses were designed to address these two concerns simultaneously.

In general they confirmed the notion that it was possible to: (1) identify and examine individual affects and; (2) compare individual emotions within a dyadic format. It also supported the concept that the dimensional and discrete approaches could be successfully integrated. Each can provide complementary information; the discrete model directing attention to the structure of specific states and the dimensional model to the relationships between these entities.

The discrete theorists such as Plutchik, Tomkins, Izard and Ekman argue that there are approximately eight prototypical affective states or state-clusters. These are thought to be happiness, surprise, fear, anger, sadness, disgust, contempt and Interest. The methodology described in this thesis appears to be

sufficiently powerful and sensitive to determine the phenomenological structure of these states. It also appears capable of determining the subjective relationships between these basic states. Furthermore, the methodology can be used to identify other affects and compare them to this basic network of emotions. It can then be determined by examining their respective phenomenological structures whether the "non-basic" emotions are fundamentally different from the "basic" emotions.

The results indicated that both Interest and Boredom are characterized by the common experiential factors of pleasure, arousal, dominance, and spontaneity. These two emotions differed in their location within their common affective space. That is, Interest was experienced as being more pleasant, more arousing and more spontaneous than Boredom. Unfortunately, from the point of view of this thesis, neither Interest nor Boredom were characterized by a unique factor. The hypothesized depth-of-experiencing factor loaded modestly on the pleasure factor. There was no other configuration of scales that comprised a separate factor. Thus only partial support for the notion that affects could be distinguished by a different number of factors was attained by comparing Interest to Boredom. That is, the depth-of-experiencing dimension was found

to be not important in the structure of these two emotions. On the other hand, both Interest and Boredom were discovered to have the same number of factors.

There may be a number of reasons as to why a unique factor was not revealed in the analysis of these emotional states. It may be that an analysis of other dyads would demonstrate a different number of structures per emotion. For example, if anger or fear were to be compared to Boredom, the number of factors per emotion might be different.

The scales (and factors) used in this research and others were derived from the analysis of many emotions at one time. They are, in effect, common factors. Put more specifically, the research and theory reviewed in this thesis indicates that there may be at least five common phenomenological dimensions involved in the structure of affective states. These include pleasure, arousal, dominance, spontaneity and depth-of-experiencing. Table 12 presents the researchers who have theoretically and empirically demonstrated common subjective structures other than pleasure and arousal.

It may be that another methodological refinement is required to facilitate the discrimination between emotional states. What is needed is structural phenomenological work that can derive dimensions that

Table 12

Postulated Common Subjective Structures of Affect

<u>Author</u>	<u>Dominance</u>	<u>Spontaneity Certainty</u>	<u>Depth-of- Experiencing</u>
Osgood	x	x	
Mehrabian Russell	x		
Averill		x	x
Whissell	x		
Izard	x	x	
Daly, Lancee Polivy			x
Scherer	x		x
Roseman	x	x	
Smith Ellsworth	x	x	
Frijda			x
Lawson	x	x	x

are unique to individual emotions. Unique scales and factors exclusive of the common factors might be constructed in order to label or tag individual emotions. That is, subjects may be asked to rate a wide variety of emotions and select phenomenological scales that are specific to each affect. Perhaps a multitrait-multimethod factor analytic technique (Brown 1984; Schmitt 1978; Tucker, 1972) can be used to verify

whether these scales (and thus factors) load uniquely on each emotional state. These unique structures would most likely be combined with a given number of common factors to fully describe individual affects.

Perhaps part of the problem of identifying and comparing emotions lies within the method used to provoke these emotions. The method used in this thesis was to induce two common affects of rather low profile; i.e., low degrees of pleasure, arousal, dominance and so on. As mentioned previously, this was done in part to best generate sufficient data for a factor analysis. It may be that a procedure that provokes higher profile affects may facilitate a structural and process analysis. One such method may be to use commercial movies that are, after all, designed to generate high level emotional states in viewers. This methodological change would also have the beneficial effect of generating large sets of data at one point in time and solve ethical issues at the same time.

