PROTOTYPE CATEGORIZATION OF EMOTION

by

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Abstract

Psychologists have yet to agree on a definition of emotion. Attempts at a classical definition, whereby a concept is defined by a necessary and sufficient set of criterial attributes have not met with success. The purpose of this research, therefore, was to test the feasibility of an alternative to the classical view, namely prototype theory. According to the prototype view, concepts are organized in terms of prototypes, which are the clearest cases or best examples of the category. Category members are nonequivalent and can be ordered in terms of their degree of resemblance to the prototypical cases. Boundaries between categories are therefore ill-defined.

In this research, the feasibility of conceptualizing the everyday concept of emotion as structured in terms of prototypes was tested using Rosch's approach. Rosch and her associates have recently demonstrated that many natural language categories such as fruit, furniture, and vehicle can be conceptualized as prototypically organized. Rosch has also demonstrated that many natural language categories are organized hierarchically. For example, the set fruit, apple, Granny Smith apple illustrates a hierarchy with a superordinate, middle, and subordinate level.

The first two studies examined the hierarchical structure of emotion categories. In Study One, "emotion" was taken to be the highest, or superordinate level. Subjects

were asked to list members of the category emotion. As predicted, prototypical category members like "happiness", "anger", and "sadness", were listed first and with greater frequency than less typical members like "respect", "awe", and "boredom". The purpose of Study Two was to explore the possibility of a subordinate level of the hierarchy. Subjects were asked to list types of emotion categories generated in Study One. It was discovered that unlike the Study One results where all responses were single words, emotion categories at this level of the hierarchy are not coded monolexemically. Subjects had to "invent" subordinate categories. Consequently there was little agreement in their responses.

Internal structure refers to that general class of conceptions of categories in which categories are composed of a core meaning and in which items within the category may be considered differentially representative of the meaning of the category term. In this research, representativeness was operationally defined by means of subjects' ratings of how good each item is as an example of its category. In Study Three, prototypicality ratings were obtained for 20 emotion terms (generated in Study One) as a measure of category representativeness. As predicted, subjects found it meaningful to rate the extent to which each instance was a good example of the category emotion. Moreover, subjects agreed with one another in their responses. Representativeness of items within a category was then shown

to affect certain dependent variables important in psychological research. Study Four concerned speed of processing. Subjects were asked to verify statements of the form "An {exemplar} is a {category name}". As predicted, response times were shorter for verification of the category membership of highly prototypical than less typical exemplars. In Study Five, subjects were given the 20 target emotions and were asked to give the general category to which each belonged. As predicted, "emotion" was given as the superordinate category name more often for prototypical than nonprototypical exemplars. In Study Six, subjects generated attributes of the 20 target emotions. A family resemblance score was computed for each emotion based on the attributes each had in common with the other category members. As predicted, prototypical category members resembled the entire family to a greater degree (i.e. had a higher family resemblance score) than nonprototypical members. Overall, the results suggested how people may organize their concept of emotion. People need not be able to define "emotion" in order to use the concept in an orderly and comprehensive way.

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Introduction

The search for a definition of "emotion" carried out in psychology and other related disciplines has been marked with conflict, confusion, and disagreement. Such a singular lack of success raises the question whether a definition of the word emotion is even possible--or rather a definition in the classical sense whereby concepts are defined by a necessary and sufficient set of criterial attributes. Recently, psychologists have begun to explore an alternative form of definition known as the prototype view. Prototypes are defined as the clearest cases or best examples of a category. Within the prototype view, category members can be ordered in terms of their degree of resemblance to the prototypical cases. Membership in the category is a matter of degree, rather than all-or-none as in the classical view, and there are no sharp boundaries separating members from non-members. The prototype view may shed light on how people use and understand the concept of emotion without being able to define it.

The purpose of the research to be reported here was to test the possibility that the everyday concept of emotion may be better understood from the prototype view. Thus the research to be reported attempts to describe a form of folk knowledge or everyday way of thinking. It does not attempt to tell psychologists how they should conceptualize the

phenomena commonly referred to by the word "emotion".

The Search for a Definition of Emotion

In the famous Wittenberg symposium on emotion held in 1928, one of the participants described the psychology of emotion as "the most confused chapter in all psychology"(Claparede, 1928, p.124). Twenty years later, Hebb(1949) wrote, "The discussion of emotion has been about as confused as that of any topic in psychology" (p.235). Thirty years after that, Plutchik asked "Why is the study of emotion in such an unsatisfactory state compared to other parts of psychology?" (p. xvii). As a partial answer to his question, he suggested:

> For one thing, it appears to be exceedingly difficult to create a definition of the word emotion that is acceptable to most investigators. Some writers have defined emotions as disruptive states; others have defined them as organized. A few have claimed that emotions are so subjective, vague, and idiosyncratic that a general definition is all but impossible. And some writers have said that since we cannot clearly distinguish between emotions and other psychological states,

we should drop the term entirely"

(Plutchik, 1980, p. xvii).

The latter position was adopted by Duffy (1941). In a paper entitled "An explanation of emotional phenomena without the use of the concept 'Emotion'", her introductory statement was: "For many years the writer has been of the opinion that 'emotion' as a scientific concept is less than useless"(Duffy, 1941, p.283). In a later paper she recommended the "abandonment of 'emotion' and other vague and unmeasurable categories"(Duffy, 1943, p.197).

Historically, emotion has been defined in various ways. William James (1884) defined emotion thus: "My thesis...is that the bodily changes follow directly the PERCEPTION of the exciting fact, and that our feeling of the same changes as they occur IS the emotion" (James, 1884, p. 189). For James, emotion was a feeling, a mental event. James' definition has sometimes been misinterpreted as a physiological definition of emotion. Thus when Lange (cited in Plutchik, 1980, p.9), a physiologist, suggested that emotion is a physiological event, the conceptualization became known as the James-Lange theory. However, it should be clear from his statement quoted, that for James, emotion is the <u>perception</u> of physiological change; whereas for Lange, physiological change <u>is</u> emotion.

Cannon attempted to remove the emphasis in emotion research that had been placed on peripheral physiology, and replace it with neurology. According to Cannon:

For theory that emotional experiences arise from changes in effector organs is substituted the idea that they are produced by unusual and powerful influences emerging from the region of the thalamus and affecting various systems of cortical neurones (Cannon, 1928, p.257)

Cannon's research involved removing various portions of animals' brains and observing any resultant emotional states. Based on his research, Cannon concluded that the experience of emotion depends on the occurrence of neural discharges from the optic thalamus. He proposed that the thalamic discharge simultaneously produces both an emotional experience <u>and</u> a series of bodily changes.

With the advent of behaviorism occurred a significant change in how emotion was defined. Consistent with his behavioral view, John B. Watson rejected a physiological or neurological analysis of emotion. In his opinion,

it is perfectly possible for a student of behavior entirely ignorant of the sympathetic nervous system and of the glands and smooth muscles or even of the central nervous system as a whole, to write a thoroughly comprehensive and accurate study of the emotions--their types, their interrelations with habits,

their role, etc. (Watson, 1919, p.195).

Watson formulated emotion as a hereditary pattern reaction, meaning that "the separate details of the response appear with some constancy, with some regularity and in approximately the same sequential order each time the exciting stimulus is presented" (Watson, 1919, p. 195). What this view implied is that emotion is a disturbance of organized activity and that the basic patterns of an emotional reaction are unlearned. The function of learning, in this context, is to disassemble and partially inhibit the hereditary pattern of emotion.

B.F. Skinner offered several definitions of emotion. In his early work, Skinner defined emotion in the following way: "Emotion is not primarily a kind of response at all but rather a state of strength comparable in many respects with a drive" (Skinner, 1938, p.407).

In 1956, the Langian definition was resurrected by Wenger, who defined emotion as "activity and reactivity of the tissues and organs innervated by the autonomic nervous system. It may involve, but does not necessarily involve skeletal muscular response or mental activity" (Wenger, 1956, p.343).

More recently, there has been a trend in psychology to move away from definitions of emotion as a single entity toward definitions of emotion as consisting of several components. The most popular candidates have been cognitive/mental, behavioral, and physiological responses,

with theorists varying in terms of the importance assigned to each of these. Izard (1979) suggested that:

> Since it is generally agreed that emotions have a neuro-physiological, subjective, and affective component, it would avoid confusion if students of emotions designated which of these components they are investigating or discussing (Izard, 1979, p. 448).

Lazarus (1975) conceptualized emotion as: "a complex disturbance that includes three main components: subjective affect, physiological changes...and action impulses having both instrumental and expressive qualities" (Lazarus, 1975, p.554).

Based on his research with drug-induced states, Schachter(1967) concluded that bodily reactions comprise a part of emotional experience, but that, depending on cognitive factors, the same reactions can be part of very different emotions. The cognitive component was also emphasized by Ellis(1962), who similarly conceptualized emotion as consisting of cognitive (referred to as the belief system within his framework), physiological and behavioral components.

What view of emotion emerges from these attempts to define emotion? Having completed an extensive review of the literature on definitions of emotion, Plutchik (1980) concluded: "For one thing, it is evident that there is

relatively little consistency or unanimity in the proposed definitions" (p.80). He further commented that:

> A second interesting point about the definitions is that many are not really explicit definitions at all. They talk indirectly about some phenomenon (which we might label X) without giving us any clear idea of what X is in familiar terms. For example, to say that X is a complex process that has physiological, expressive, and subjective aspects does not really tell us what X is, since many states can be described in exactly these same terms. Similarly, to say that an emotion is a state of strength or weakness of an operant response or that emotional feeling is added to sensation when the thalamus is aroused also fails to identify emotions for someone who does not already know what they are (Plutchik, 1980, p. 83).

Plutchik also observed that many writers who have presented theories of emotion never provide an explicit definition of the word. This is the position adopted by Strongman(1973), author of the book Psychology of Emotion:

> ...at present emotion defies definition.
> Some theorists stress psychological

factors, some behavioral, some
subjective. Some deal only with extremes,
some say emotion colours all behavior.
For the moment I will not add to the
confusion by producing my own definition
of emotion. Most of this book will be
concerned with describing emotion rather
than defining it. The aim is to give the
reader more connotations to the word than
he has at present (Strongman, 1973, p.1).

Perhaps emotion truly defies definition. Watson(1919)
observed that "hard and fast definitions are not possible in
the Psychology of emotion"(Watson, 1919, p.145).

Wenger(1956) offers the following comment on this
matter:

Emotion is a peculiar word. Almost
everyone thinks he understands it until
he attempts to define it. Then
practically no one claims to understand
it. Scientists who investigate it
disagree. Philosophers, novelists, and
others who write about it disagree. But
in the meantime we all go about our
individual ways, sometimes enjoying our
"emotions" and sometimes bemoaning them
(Wenger, 1956, p. 339).

Similarly, Young(1961) observed that "while everybody

talks about emotion no one seems to know exactly what emotion is nor what to do about it"(Young, 1961, p.351).

Duffy(1941) lamented that her recommendation has not been followed:

> But, alas, the concept of emotion has not
> been abandoned. Psychologists remain
> convinced that the term refers to a
> distinguishable category of responses,
> and they perservere in the attempts to
> give this category more adequate
> definition... The readings of these
> definitions has left the writer with a
> sentiment similar to that expressed by
> William James in regard to classifactory
> descriptions of separate emotions--that
> he 'should as lief read verbal
> descriptions of the shape of the rocks on
> a New Hampshire farm as toil through them
> again'(Duffy, 1941, p. 283)

What emerges is a potpourri of views on the matter of defining emotion. The writers cited agree that attempts at defining emotion have not been successful. Plutchik(1980) maintains that due to the necessity of an explicit definition these efforts should continue. Others, like Strongman, said that a definition is not possible, but emotion should still be studied. Duffy (1941) suggested that emotion is not

definable, and that this is grounds for <u>not</u> continuing to use the concept.

Is a Classical Definition Possible?

The prototype analysis of emotion to be offered here will not necessarily tell psychologists how best to conceptualize emotional phenomena. But the fact that experts have been unable to agree on a definition does suggest that non-experts may not base their use of the word "emotion" on a classical definition. The experts' arguments over definition also suggests that they have assumed that such a classical definition can be found. This may be because concepts have traditionally been thought of as defined by a set of necessary and sufficient criterial attributes. Category membership is therefore an all-or-none phenomenon--any instance which meets the criterion is a member, other things are non-members. Boundaries between categories are thus clearly defined. Since each member must possess the particular set of attributes that is the criterion for category inclusion, all members have a full and equal degree of membership and are therefore equally representative of the category. The traditional, classical view of concepts fosters the assumption that a precise definition of emotion is both necessary and possible. This assumption about the nature of concepts seems to have been implicit in the search for a definition of emotion. This assumption has not been accepted by everyone, however.

William James opened his book <u>The Varieties of Religious Experience</u> with the comment that "Most books on the philosophy of religion try to begin with a precise definition of what its essence consists of" (James, 1929, p.26). Adhering to this literary tradition, James attempted to define "religious experiences". He began by making a distinction between institutional and personal religion before offering any definitions:

> Were we to limit our view to institutional, we should have to define religion as an external art, the art of winning the favor of the gods. In the more personal branch of religion it is in the contrary the inner dispositions of man himself which form the center of his interest, his conscience, his deserts, his helplessness, his incompleteness. (James, 1929, p.29)

James decided to focus on personal religious experiences. He discovered that for each component or attribute he proposed, he could readily generate an example of a religious experience in which that particular component was absent. Moreover, the issue of how personal religion could be distinguished from man's conscience or morality was problematic. After much debate, James tentatively suggested that religious experiences might be characterized by

solemnity, seriousness, and tenderness. However, even at this stage, qualifiers were necessary. For example, "If glad, we must not grin or snicker...If sad we must not scream or curse..." (James, 1929, p. 38). Finally, James was compelled to conclude that:

> ...do what we will with our defining, the truth must at last be confronted that we are dealing with a field of experience that cannot be sharply drawn. The pretension, under such conditions, to be rigorously 'scientific' or 'exact' in our terms would only stamp us as lacking in understanding of our task. Things are more or less divine, states of mind are more or less religious, reactions are more or less total, but the boundaries are always misty, and it is everywhere a question of amount and degree (James, 1929, p. 38).

In light of his original purpose, namely defining religion, James' final statement on the matter was,"the word religion cannot stand for any single principle or essense, but is rather a collective name. The theorizing mind tends to the over-simplification of its materials" (James, 1929, p. 26).

To illustrate a similar point, Wittgenstein (1953)

attempted to define "games". He speculated that a game could be defined as an event in which there is competition between players. However, consider children playing ring-around-the-rosy. This is a game in which there is no competition between players. Wittgenstein found that for each supporting example an equal number of counterexamples could be found. He then speculated that games might rather be defined as requiring skill. However, the skills required to play chess, hide-and-seek, and tennis seem very different in nature, and there are games of chance that require no skill at all. Thus, that definition seemed inadequate. After numerous such attempts, Wittgenstein was forced to declare himself a loser in the defining game. Like James, he eventually concluded that a concept like "game" cannot be explicitly defined. He illustrated this point with a rather descriptive analogy:

> in spinning a thread we twist fibre on
> fibre and the strength of the thread does
> not reside in the fact that some one
> fibre runs through the whole length, but
> in the overlapping of many fibres
> (Wittgenstein, 1953, p.32).

The absence of a defining feature or set of features precludes the establishment of a game/nongame boundary. If a concept like "game" could be defined by a necessary and sufficient set of features, then any instance that possessed the criterial features would be a game, and any instance that did not possess the criterial features would not be a game.

Boundaries between games and nongames would therefore be well defined. However, as Wittgenstein demonstrated, the concept "game" does not possess a set of necessary and sufficient criterial attributes. Different games share different attributes that vary in kind and number. Some attributes are also common to neighboring concepts resulting in indistinct between-category boundaries.

Wittgenstein argued that a concept with blurred edges is, however, no less a concept than one in which the boundaries are sharply defined. This last point of Wittgenstein's is an important one in light of Duffy's widely cited argument that because "emotion" cannot be classically defined, it is not a useful concept.

The Prototype View

One alternative to the classical view of concepts is subsumed under the rubric "prototype theory". James alluded to much of what is now called "prototype theory" in The Varieties of Religious Experience, although Wittgenstein is generally credited as the founding father of this view. In the 18th century, Bishop Berkeley raised questions concerning the role of prototypes in psychological processes, stimulating modern day psychologists to empirically investigate this issue. Recently, Eleanor Rosch and her colleagues have been mainly responsible for rekindling an interest in this idea.

Very generally, the prototype point of view is that categories have an internal structure. Categories are

organized around prototypes, which are the clearest cases or best examples of the category. To be a category member is to resemble the prototype. Category members thus differ in terms of degree of resemblance to the prototypical cases. This means that all category members are not equivalent, and can be ordered in terms of how representative they are of the category. Exemplars that are the most representative of the category share the greatest number of attributes with all other members of the category. Less typical exemplars have fewer attributes in common with the prototypical cases and also have a greater proportion of attributes in common with other categories. Boundaries between categories are therefore ill-defined. Consider, for example, some of the qualities ordinarily treated as attributes in classifying animals: "coat"(fur, feathers), "oral opening" (mouth, beak), and "primary mode of locomotion" (flying, on foot) (Mervis and Rosch, 1981). Robins and sparrows, prototypical members of the category "bird", share all of these qualities: feathers, beak, and flying. Turkeys are less prototypical exemplars of the category. Turkeys do not share the "primary mode of locomotion" attribute with robins and sparrows. Penguins are even less representative of the category "bird" and do not share the feathers and flying attributes with sparrows and robins.

The classical view of concepts, in contrast, advocates distinct category boundaries, and a specifiable set of necessary and sufficient criterial attributes. Each exemplar

is therefore equally representative of the category. However, it is not necessary to choose between the classical view and the prototype view--both may be correct in representing something of the way in which we think about some concepts. Or, perhaps the classical view is a better view of how we define some concepts, the prototype view a better view for other concepts. Undoubtedly some categories and some kinds of processing of categories are an all-or-none phenomena. Something either is or is not a one dollar bill; someone either is or is not pregnant. Conversely, one would probably not say that a particular person is "sort of" the Prime Minister of Canada. The classical view of concepts has typically been implicit in the concept formation research paradigm, in which subjects learn criterial attributes for a concept, e.g., blue and circle. If the target subset consists of the conjunction "blue circle", with size as an irrelevant attribute, it does not make sense to ask if the large or small circle is a better example of the concept "blue circle".

On the other hand, categories like dollar bills and Prime Ministers may not be representative of the majority of concepts.

The notion that prototypes play a role in psychological processing of some concepts has been supported amply through research. The empirical studies seeking evidence concerning prototypes have largely addressed the question of how prototypes develop and by what process new exemplars are

classified. The question is not new; Bishop Berkeley considered it a long time ago:

> In his mind's eye all images of triangles seemed to have rather specific properties. They were equilateral or isoceles or right triangles, and he searched in vain for a mental image of the "universal triangle". Although it is easy to define verbally what we mean by a triangle, it is not clear what the "perfect" triangle looks like. We see lots of different kinds of triangles; from this variety what do we create in our mind as the basis of recognizing a triangle? (Cited in Calfee, 1975, p. 222).

The speculation invited by Berkeley's search for the "perfect triangle" culminated several centuries later in what has itself become a prototype experiment by Posner, Goldsmith and Welton (1967). These investigators created the prototype of a triangle and other forms, and then presented subjects with distortions of the prototypes. It was found that subjects could classify the distortions of a particular prototype into a common category. Patterns derived from another prototype were grouped together. In a subsequent classification task, the original prototypes were included in the set of stimuli to be grouped. Subjects classified the

prototypes (which had not been previously presented) as accurately as the distortions that they had grouped in the first task. Franks and Bransford(1971) constructed a series of figures, one card consisting of the prototype, and the remainder "transformations", which varied in the number of deviations (distance) from the prototype. Subjects were required to reproduce the transformations during the "training phase" of the experiment. A subsequent recognition task included the prototype (not previously seen) and the transformations. The investigators discovered that subjects "recognized" the unseen prototype with greater probability than its previously seen transformations. Moreover, they did so with a greater degree of confidence. It was also found that the recognition ratings were related to transformational distance, with the prototype most frequently recognized, transformations consisting of one permutation next, and so on.