In summary, the analysis of the data confirms the structural hypotheses to the following degree:

(1) It is possible to integrate the discrete and dimensional approaches to affect via a workable methodology;

(2) This methodology can be used to identify individual emotional states and compare them in a systematic fashion;

(3) This methodology may require further refinement in order to maximize its ability to identify and compare affective states.

It should be pointed out that the data on which the structural factor analyses were based were gathered from first year university students. There was no attempt to select these subjects on a randomized and stratified basis. Thus these results can not be safely generalized beyond the sample selected. However, as mentioned previously, this thesis aimed at demonstrating the feasibility of a theoretical approach and a related methodology. It falls upon further research to establish whether these results are universal or specific to this study.

The third purpose of this thesis was to investigate the phenomenological experience of transition between affective states. This was attempted on the basis of the structural analysis of the emotions of Interest and Boredom.

The structural hypotheses postulated that the dimensions of pleasure and arousal were to be the key

to the changes in emotional state. In general, the results lend credence to this notion. It was discovered that the factors of pleasure and arousal were the best variables correlated with the transition of Interest to Boredom. The type of data that correlated most highly with this change was the difference data; i.e., the levels of pleasure and arousal in Interest minus these levels in Boredom or Interest after the transition. It was superior or equal to the initial and synergy types of data.

The regression analysis of the initial data indicated that it may be very difficult to predict the transition between affective states from information gathered from the first state. Essentially it seems that people who were experiencing Interest and became Bored were not experientially different than those who do not become Bored and remained Interested. The post data indicate that the two states are very distinct and can be easily identified and distinguished from each other. The difference data indicate that the critical variables for the transition between Interest and Boredom are the factors of pleasure and arousal. That is, the greater the decrease in these two dimensions, the greater the probability that a person will go from Interest to Boredom. However, as difference data requires information from the consequent state of a

'transition', this type of data cannot be used to predict a future change in emotional state.

In relation to the issue of transition between affective states Lazarus' (1984) views are relevant. He suggests that "emotion reflects a constantly changing person-environment relationship. When central life agendas (e.g., biological, survival, personal and social values and goals) are engaged, this relationship becomes a source of emotion. Therefore, an emotional experience cannot be understood solely in terms of what happens inside the person or the brain, but grows out of the ongoing transactions with the environment that are evaluated (Lazarus, 1984, p. 124)".

Lazarus argues that "cognitive activity is a necessary precondition to emotion because to experience an emotion, people must comprehend ___ whether in the form of a primitive evaluative perception or a highly differentiated symbolic process ___ that their well-being is implicated in a transaction, for better or worse (Lazarus, 1984, p. 124)".

It follows from this argument that a researcher has to have some measure of what is being transacted between the person and the environment. That is, the stimulation which is provoking some processing reaction from the person has to be known to the investigator

before he can predict the nature of that processing, regardless of whether it is affective or cognitive in quality. In other words, the experimenter has to know something about that to which the person is attending as it is the attentional system that precedes and connects these two systems. If one can measure or categorize what the individual is attending to it may be possible to predict a change in emotional state. Perhaps if there is a change in a person's attentional field, this by itself or in conjunction with the immediate affective state may predict a change in emotional state.

Klinger (1978) has described a number of techniques that have been used to measure the stream of consciousness which may be applicable to predicting the transition from one affective state to another. One such technique is descriptive thought-sampling "where an experimenter stops people in the middle of whatever they are doing and requests verbal narrative descriptions of what had been going on in their consciousness just before the interruption (p. 229)".

Another related methodology is thought-sampling using ratings. In this case, investigators may ask subjects to rate their inner experience instead of or in addition to providing a narrative description. For

example, Antrobus, Singer and Greenberg (1966) asked individuals to indicate the presence or absence of thoughts other than the immediate situation during the preceeding 15 seconds. Klinger et al. (1976) supplemented their subjects' narrative descriptions of their thoughts with ratings of their imagery on a series of scales.