Using "real life" figures, Reed (1972) conducted several studies involving faces in which the features (e.g. eye placement, length of nose, height of forehead) were varied. In a typical problem subjects were asked to classify these schematic faces into one or the other of two rows of faces. According to Reed, "the dominant strategy was to form an abstract image or prototype to represent each category and to classify test patterns on the basis of similarity to the two prototypes" (Reed, 1972, p. 401).

Eleanor Rosch and her associates have been instrumental

in articulating and re-kindling an interest in the approach to categorization suggested by James, Wittgenstein, and the modern day psychologists mentioned. Initially, Rosch's research focused on color categories(Heider 1971,1972). In a series of studies, she demonstrated that there are salient areas of the color space (focal colors) which are given the shortest names and are named most quickly across languages. Focal colors are also most accurately recognized across cultures and are paired with their corresponding names with fewest errors. A developmental study by Mervis, Catlin, & Rosch (1975) revealed that foci for color categories become established and stabilized earlier than boundaries, and focal judgments are more stable than boundary judgments.

Rosch then extended her work to semantic categories for everyday objects (Rosch 1973,1974,1975a,1975b; Rosch and Mervis 1976, Rosch, Mervis, Gray, Johnson, & Boyes-Braem 1976; Rosch, Simpson, & Miller 1976; Rosch 1978a,1978b; Rosch 1981; Rosch and Mervis 1981). In this research, representativeness of category members was measured through subjects' ratings of goodness-of-example for natural language categories like fruit, sport, vehicle, bird, and so on. Reaction times in a category verification task were shorter to prototypical exemplars (Rosch, 1973). Priming (prior presentation of the category name) facilitated recognition for highly typical but not for less typical exemplars (Rosch, 1975b). It was also demonstrated that typical exemplars share the most attributes, while less typical exemplars have fewer

attributes in common with the prototypical cases, and also have a greater number of attributes in common with adjacent categories (Rosch and Mervis, 1975).

Some of the major concepts in psychology have recently been re-conceptualized in light of the prototype view of concepts. Cantor, Smith, French, & Mezzich (1980) addressed a problematic aspect of psychiatric diagnosis--namely that many patients do not fit into one and only one category. Some patients appear to be prototypical examples of schizophrenia, depression, or other diagnostic categories, but other patients are rather poor examples. From a prototype view, the blurry boundaries of the diagnostic categories can be viewed as orderly and predictable, rather than problematic. Empirical evidence on diagnostic judgments supported the hypotheses derived from the prototype view of these categories.

Cantor and Mischel (1979) have also applied this view to an analysis of personality types. Extraversion, for example, can be formulated in terms of a "prototypical extravert". These researchers also presented subjects with statements about various personality types (Cantor and Mischel, 1977). In a subsequent recognition task subjects "recognized" highly prototypical statements that had not been previously presented with greater certainty than statements of intermediate degrees of typicality that they had seen.

Neisser(1979) argued that no single ability or single mental process can serve as an adequate definition of

intelligence. He suggested that the concept of intelligence is a category which is organized in terms of a prototype. Actual persons resemble the "intelligent" prototype to varying degrees and along varying dimensions. Thus two equally intelligent persons could be quite different in their actual mental skills. One intelligent person might be extremely good at solving the Rubik's cube and cross-word puzzles but mediocre in telling jokes and filling out income tax forms. Another equally intelligent person might have these attributes in reverse.

Can Emotion be Conceptualized as a Prototype?

How might the concept of emotion be conceptualized? In approaching such an issue, the lesson that can be learned from James warrants lengthy quotation:

> Let us not fall immediately into a one-sided view of our subject, but let us rather admit freely at the outset that we may very likely find no one essence, but many characters which may alternately be equally important in religion. If we should inquire for the essence of 'government', for example, one man might tell us it was authority, another submission, another police, another an army, another an assembly, another a system of laws; yet all the while it would be true that no concrete government

can exist without all these things, one
of which is more important at one moment
and others at another. The man who knows
government most completely troubles
himself least about a definition which
shall give their essence. Enjoying an
intimate acquaintance with all their
particularities in turn, he would
naturally regard an abstract conception
in which these things were unified as a
thing more misleading than enlightening
and why may not religion be a conception
equally complex? (James, 1929, p. 27).

Substituting "emotion" for "religion" in this quotation
is evocative. As was argued earlier, attempts at defining
"emotion" have not been particularly successful or
illuminating, but have met the same fate as the search for
definitions of games and religious experiences. The thesis of
the present study is that "emotion" lacks a classical
definition and is organized as a prototype, with no clear
boundary separating emotion from non-emotion. There is no
empirical evidence currently available in the literature to
support this thesis, although several theorists have
suggested the possibility. Based on an examination of various
definitions of emotion that have been offered, Duffy(1941)
noted:

Changes in energy level, in degree of

organization of responses, and in conscious state occur in a continuum. There is no point on this continuum where a "non-emotional" energy level changes suddenly to an "emotional" evergy level; there is no point at which a "non-emotional" degree of disorganization of response changes suddenly to an "emotional" degree of disorganization; and there is no point at which a "non-emotional" conscious state changes suddenly to an "emotional" one. These characteristics of experience and behavior show continuous variation rather than separation into hard and fast categories. Extremes of the continuum are readily identified as "emotion"; intermediate points offer difficulty in identification (Duffy, 1941, p.291).

Averill (1975) set out to collect an exhaustive list of emotion terms in the English language, and eventually concluded that:

There are some terms which everyone would agree refer to emotional states, e.g. "angry", "fearful", "grieving", "loving", but such terms are relatively few, and they represent only one extreme of a

continuum. Between the two ends of this continuum of affective meaning, any dividing line between emotional and unemotional concepts is necessarily vague and somewhat arbitrary (Averill, 1975, p. 6).

Leeper (1948) observed that some emotions are commonly regarded as prototypical. His focus, however, was not so much on an empirical examination of how the concept is organized but was, rather, essentially a plea for the inclusion of positive emotions within the set of "prototypical emotions":

Unless we take an extremely pessimistic view of human life, we might just as well say that such "pleasurable emotions" or "positive emotions" are, in general, just as numerous and important in human life as are the "unpleasurable" or "negative" emotions. It is hard to see, therefore, why they secure merely passive mention and why such emotions as fear and anger are discussed as though they are the only valid prototypes of emotion (Leeper, 1948).

While Leeper does not make any systematic investigations of this notion, he deserves mention for suggesting that some emotions can be (are) regarded as more prototypical than

others.

What are the implications of re-conceptualizing emotion in the way that concepts like intelligence, psychiatric diagnosis, personality types and so on have been organized?

If emotion is prototypically organized, one would expect that all members would not be equally representative of the category, but rather a given instance would be a better or poorer example of the category in relation to the other category members. Further, one would predict that rather than possessing a common set of criterial attributes, category exemplars would share various attributes in overlapping and criss-crossing ways. On the other hand, if emotion is classically defined, one would expect no internal structure. All members would be equally representative of the category and would share the same set of defining features.

One of the major issues that would be influenced by such a view is the idea of a definable set of emotions. One would expect that certain emotions would be more exemplary of the category, while others would be less representative. Rather than being considered anomalous, borderline cases in this context would be orderly and expected. Such a view of emotion would imply that a distinct emotion/nonemotion boundary cannot be established.

A prototype view of emotion would not mean, however, that the concept must be abandoned, as Duffy suggested. It seems that looking at emotion as a concept with blurred edges could be potentially useful. Adopting the following argument

from Wittgenstein:

> One might say that the concept 'game' is
> a concept with blurred edges. But is a
> blurred concept a concept at all? Is it
> even always an advantage to replace an
> indistinct picture by a sharp one? Isn't
> the indistinct one often exactly what we
> need? (Wittgenstein, 1953. p. 34).

Overview of the Present Study

To recapitulate, various writers have alluded to aspects of the structure of emotion which invites speculation and empirical investigation of the notion that the concept of emotion is prototypically organized. Such an approach seems warranted given the state of the art of defining emotion. The present research consists of a set of preliminary studies to test the feasibility of viewing emotion as a prototypically organized concept. One of the merits of the Roschian approach is that through her research with natural language categories, she has provided a framework that can be applied to new areas. Rosch does not spell out specific hypotheses, but rather offers a general approach that must be specified through empirical means in any particular domain. The exploratory nature of the present research must therefore be emphasized.

Two kinds of studies were conducted in the present investigation. The first set of studies examined the notion that emotion categories are structured hierarchically, where

the idea of a hierarchy very simply refers to a principle of inclusion: a higher level includes the levels below it. Common sense suggests that <u>wrath</u>, <u>indignation</u>, and <u>fury</u> may be types of <u>anger</u> and that <u>anger</u>, <u>fear</u>, and <u>happiness</u> may be types of <u>emotion</u>. Because no investigations have been carried out on this topic, however, the hierarchical nature of the concept of emotion was the first topic of study here.

The second type of study referred to the <u>internal structure</u> of categories. In the domain of emotion, one would expect that certain instances would be better examples of the category than others, and that category members could be ordered along a dimension of category representativeness. If successful, then further questions would be raised: Is the category membership of protoytpical cases verified faster than that of less typical cases? Is there a greater likelihood that prototypical cases will elicit "emotion" as their category name? Do the prototypical cases have more attributes in common with each other as compared to the less representative exemplars?

It is from the convergence of several measures that internal structure is demonstrated. Following Rosch, in this research, evidence from several studies is relied upon in order to demonstrate internal structure. If these measures converge, the case that emotion may be a prototype concept can be made with greater confidence.

PART I   THE HIERARCHICAL STRUCTURE OF EMOTION

Some categories are subordinate to other categories; some are superordinate. For example, the set fruit, apple, Granny Smith apple illustrates a hierarchy with a superordinate, middle, and subordinate level. Rosch has demonstrated that many natural language categories like vehicle, fruit, and furniture are organized hierarchically (Rosch et al. 1976b). In studies investigating the hierarchical structure of categories, subjects are typically given the category name and are asked to generate examples that fall within the category. Or, conversely, subjects are given a lower level instance and are required to give a name higher in the hierarchy.

Whether or not emotion forms this kind of hierarchy is open to investigation. For my purposes, emotion was taken to be the highest level, and was therefore termed "superordinate". In one study, subjects were asked to list instances (members) of the category emotion. In order to explore the possibility of a subordinate level, subjects in another study were asked to list instances of some of the categories that had been generated in the first task.

Study One   Free Listing of Exemplars

In this free listing task, subjects were simply required to list what they thought was included in the category emotion.

Method

Subjects. Subjects were 200 students enrolled in various psychology courses at the University of British Columbia. Participation was voluntary.

Procedure. Subjects read instructions and were given one minute to provide their responses. The following instructions were provided:

> This study is part of a larger project on the sorts of things people have in mind when they hear and use words. On this questionnaire we are interested in the kinds of things which might belong to general categories. We will give you the category and you will give us the items. For example, if given the category "SEAFOOD", you might respond with such items as clams, oysters, lobster tails, shrimp salad, pickled herring, and so on.
>
> Now, please list as many items of the category "EMOTION" as come readily to mind. Stop after about a minute or 20 items.

Results and Discussion

Subjects' responses were collapsed across syntactical form (e.g."happy" and "happiness" were combined). The rationale was that in no instance did a subject mention both

terms as though they were separate emotions. This left 383 different responses, which are listed in Table 1.

Instances listed for the category emotion seemed to vary tremendously in how readily they came to mind. Of the 383 responses, 188 were idiosyncratic, i.e. listed by only one individual. Only four categories, happiness, anger, sadness, and love, were listed by more than half the subjects. Figure 1 illustrates this point by showing the distribution of endorsements for the 383 terms--endorsement defined as the per cent subjects who listed the term. As can be seen, there was considerable variability in the frequency with which each term was generated, with no clear break in the distribution. There was no obvious boundary but rather a gradual change from instances that came readily to mind to those that do not.

Twenty emotion terms, listed in Table 2, were selected as the target terms for further analysis in this and subsequent studies. The items with the ten highest endorsements were selected. The remaining items were chosen at random from among those 108 remaining items, that were generated by at least 4 subjects (2% of the sample). In subsequent studies, the assumption was made that these terms exist at the same hierarchical level.

At the time of data collection it was unknown that similar frequency data had been collected for various categories, including emotion, by Hunt and Hodge (1971). These researchers asked participants to list only four

Table 1

Free Listing of Exemplars of Emotion

happiness(152)	confusion(17)	glad(9)
anger(149)	surprise(17)	affection (8)
sadness(136)	despair(16)	boredom(8)
love(124)	hurt(16)	delight(8)
fear(96)	liking(16)	greed(8)
hate(89)	lonely(16)	hope(8)
joy(82)	sympathy(16)	lust(8)
excitement(53)	compassion(14)	tenderness(8)
anxiety(50)	ecstasy(14)	annoyed(7)
depression(42)	envy(14)	arousal(7)
frustration(39)	grief(14)	cheerful(7)
crying(36)	mad(14)	disappointment(7)
feelings(35)	sorrow(14)	distress(7)
jealousy(29)	warmth(14)	frightened(7)
disgust(27)	nervous(13)	hoplessness(7)
laughter(27)	pain(13)	irritation(7)
elation(26)	tense(13)	kindness(7)
caring(24)	moody(12)	longing(7)
guilt(22)	pride(12)	melancholy(7)
embarrassment(20)	smiling(12)	rage(7)
contentment(19)	trust(12)	relief(7)
peace(19)	passion(11)	sensitive(7)
upset(19)	tears(11)	pleased(7)
worry(19)	pleasure(10)	respect(7)
empathy(18)	calm(9)	scared(7)

Table 1 (continued)

sex(6)	hostility(4)	expectation (3)
shyness(6)	humor(4)	expressive(3)
sincerity(6)	loyalty(4)	giving(3)
strong(6)	miserable(4)	helping(3)
afraid(5)	mournful(4)	helplessness(3)
anticipation(5)	needs(4)	high(3)
bitterness(5)	pensive(4)	humility(3)
concern(5)	rejection(4)	jubilation(3)
control(5)	remorse(4)	negative(3)
dislike(5)	serenity(4)	passivity(3)
exuberance(5)	shame(4)	positive(3)
panic(5)	sharing(4)	quiet(3)
satisfaction(5)	stress(4)	reactions(3)
touching(5)	thrilled(4)	resentment(3)
aggression(4)	tranquility(4)	terror(3)
amused(4)	unhappy(4)	thinking(3)
apprehension(4)	violence(4)	wonder(3)
awe(4)	vulnerability(4)	admiration(2)
deep(4)	ambivalence(3)	alert(2)
desire(4)	attraction(3)	amazement(2)
dismay(4)	bliss(3)	appreciation(2)
enjoyment(4)	confidence(3)	anguish(2)
enthusiasm(4)	conflict(3)	belonging(2)
exhilaration(4)	defeat(3)	boisterous(2)
gay(4)	dejection(3)	closeness(2)

Table 1 (continued)

communication(2)	relaxed(2)	apathy(1)
complacent(2)	repulsion(2)	ashamed(1)
contempt(2)	responsibility(2)	assertive(1)
criticism(2)	responsiveness(2)	assessing(1)
cynical(2)	self-concept(2)	assurance(1)
devotion(2)	self-esteem(2)	astonished(1)
distrust(2)	sentimental(2)	awareness(1)
disturbed(2)	softness(2)	bedazzled(1)
dread(2)	state(2)	bewildered(1)
edgy(2)	stubborness(2)	bigotry(1)
expression(2)	successful(2)	blank(1)
euphoria(2)	tiredness(2)	blush(1)
frown(2)	turbulent(2)	bold(1)
gentleness(2)	uncertainty(2)	bothering(1)
hardness(2)	uncontrollable(2)	brilliant(1)
heart(2)	understanding(2)	bubbling(1)
hyperactive(2)	unstable(2)	carefree(1)
impulse(2)	uptight(2)	chagrin(1)
insecurity(2)	wanting(2)	changeable(1)
malicious(2)	weak(2)	choleric(1)
meditating(2)	withdrawn(2)	circumstantial(1)
mixed(2)	accepting(1)	comfort(1)
outgoingness(2)	accomplishment(1)	competent(1)
protective(2)	action(1)	complete(1)
rapture(2)	aggravation(1)	contemplative(1)

Table 1 (continued)

craziness(1)	evaluating(1)	harried(1)
creativity(1)	evasiveness(1)	haughtiness(1)
curious(1)	exercising(1)	hit(1)
daydreaming(1)	explosive(1)	honesty(1)
demanding(1)	faith(1)	honor(1)
dependent(1)	faithfulness(1)	horny(1)
despise(1)	flabbergasted(1)	horor(1)
detached(1)	fret(1)	hot(1)
diffident(1)	frivolous(1)	hugging(1)
discouragement(1)	fulfilled(1)	humiliation(1)
disgrace(1)	fun(1)	hunger(1)
disgruntled(1)	fury(1)	hypoactive(1)
disparagement(1)	generous(1)	hysterical(1)
dizziness(1)	gingery(1)	impatience(1)
doubt(1)	glee(1)	impressions(1)
dreaming(1)	good(1)	inadequacy(1)
dreamy(1)	grabbing(1)	independent(1)
eagerness(1)	gratitude(1)	indifference(1)
ease(1)	gregariousness(1)	infatuation(1)
enamoured(1)	grimace(1)	injury(1)
encouraging(1)	grin(1)	injury(1)
endurance(1)	grumpy(1)	instinctive(1)
energetic(1)	grunt(1)	interested(1)
engrossed(1)	harassed(1)	intimidation(1)
essential(1)	harm(1)	

Table 1 (continued)

joking(1)	reflective(1)	solemnity(1)
jumpy(1)	reluctance(1)	spiritual(1)
kill(1)	reprisal(1)	stability(1)
listening(1)	reserve(1)	startled(1)
lively(1)	resignation(1)	stillness(1)
lousy(1)	ridicule(1)	stoic(1)
low(1)	romantic(1)	stroking(1)
manic(1)	sacrificing(1)	subdued(1)
mellowness(1)	sanguinity(1)	suffering(1)
misbehavior(1)	security(1)	sullen(1)
mistrust(1)	self-actualization(1)	superficial(1)
moved(1)	sef-assured(1)	suspicion(1)
hasty(1)	sef-control(1)	tease(1)
nice(1)	self-satisfaction(1)	temper(1)
nostalgia(1)	selfish(1)	temperament(1)
nurturance(1)	senses(1)	tingling(1)
optimistic(1)	sensual(1)	togetherness(1)
outraged(1)	seriousness(1)	tolerance(1)
overwhelmed(1)	shock(1)	transcendence(1)
placidness(1)	silly(1)	trepidation(1)
playing(1)	sing(1)	triumph(1)
power(1)	smug(1)	troubled(1)
pressured(1)	sneak(1)	turmoil(1)
punishment(1)	snob(1)	tyranny(1)

Table One (continued)

puzzled(1)	snort(1)	unbalanced(1)
uneasy(1)	unity(1)	unrealistic(1)
unresponsive(1)	unstable(1)	uplifted(1)
vengeance(1)	vibrant(1)	vivacious(1)
vitality(1)	wail(1)	watchful(1)
well-being(1)	yelling(1)	

Note: The number in parentheses is the number of subjects who listed each item or some syntactic variant of it.