A third technique is event recording. With this methodology people can be asked to indicate whenever a certain kind of event occurs in their consciousness. For example, Pope (1977) required experimental subjects to move a key whenever their thoughts shifted to a new topic. Klinger et al (1977) trained individuals in a dichotic listening task to demonstrate with a toggle switch whenever their attention changed from the stimuli being piped into one ear to those piped into the other ear. In a similar fashion, individuals could be trained to indicate when they perceived their affective state to have changed.

Regardless of the type of variable that is used, the optimal set of emotion variables that was involved in the transition between affective states was almost always comprised of the pleasure and arousal dimensions. It may be that the pleasure and arousal factors are "core" structures that are central to or of

primary importance to the process of transition of emotional state. Perhaps it is the change in status in these two continua, initiated either by internal or external stimulation, that triggers or provokes the transition between various emotional states. The other affective dimensions may follow or lead to these "core" changes.

This idea is slightly contrary to the thinking of Apter (1982). In his model, the core or controlling variable is the arousal dimension. The other continua such as pleasure (and the feeling of spontaneity in paratelic states) are viewed as being dependent on this structure. However, both the structural and process data indicate that pleasure and arousal are independent of each other. Thus, the process model presented in this ~~thesis~~ indicates that the transition between emotional states may be multistable and relies on two controlling variables, whereas Apter's theory posits a simpler bistable system.

In short, Apter (1982) suggests that there are two motivational systems within a larger meta-motivational system. The motivational systems are the telic and paratelic systems in which the controlling variable is felt arousal. The model presented in this paper has attempted to examine the transition of Interest to

Boredom. As mentioned previously, this appears to be similar to the telic system transition between excitement and Boredom in Apter's model. However, the results of this thesis suggest that there are two core variables involved in the telic system; felt arousal and hedonic tone. Analogously, felt arousal and hedonic tone ought to be involved in paratelic transitions and intersystem changes. Since there are now two controllers in the metamotivational system, there should be more optimal states and the whole system is multistable rather than bistable in nature. One consequence of this increase in complexity is an increase in the number of postulated basic or prototypical affective states beyond the four described by Apter.

Another difference between the model put forth by Apter and the one presented in this paper is the nature of the transitions between the emotional states. As Apter points out there is a distinction worth making between those multistabilities which can be referred to as 'value-determined' and those which can be referred to as 'externally-controlled' multistabilities. In the former it is the value of the control variables themselves which determine the possible preferred states that will be operative; i.e., the state or states around which control is actually taking place.

In the latter, factors external to the value of the variables determine which of the states is operative.

In other words, for these systems the values of the control variables do not determine which state is viable. This is determined by some external controller or external disturbing force. As mentioned above, it is speculated that one of these external controllers could be the attentional system or whatever variable is critical in this system. Thus a change in the external attentional controller would perhaps precipitate a change between telic and paratelic motivational systems or perhaps provoke changes within these systems; i.e., transition between emotional states.

It is interesting to note that the concept of core structures was also discussed by Russell (Russell and Pratt, 1980). He has maintained that the dimensions of pleasure and arousal were intrinsic affective structures while other factors were perceptual-cognitive in nature. This thesis disagrees with this distinction, but it may be that these continua are the core or critical structures involved in the changing or transforming of emotional states.

The issue of core dimensions of affect versus perceptual-cognitive dimensions related to them brings into question the larger issues of the definitions of

emotion and cognition. Recently, this problem has been debated by Lazarus (1984) and Zajonc (1984) under the guise of whether affect was necessarily dependent on cognition; i.e., whether cognition was primary to affect. From the point of view of this thesis and others (Kleinginna and Kleinginna, 1985; Ellis, 1985) the debate appears to center on where to draw the boundary between these two phenomena. More specifically, Lazarus seems to be claiming the evaluative or pleasure dimension to be cognitive in nature, while Zajonc is claiming that it is essentially emotional.