Figure 1. Per cent endorsements per emotion category.
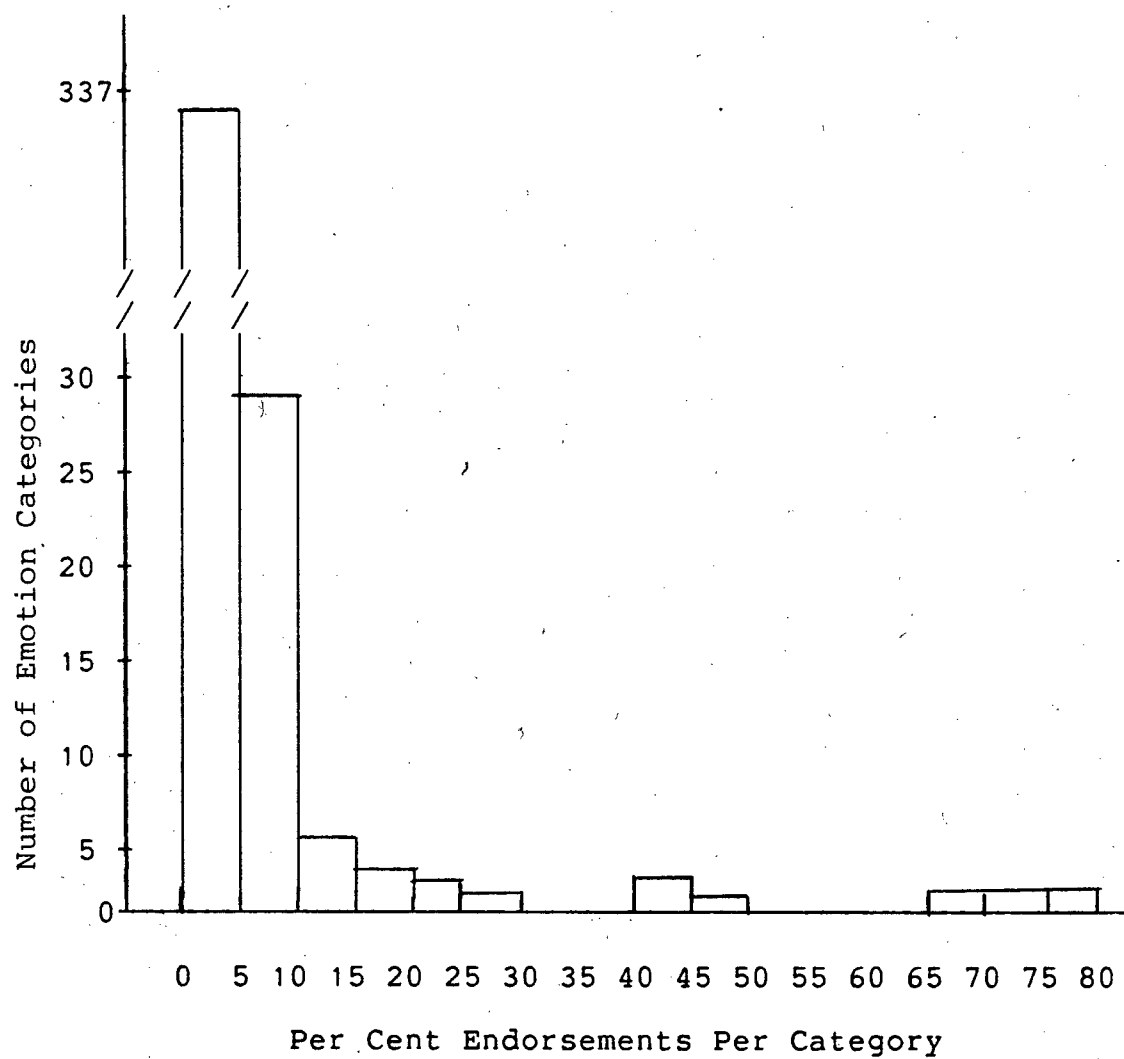
Table 2

Frequency of Listing in a Free Production of Exemplars Task for

20 Categories of Emotion

	STUDY ONE (All responses in one minute)		STUDY ONE (First four responses)		HUNT & HODGE (Four responses)	
Category	Rank	% Subjects	Rank	% Subjects	Rank	% Subjects
Happiness	1	76.0	1	51.0	4	29.75
Anger	2	74.5	2	49.0	5	27.75
Sadness	3	68.0	3	42.5	6	22.75
Love	4	62.0	4	38.5	2	52.25
Fear	5	48.0	5	24.5	1	53.25
Hate	6	44.5	6	19.5	3	44.50
Joy	7	41.0	7	13.0	7	15.75
Excitement	8	26.5	8	6.5	10	5.00
Anxiety	9	25.0	10	3.5	9	7.00
Depression	10	21.0	9	4.0	8	7.50
Disgust	11	13.5	13	2.5	14	1.00
Guilt	12	11.0	11.5	3.0	13	1.25
Embarrassment	13	10.0	11.5	3.0	17	.25
Worry	14	9.5	14	1.5	15.5	.75
Envy	15	7.0	15.5	.5	12	1.5
Pride	16	6.0	18.5	0	15.5	.75
Calmness	17	4.5	18.5	0	11	2.0
Boredom	18	4.0	18.5	0	19	0
Respect	19	3.5	15.5	.5	19	0
Awe	20	2.0	18.5	0	19	0

*Note: Study One N=200;Hunt & Hodge N=400.

responses for each of the categories. To enable comparison with Hunt and Hodge, a second frequency count was performed on the present data, tallying only the first four responses.

In Table 2 appears frequency of listing, raw scores and ranks, for the 20 target terms both as originally scored and based only on the first four responses. The frequency-of-listing scores based on all responses correlated .97 with those based on the first four. These two scores correlated .80 and .76 with the Hunt and Hodge frequency scores. The same three correlations computed with the ranks were .98, .89, and .86, respectively. Thus, the frequency scores showed considerable reliability across scoring methods and samples of subjects. Of course, this reliability occurred for a sample of 20 terms extending over a considerable range of frequency-of-listing scores(2% to 76%).

A further analysis was carried out to examine the reliability of a more restricted range of emotion categories. Thus 30 items were selected that were among the top 118 (i.e. endorsed by 2% of the sample) but not in the top 10. Thus the range of frequency scores was restricted to 2% to 20%. Frequency of listing data for the 30 emotion categories appears in Table 3. For the 30 terms, frequency-of-listing scores based on all responses correlated .75 with those based on the first four. These two scores correlated .47 and .40 with the Hunt and Hodge frequency scores. The same three correlations with the ranks are .68, .51, and .51, respectively. For all 50 terms (these 30 plus the 20 of Table

Table 3

Frequency of Listing in a Free Production of Exemplars Task for

30 Categories of Emotion

Category	STUDY ONE (All responses in one minute)		STUDY ONE (First four responses)		HUNT & HODGE (Four responses)	
	Rank	% Subjects	Rank	% Subjects	Rank	% Subjects
Frustration	1	19.5	3	6.0	4.5	2.25
Crying	2	18.0	2	8.0	2	4.75
Feelings	3	17.5	1	13.0	12	.5
Jealousy	4	14.5	6	3.5	3	2.75
Laughter	5	13.5	4	5.0	1	6.0
Elation	6	13.0	5	4.0	6	6.0
Caring	7	12.0	7	2.5	16	.25
Liking	8	8.0	8	1.5	24	0
Nervousness	9	6.5	12	.5	7.5	.75
Trust	10	6.0	12	.5	12	.5
Hope	11	4.0	12	.5	12	.5
Cheerfulness	12.5	3.5	12	.5	12	.5
Sensitive	12.5	3.5	12	.5	12	.5
Anticipation	14.5	2.5	23	0	24	0
Satisfaction	14.5	2.5	23	0	16	.25

Table 3 (continued)

Frequency of Listing in a Free Production of Exemplars Task for

30 Categories of Emotion

Category	STUDY ONE (All responses in one minute)		STUDY ONE (First four responses)		HUNT & HODGE (Four responses)	
	Rank	% Subjects	Rank	% Subjects	Rank	% Subjects
Desire	18.5	2.0	23	0	24	2.25
Enthusiasm	18.5	2.0	23	0	24	0
Humor	18.5	2.0	12	.5	12	.5
Loathing	18.5	2.0	23	0	24	0
Mournful	18.5	2.0	23	0	24	0
Attraction	23	1.5	23	0	7.5	.75
Confidence	23	1.5	23	0	24	0
Dejection	23	1.5	23	0	24	0
Humility	23	1.5	23	0	24	0
Wonder	23	1.5	23	0	24	0
Alert	28	1.0	23	0	24	0
Closeness	28	1.0	23	0	24	0
Devotion	28	1.0	23	0	24	0
Gentleness	28	1.0	12	.5	16	.25
Tiredness	28	1.0	23	0	24	0

2), the frequency-of-listing scores based on all responses correlated .97 with those based on the first four. These two scores correlated .84 and .81 with the Hunt & Hodge frequency scores. The same three correlations computed with the ranks are .91, .87, and .83, respectively.

As a final comment, within a classical view of concepts, one would expect that if all members are equally representative of the category, there would not be a great deal of variability in how much instances came to mind. However, as shown by Figure 1, this notion was not supported in the presented study. As shown by Table 1, some instances were very borderline looking--a finding that is easily accounted for by the prototype view.

Study Two   Generation of Subordinates

At the subordinate level of the hierarchy, a middle level category is further subdivided. Imagine walking into a specialty coffee store and asking for a pound of coffee. This information would be inadequate--the shopkeeper would want to know if you were referring to Mocha, Brazilian Santos, Java, Columbian, and so on.

The existence of categories at the subordinate level has been demonstrated for some natural language concepts. For example, Rosch et al. (1976b) have demonstrated that given the category table, subjects list: kitchen table, dining room table; for car: sports car, 4 door sedan car, and so on.