Affective theorists such as Russell (1980), Whissell (1981), and Daly et al. (1983) would consider the evaluative dimension to be affective in nature. On the other hand, cognitive theorists such as Scherer (1982), Roseman (1984) and Smith and Ellsworth (1985) would consider it to be cognitive in nature. Ultimately, the precise distinction between cognition and affect may be arbitrary. This thesis has argued that there are at least five common affective dimensions. It has excluded the dimension of agency which is considered to be an attributional structure and therefore cognitive in essence. However, it is possible to conceive of this attribution as being a type of evaluation; for example, the percentage of causation associated with

the environment. Thus it may be possible to construe this factor in an affective sense.

It is noteworthy to point out that although there is controversy over whether dimensions are cognitive or affective in nature, the methodology described in this thesis allows these structures to be reliably and validly defined. It follows therefore that configurations of these continua can in turn be reliably and validly defined. It may therefore be somewhat irrelevant whether ultimately these states are considered affective, affective-cognitive or perceptual-cognitive in nature.

In summary, the results of the process analyses indicate that the transition between emotional states may well be described by a continuous model in which the pleasure and arousal dimensions are the controlling factors in the transition between emotions. It remains to be seen whether other variables can serve as core structures when other affects are examined with this or related methodologies.

The research presented in this thesis has been directed at developing a taxonomic model of emotions. This model would consist of a set of emotions, each with their own structure and relationships to other affective states, that are clearly defined. If this

endeavour is realized, then it may be possible to systematically relate the subjective description of emotions to the neurophysiological, behavioural and social-communicative models of affect. This information may in turn add to our knowledge of human motivation, personality and consciousness; perhaps moving us toward a synthesis of these fields of investigation.

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Appendix 1

Deck # 128	Median Solved Time (sec)
party	14.0
scrub curbs	21.0
voice	4.0
earth heart	9.5
vital	19.5
board broad	16.0
peony	12.0
cause sauce	5.5
guide	7.0
cloth	9.0
beard bread	1.5
labor	5.0

Deck # 39

funny	5.0
judge	3.0
fling	3.5
flood	5.5
baton	9.5
clerk	17.5
human	15.0
cramp	12.0
shore horse	6.5
giant	7.5
roach	9.5
fault	7.0

Appendix 2Physiological Indices of Intuition

This study is an attempt to explore the relationship between physiological activity and intuition. The psychological literature indicates that there is an increase in this activity when people attempt to solve mental problems. In addition, it has been shown these changes can be detected by instruments measuring physiological indices such as galvanic skin and electrodermal responses.

One relatively unexplored area of problem-solving has been "spontaneous problem-solving". This phenomenon, known as intuition, is that process in which one suddenly solves a problem without having to go through a series of trials and errors. However, investigation into this area has often been hampered by the interfering effects of emotional reactions. In view of this, this study is designed to examine the physiological correlates of intuition by taking the effects of emotional responses into account.

Appendix 3

irritation - anger

delight - joy

distraction - surprise

boredom - disgust

apprehension - fear

acceptance - trust

dejection - sadness

abasement - shame

disdain - contempt

interest - curiosity

guilt

Primary Emotion _____

Appendix 4

I feel

pleased	-----	annoyed
unpredictable	-----	predictable
influential	-----	influenced
guided	-----	autonomous
aroused	-----	unaroused
calm	-----	excited
spontaneous	-----	deliberate.
unsatisfied	-----	satisfied
happy	-----	unhappy
indifferent	-----	involved
frenzied	-----	sluggish
controlled	-----	controlling
natural	-----	artificial
shallow	-----	deep
intentional	-----	involuntary

Appendix 5Physiological Indices of Intuition

I consent to the tasks and procedures outlined to me by the experimenter. I realize that I will be informed of my progress during the session and that I will be debriefed after its completion.

I realize that I am free to refuse my consent, without penalty, anytime during the experiment.

date: _____