Whether or not such a level is present in the domain of emotion has not been investigated. It was not clear whether or not subjects would be able to list types of happiness, anger, and so on. For example, for love, one might respond with: filial love, passionate love, love for God, self-love, affection and so on. On the other hand, what types of awe can we list? or the kinds of boredom? It seems difficult to generate subordinates in these cases. Perhaps some emotion categories can be further subdivided, while others cannot.

Method

Subjects. Fifty-five subjects participated in the study. Respondents were enrolled in psychology classes at the University of British Columbia. Participation was voluntary.

Procedure. Participants were given the following instructions:

> This study is part of a larger project on
> the sorts of things people have in mind
> when they hear and use words. On each
> page of the booklet you will find the
> name of a general category. Your task is
> to give us types of that category. For
> example, if given the category CHAIR, you
> might respond with rocking chair,
> recliner, armchair, stool, bean bag
> chair, lawn chair, or other types of
> chair. Or, if given the category

EXERCISE, you might write jogging, body building, squash, tennis, dancing, and so on.

The categories we are interested in involve emotional states, things that you can experience. For each of the psychological events listed in the booklet, please write down as many types of that experience as you can think of. For some of the categories you will be able to generate many types. For others you might not be able to come up with any. Don't worry about whether your response is right or wrong. Just give us your opinion.

You may now proceed to the first page. Stop after about a minute or two, or about 10 items. Then proceed to the next page, until you have completed the booklet.

Subjects were given as much time as they wished to complete the exercise. Each subject generated subordinates for all 20 target emotions presented in random order. These were the 20 items from Study One that were listed in Table 2, which had endorsement scores ranging from 2% to 76%.

Results and Discussion

The responses generated by subjects in this study were more complex and difficult to interpret than the responses given by subjects when asked to list instances of "emotion" (Study One). There was much less consensus in the present than in the earlier task. Whereas in Study One the most popular response to "emotion" (happiness) was given by 76% of the subjects, the most popular reponse in these data was "jealousy" given by only 34.5% of the subjects for "envy". Of all the responses generated in Study One, 49% were idiosyncratic, compared to 96% in this study.

In Study One 100% of all responses were single words, whereas in this study, 62% of all responses were single words. Phrases constituted 38% of the responses. Even where single words were listed, their interpretation was much less straightforward than in Study One. For example, "death" was listed as a type of depression. The subject did not mean to say a dead person is a depressed person. Rather, one type of depression is depression-caused-by-the-death-of-another. Also, some single words were probably not meant to stand alone, but to modify the original category, as when "total" was given as a type of joy.

One result to emerge from this study therefore, was that fewer subordinate categories of emotion are coded monolexemically in English--a result that contrasts dramatically with the Study One finding where all middle level categories were monolexemic. In this study, if single

words that cannot stand alone as types of emotion or words already listed as middle level categories are excluded, monolexemic types were generated for only 8 of the 20 emotion categories. A total of 50 monolexemic types were given across the 8 emotion categories, (compared with 383 at the middle level), ranging from one to twelve monolexemic types per category. When considering only non-idiosyncratic responses,i.e. responses endorsed by two or more subjects, monolexemic types were produced only for 6 of the 20 emotion categories. A total of 13 non-idiosyncratic monoleximic types were generated, ranging from one to four types per emotion category.

When asked to generate subordinate categories, subjects create their responses in a variety of ways, which is apparent from the large number of idiosyncratic responses. To illustrate this aspect of the results, the responses were grouped into types according to how the response was formed. The eight principal ways of forming the responses were:

1. By specifying the cause or object. For example, kinds of anger can be differentiated according to the cause: anger caused by frustration, anger caused by jealousy. In many cases, the cause and object could not be distinguished as when "nature" was given as a response for "awe". Thus cause and object categories were combined.

2. By specifying presence of specific components such as cognitive or behavioral e.g. anger that includes aggression, irrational anger.

3. By modifying the name of the original category e.g. "anger" can be subdivided by giving an adjective with anger: violent anger, misdirected anger.

4. By listing associated emotions e.g. happiness accompanies "joy".

5. By listing monolexemic types e.g. infatuation as a type of "love".

6. By giving synonyms of the original category e.g. jealousy for "envy".

7. Miscellaneous responses--those responses that did not clearly fit in any of categories 1-6.

The responses grouped according to this classification system appear in Table 4. Only responses with a frequency of two or more were included. The number of idiosyncratic responses for each category is given.

For the present purposes the attempt has been simply to present the data, without imposing any particular interpretation thereof. No responses were combined.

The following should be noted concerning the grouping procedure: First, the various categories do not contrast with one another. Irrational anger does not contrast with violent anger--any real instance of anger could be one, the other, or both.

Secondly, the syntactical and semantic form of the responses was preserved. Anger that includes aggression may be the same as violent anger.

In summary, if we take emotion as the superordinate

Table 4

Subordinates for 20 Emotion Categories

. . . .

JOY

. . . .

CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
Christmas(3)	happy(2)	happiness(18)	carefree(2)			alive(2)
friendship(2)	sexual joy(2)	love(4)				free(2)
success(2)		elation(2)				warmth(2)
		excitement(2)				
		glad(2)				
		peace(2)				
(58 responses)*	(20 responses)	(28 responses)	(14 responses)	(1 response)	(0 responses)	(4 responses)
(55 freq=1)**	(18 freq=1)	(22 freq=1)	(13 freq=1)	(1 freq=1)	(0 freq=1)	(1 freq=1)

* The number in parentheses means a total of 58 subordinate categories which were classified as a cause/object of "Joy" were generated. N=55.

** Fifty-five of the 58 subordinate categories classified as a cause/object of "Joy" were idiosyncratic, i.e., generated by only one subject. The remaining 3 categories are listed in Table 4, followed by the number of subjects who generated that response.

....

DEPRESSION

....

CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
loneliness(5)	sad(6)	sadness(10)	worry(4)			incompetent(2)
alone(2)	suicidal(3)	lonely(8)	crying(2)			
isolation(2)	worried(2)	helplessness(4)	tears(2)			
loss(4)						
weather(2)						
(69 responses)	(60 responses)	(36 responses)	(14 responses)	(0 responses)	(0 responses)	(12 responses)
(64 freq=1)	(57 freq=1)	(33 freq=1)	(11 freq=1)	(0 freq=1)	(0 freq=1)	(11 freq=1)

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                                                FEAR

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CAUSE/OBJECT        MODIFIER         ASSOCIATED       COMPONENT        SYNONYM          MONOLEXEMIC      MISCELLANEOUS
                                     EMOTION                                           TYPES

unknown(4)          anxious(4)       anxiety(6)       worry(4)                          frightened(2)

death(3)            nervous(4)       panic(2)         tense(2)                          terror(2)

failure(3)          helpless(2)

of failure(2)

spiders(3)

stress(3)

falling(2)

of dying(2)

thunder(2)

(89 responses)      (48 responses)  (9 responses)    (23 responses)   (3 responses)    (12 responses)   (5 responses)

(80 freq=1)         (45 freq=1)     (7 freq=1)       (21 freq=1)      (3 freq=1)       (10 freq=1)      (5 freq=1)
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EXCITEMENT

CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	- SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
fun(3)	happy(7)	happiness(7)	butterflies(2)			
sports(3)	nervous(3)	joy(5)				
success(3)	sexual(4)	love(3)				
adventure(2)	emotional(2)	fear(2)				
anticipation(2)	feverish(2)	thrill(2)				
expectations(2)						
music(2)						
party(8)						
(80 responses)	(45 responses)	(16 responses)	(39 responses)	(0 responses)	(0 responses)	(10 responses)
(72 freq=1)	(40 freq=1)	(11 freq=1)	(38 freq=1)	(0 freq=1)	(0 freq=1)	(10 freq=1)

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                                                        ANGER

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CAUSE/OBJECT        MODIFIER        ASSOCIATED       COMPONENT        SYNONYM         MONOLEXEMIC      MISCELLANEOUS
                                    EMOTION                                           TYPES

frustration(6)      irrational(4)   upset(5)         aggression(3)    mad(10)         fury(3)

jealousy(3)         rational anger(2)

                                    hatred(4)                         madness(4)      rage(3)

temper(3)           violent anger(2)

                                    fear(3)

argument(2)                         disgust(2)

hurt(2)                             hate(2)

                                    unhappy(2)

(49 responses)      (58 responses)  (14 responses)   (12 responses)   (3 responses)  (14 responses)   (4 responses)

(44 freq=1)         (55 freq=1)     (8 freq=1)       (11 freq=1)      (1 freq=1)      (12 freq=1)      (4 freq=1)
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                                            ANXIETY
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CAUSE/OBJECT      MODIFIER        ASSOCIATED       COMPONENT        SYNONYM         MONOLEXEMIC      MISCELLANEOUS
                                  EMOTION                                           TYPES

stress(3)         worried(5)      fear(7)          worry(8)
tension(2)        nervous(4)      upset(7)         nervousness(7)
                  anxious(2)      frustration      tense(3)
                  excited(2)      apprehension(2)  frowning(2)
                  fearful(2)      helplessness(2)  sweating(2)

(60 responses)    (42 responses)  (21 responses)   (39 responses)   (0 responses)   (0 responses)    (5 responses)
(58 freq=1)       (37 freq=1)     (16 freq=1)      (34 freq=1)      (0 freq=1)      (0 freq=1)       (5 freq=1)
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GUILT

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
cheating(3)	emotional(2)	remorse(3)	conscience(2)			punish(2)
failure	unlawful(2)	embarrass(2)				untrustworthy(2)
sin(2)		regret(2)				
wrong(2)		sorrow(2)				
(74 responses)	(32 responses)	(22 responses)	(21 responses)	(0 responses)	(0 responses)	(14 responses)
(70 freq=1)	(30 freq=1)	(18 freq=1)	(20 freq=1)	(0 freq=1)	(0 freq=1)	(12 freq=1)

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<div align="center">ENVY</div>

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
beauty(2)		hate(6)	desire(4)	jealousy(19)		green(3)
independence(2)		anger(3)	longing(3)	jealous(4)		
		dislike(3)	want(3)			
		admiration(2)	wishfulness(2)			
		angry(2)				
(41 responses)	(26 responses)	(17 responses)	(27 responses)	(4 responses)	(0 responses)	(6 responses)
(39 freq=1)	(26 freq=1)	(12 freq=1)	(23 freq=1)	(2 freq=1)	(0 freq=1)	(5 freq=1)

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                                              EMBARRASSMENT

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CAUSE/OBJECT      MODIFIER        ASSOCIATED       COMPONENT        SYNONYM        MONOLEXEMIC      MISCELLANEOUS
                                  EMOTION                                          TYPES

being wrong(2)    for others(2)   shame(6)         blush(4)
                  personal(2)     guilt(3)         blushing(2)
                  small(2)                         red-faced(2)
                                                   self-consciousness(2)

(63 responses)    (40 responses)  (10 responses)   (40 responses)  (0 responses)  (0 responses)    (6 responses)
(62 freq=1)       (37 freq=1)     (8 freq=1)       (36 freq=1)     (0 freq=1)     (0 freq=1)       (6 freq=1)
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                                              DISGUST

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CAUSE/OBJECT      MODIFIER        ASSOCIATED        COMPONENT        SYNONYM        MONOLEXEMIC      MISCELLANEOUS
                                  EMOTION                                           TYPES

prostitution(2)   total(2)        hate(6)           nausea(3)
                                  disdain(4)        disrespect(2)
                                  hatred(4)         distaste(2)
                                  dislike(3)        sick(2)
                                  loathing(3)
                                  repulsion(3)
                                  anger(2)
                                  despise(2)
                                  disappointed(2)
                                  repelled(2)
                                  revolt(2)
                                  turned off(2)

(48 responses)    (18 responses)  (31 responses)   (25 responses)   (0 responses)  (0 responses)    (11 responses)

(47 freq=1)       (17 freq=1)     (19 freq=1)      (21 freq=1)      (0 freq=1)     (0 freq=1)       (11 freq=1)
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                                                    CALM

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
lakes(2)	relaxed(9)	peaceful(5)	relaxation(6)	serenity(7)		solitude(2)
nature(2)	content(3)	peace(4)	quiet(5)	serene(5)		
	happy(2)	contentment(2)	sleep(3)	tranquil(3)		
		not excited(2)	comfortable(2)	tranquility(2)		
			controlled(2)			
			quietness(2)			
			security(2)			
			"together"(2)			
(37 responses)	(33 responses)	(9 responses)	(51 responses)	(6 responses)	(0 responses)	(10 responses)
(35 freq=1)	(30 freq=1)	(5 freq=1)	(43 freq=1)	(2 freq=1)	(0 freq=1)	(9 freq=1)

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                                          BOREDOM
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CAUSE/OBJECT        MODIFIER        ASSOCIATED      COMPONENT       SYNONYM         MONOLEXEMIC     MISCELLANEOUS
                                    EMOTION                                         TYPES

nothing to do(5)    listless(2)                     tired(5)                                        dull(4)

no excitement(2)    repitious(2)                    lazy(3)                                         drab(2)

no one to talk to(2)

                    total(2)                        disinterested(2)

routine(2)          uninterested(2)                 lethargy(2)

school(2)      -                                    lifeless(2)

                                                    sleepy(2)

                                                    uninteresting(2)

                                                    unstimulated(2)

                                                    yawning(2)

(62 responses)      (32 responses)  (15 responses)  (41 responses)  (1 response)    (0 responses)   (12 responses)

(57 freq=1)         (28 freq=1)     (15 freq=1)     (32 freq=1)     (1 freq=1)      (0 freq=1)      (10 freq=1)
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AWE

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
nature(2)	respectful(3)	amazement(8)	respect(7)			
	religious(2)	surprise(6)	flabbergasted(3)			
		envy(3)	shock(3)			
		wonder(4)	speechless(3)			
		bewilderment(2)	stunned(3)			
		flustered(2)	dumb-struck(2)			
		impressed(2)	shocked(2)			
		jealousy(2)	overwhelmed(3)			
		wonderment(2)	worship(2)			
(45 responses)	(15 responses)	(27 responses)	(33 responses)	(0 responses)	(0 responses)	(5 responses)
(44 freq=1)	(13 freq=1)	(18 freq=1)	(24 freq=1)	(0 freq=1)	(0 freq=1)	(5 freq=1)

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                                         HAPPINESS
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CAUSE/OBJECT      MODIFIER       ASSOCIATED      COMPONENT      SYNONYM        MONOLEXEMIC      MISCELLANEOUS
                                 EMOTION                                       TYPES

friends(6)        joyful(2)      love(14)        laughing(4)                  contentment(5)  warmth(3)

family(4)                        joy(10)         laughter(3)                  content(3)

being in love(2)                 affectionate(2) smiling(3)                   cheerful(2)

fun(2)                           natural high(2) drinking(2)                  pleasure(2)

sunshine(2)                      peace(2)        free(2)

travelling(2)                                    relaxation(2)

                                                 secure(2)

                                                 security(2)

                                                 sex(2)

                                                 singing(2)

(74 responses)    (39 responses) (25 responses)  (43 responses) (0 responses)  (15 responses)  (3 responses)

(68 freq=1)       (38 freq=1)    (20 freq=1)     (33 freq=1)    (0 freq=1)     (11 freq=1)     (2 freq=1)
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SADNESS

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
death(7)	long-term(2)	depression(11)	tears(6)			
loneliness(6)	short-term(2)	depressed(6)	crying(6)			
loss(5)		sorrow(5)	frown(3)			
failure(4)		unhappy(5)	cry(2)			
lonely(3)		melancholy(4)	helplessness(2)			
		grief(2)	mourning(2)			
		unhappiness(2)	tiredness(2)			
		upset(2)				
(50 responses)	(27 responses)	(36 responses)	(18 responses)	(0 responses)	(0 responses)	(5 responses)
(45 freq=1)	(25 freq=1)	(28 freq=1)	(11 freq=1)	(0 freq=1)	(0 freq=1)	(5 freq=1)

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                                        RESPECT
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CAUSE/OBJECT      MODIFIER      ASSOCIATED      COMPONENT      SYNONYM      MONOLEXEMIC   MISCELLANEOUS
                                EMOTION                                     TYPES

parents(4)        parental(2)   love(6)         calm(2)
intelligence(3)                 honour(4)       consideration(2)
authority(2)                    admiration(2)   trust(2)
elders(2)                       awe(2)          understanding(2)
for others(2)
friendliness(2)
friends(2)
friendship(2)
kindness(2)
myself(2)
older people(2)
peers(2)
self(2)
(73 responses)    (28 responses) (23 responses) (30 responses) (0 responses)  (0 responses)  (4 responses)
(60 freq=1)       (27 freq=1)    (19 freq=1)    (26 freq=1)    (0 freq=1)     (0 freq=1)     (4 freq=1)
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6.3

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                                                  LOVE

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
friends(4)	family(6)	happiness(5)	sex(6)		affection(4)	warmth(4)
nature(2)	friendship(6)	caring(4)	lust(4)		infatuation(4)	alive(2)
pets(2)	brotherly(5)	happy(3)	respect(4)		romance(2)	heart(2)
	physical(5)	euphoria(2)	security(4)			warm(2)
	parental love(3)		togetherness(4)			
	puppy(3)		understanding(3)			
	romantic(3)		closeness(2)			
	self(3)		confident(2)			
	unrequited(3)		consideration(2)			
	constant(2)		holding hands(2)			
	joyful(2)		kissing(2)			
	passionate(2)		marriage(2)			
	sibling love(2)		passion(2)			
			relaxed(2)			
			sharing(2)			
			together(2)			
			trust(2)			
(43 responses)	(65 responses)	(32 responses)	(83 responses)	(0 responses)	(4 responses)	(14 responses)
(40 freq=1)	(52 freq=1)	(28 freq=1)	(66 freq=1)	(0 freq=1)	(1 freq=1)	(10 freq=1)

PRIDE

CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
accomplishment(5)	personal(2)	happy(3)	self-esteem(3)		conceit(3)	
achievement(2)	self-pride(2)	pleased(2)	arrogance(2)			
talent(2)		proud(2)	confidence(2)			
			ego(2)			
(68 responses)	(46 responses)	(12 responses)	(26 responses)	(0 responses)	(4 responses)	(8 responses)
(65 freq=1)	(44 freq=1)	(9 freq=1)	(22 freq=1)	(0 freq=1)	(3 freq=1)	(8 freq=1)

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                                        WORRY
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CAUSE/OBJECT      MODIFIER      ASSOCIATED      COMPONENT      SYNONYM      MONOLEXEMIC      MISCELLANEOUS
                                EMOTION                                     TYPES

stress(6)         fearful(2)    anxiety(11)     nervous(3)
exams(5)          nagging(2)    fear(8)         nail biting(2)
illness(3)                      upset(3)        nervous(3)
friends(2)                      anxious(2)
future(2)                       concern(2)
                                depression(2)
                                frustration(2)
                                regret(2)
                                scared(2)
                                uneasiness(2)

(65 responses)    (19 responses) (19 responses) (46 responses) (1 response)  (0 responses)  (2 responses)
(60 freq=1)       (17 freq=1)     (9 freq=1)     (43 freq=1)    (1 freq=1)    (0 freq=1)     (2 freq=1)
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HATRED

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CAUSE/OBJECT	MODIFIER	ASSOCIATED EMOTION	COMPONENT	SYNONYM	MONOLEXEMIC TYPES	MISCELLANEOUS
	self(2)	anger(9)	passion(2)		dislike(8)	
		despise(5)	destruction(2)			
		mad(4)	violence(2)			
		angry(3)				
		envy(3)				
		resentment(3)				
		bitterness(2)				
		detest(2)				
		jealousy(2)				
		loathe(2)				
		rage(2)				
		repulsion(2)				
(48 responses)	(41 responses)	(30 responses)	(29 responses)	(0 responses)	(2 responses)	(2 responses)
(48 freq=1)	(40 freq=1)	(18 freq=1)	(26 freq=1)	(0 freq=1)	(1 freq=1)	(2 freq=1)

level, subjects can generate a middle level with great ease. The English language provides several hundred single terms that name types of emotion. Subjects may be able to describe a subordinate level, although with greater difficulty. English provides few single terms that clearly fall at this level. So, subjects must be more inventive in describing types of love, hate, anger, happiness, and so on. As a consequence, their responses tend to be highly idiosyncratic.

PART II   INTERNAL STRUCTURE OF CATEGORIES

One of the major distinctions between the classical view of concepts and the prototype view concerns internal structure. Internal structure refers to that general class of conceptions of categories in which categories are composed of a core meaning and in which items within the category may be considered differentially representative of the meaning of the category term. Representativeness may be operationally defined by means of subject's ratings of how good an example an item is of its category. Rosch has obtained inter-subject consistency in such ratings. Individual subjects agree that some exemplars of a category are more representative than others, and different subjects choose the same examples as most representative of the category.

Representativeness of items within a category has been shown to affect many of the dependent variables used in psychological research. Most of the studies have focused on common semantic categories(e.g. "dog", "furniture", etc.).

Rosch has used such measures as the following: speed of processing, free production of exemplars, natural language use of category terms, asymmetries in similarity relationships between category exemplars, and learning and development.

Speed of processing (reaction time) has been investigated extensively in category verification tasks. Typically subjects are asked to verify statements of the form "An {exemplar} is a {category name}" as quickly as possible. Response times are shorter for verification of the category membership of representative exemplars than nonrepresentative exemplars. Rosch et al. (1976) have also demonstrated this effect for three types of artificial categories, where representativeness was defined by family resemblance, by mean values of attributes, or by degree of distortion from the prototype. These differences in response times were amplified when a prime (prior mention of the category name) wasprovided. Priming reduced response times to verify the category membership of representative exemplars but increased response times to verify the membership of nonrepresentative exemplars.

Order and probability of exemplar production have been investigated primarily for superordinate semantic categories. Frequency of mention of an exemplar is significantly correlated with degree of representativeness (Mervis et al. 1976).

Natural languages possess mechanisms for coding

gradients of representativeness. For example, languages generally include such qualifying terms ("hedges") as "roughly speaking" and "sort of"(Lakoff, 1973). Rosch (1975) has shown that when subjects are given sentence frames such as "{X} is virtually {Y}", they reliably place the more representative member of the pair in the referent {Y} slot.

Substitutability of the superordinate is another measure of exemplar representativeness. Rosch (1978) found that representativeness ratings for members of superordinate categories predict the extent to which the member is substitutable for the superordinate word in many commonly encountered sentences. For example, in the sentence "A bowl of fruit makes a nice centerpiece", "apples", but not "watermelon" produces a sentence which, subjects agree, retains its naturalness and truth value.

Asymmetry in similarity ratings between members that vary in representativeness is another way in which members of a category fail to be equivalent. Rosch(1975) has shown that less representative exemplars are more similar to more representative exemplars than vice-versa. For example, subjects feel that penguins are more similar to robins than robins are to penguins.

In the learning and development of categories, representativeness appears to be a major variable. Representativeness gradients have two basic implications for category acquisition. The first is that category membership is established first for the most representative exemplars

and last for the least typical instances. Rosch(1973,a,b) found that focal (representative) colors and forms were learned more quickly than nonfocal colors and forms by persons whose language did not contain explicit labels for these categories.

In the next set of studies to be reported, the internal structure of the category emotion was investigated. When we ask if the concept of emotion is internally structured, we are asking whether all instances have equal status or some instances of the concept are thought of as "better representatives" than others. From the Study One results we can speculate that emotions like happiness, anger, sadness, and love would be prototypical exemplars, while examples like boredom, awe, and respect would be less representative of the category. If this is the case, we might assume that the concept of emotion is organized internally; furthermore, we would expect the internal organization to affect performance on a variety of tasks.

In this project, five measures of internal structure were used. Study Three examined ratings of goodness of example (prototypicality ratings) for 50 of the emotion terms generated in Study One. Study Four examined reaction time in a category membership verfication task. It was hypothesized that response latency would be increased as a function of deviation from the prototype. Study Five examined whether or not "emotion" was elicited as the superordinate more often for prototypical than nonprototypical instances. For many

natural language categories there is a greater likelihood that the name of a prototypical category member will elicit the superordinate category name than will a less typical exemplar (Rosch, 1973). Study Six examined the "family resemblances" of the 20 target emotions. It was expected that the prototypical instances would have a greater degree of resemblance to the "emotion" family than the less typical.

Should these measures converge, predictions can be generated with some confidence concerning performance on the other measures of internal structure used by Rosch. For example, prototypical emotions could be expected to fit more easily than nonprototypical emotions in a sentence such as "Pat became overly emotional".

Study Three   Prototypicality Ratings

Method

Subjects. Subjects were 55 students enrolled in an Introductory Psychology class at the University of British Columbia. Participation was voluntary.

Procedure. The following instructions, borrowed from Rosch(1973), were provided:

> This study has to do with what we have in
> mind when we hear and use words. Let's
> consider the word "red". Close your eyes
> and imagine a true red. Now imagine an
> orangish red. Imagine a purplish red.
> Although you might still name the orange-

red or the purple-red with the term
"red", they are not as good examples of
"red" (not as clear cases of what red
refers to) as the clear, true red.
Orange and purple are even poorer
examples of "red", perhaps not even red
at all.

Notice that to judge how good an
example something is has nothing to do
with how much you like the thing. You
might prefer a purple red or purple to a
true red, but still recognize which is
the better example of "red".

The word we are interested in is
"emotion". We are interested in which
experiences or feelings are good or poor
examples of "emotion". On the following
page is a list of things that you can
feel or experience--things like hunger,
happiness, anger, and dizziness. We would
like you to rate the extent to which each
feeling on the list is a good or poor
example of "emotion". Don't worry about
why you think something is or isn't a
good example--just give us your opinion.

Subjects rated each of the 20 target emotions (taken

from Table 2) on a scale of 1-6 where a score of 1 indicated extremely poor example and 6 meant extremely good example of an emotion. Subjects were given as much time as they wished to complete the task. The order in which the terms were presented was reversed for half the subjects.

The same questionnaire was re-administered five months later (in the second term) in order to assess reliability over time. At this time prototypicality ratings were also obtained for an additional 30 emotions terms (taken from Table 3). In order to ensure anonymity while allowing identification of the questionnaires, respondents were asked to print their mother's maiden name on the response sheet.

Results and Discussion

Mean prototypicality ratings for the target 20 emotions terms at times 1 and 2 appear in Table 5. The Time 1 typicality ratings correlated .97 with the Time 2 ratings. Prototypicality ratings for the 30 additional terms appear in Table 6. An intraclass correlation coefficient was computed to assess inter-rater reliability across all 50 terms, ICC=.96, indicating that there is high agreement among subjects on ratings of prototypicality, a result that would not have been expected had the items been equally exemplary of the category. The mean inter-rater correlation coefficient was .38.

Initially it seemed quite possible that rating the extent to which an emotion is a good example of the general category would prove a meaningless task to subjects. It

Table 5

Prototypicality Ratings for 20 Emotion Categories

PROTOTYPICALITY

Category	TIME 1		TIME 2	
	Mean	Rank	Mean	Rank
Love	5.46	1	5.27	2
Anger	5.15	2	5.36	1
Hate	5.26	3	5.04	3
Sadness	5.04	4	4.49	9
Happiness	5.00	5	4.51	8
Fear	4.78	6	5.00	4
Depression	4.73	7	4.58	6
Joy	4.89	8	4.93	5
Excitement	4.58	9	4.47	10
Guilt	4.55	10	4.55	7
Embarrassment	4.36	11	4.31	12
Envy	4.13	12	4.26	13
Anxiety	4.29	13	4.44	11
Worry	3.84	14	3.96	14
Disgust	3.71	15	3.89	15
Awe	3.46	16	3.24	17
Pride	3.33	17	3.51	16
Calm	2.75	18	2.82	18
Boredom	2.71	19	2.76	19
Respect	2.49	20	2.51	20

Note: Ratings were made on a scale from 1=extremely poor example to 6=extremely good example. Time 1 N=55; Time 2 N=53. The correlation between mean ratings at Time 1 and Time 2 was .97.

Table 6

Prototypicality Ratings for 30 Emotion Categories

Category	Mean Rating	Rank	Category	Mean Rating	Rank
Jealousy	4.82	1	Hope	3.13	16
Elation	4.31	2	Satisfaction	3.11	17
Frustration	4.07	3	Liking	3.09	17
Mournful	4.00	4	Humility	3.06	18
Cheerfulness	3.95	5	Attraction	3.02	20
Loathing	3.84	6	Closeness	2.91	21
Enthusiasm	3.75	7	Sensitive	2.87	22
Feelings	3.73	8	Confidence	2.86	23
Desire	3.73	9	Humor	2.80	25
Dejection	3.55	10	Trust	2.69	25
Crying	3.51	11	Gentleness	2.58	26
Nervousness	3.47	12	Devotion	2.53	27
Anticipation	3.35	13	Wonder	2.16	28
Laughter	3.22	14	Alert	2.16	29
Caring	3.16	15	Tiredness	2.15	30

seemed plausible that they would question the credibility of the task, refuse to complete the ratings, or resort to some other judgment such as their preference for each emotion. Further, it seemed plausible that even if subjects performed the task, their responses would be highly idiosyncratic because of the subjective nature of emotional experiences. However, subjects found it meaningful to rate the extent to which an instance was a good example of a category. This is in and of itself a noteworthy finding. Moreover, as shown by the inter-rater reliability, subjects agree with each other about their responses.

This study provides evidence that the category emotion is thought to be internally structured. There are prototypes (clearest cases, best examples) of the category with instances varying from better to poorer examples. All emotions are not equal.

Study Four   Reaction Time as a Measure of Internal
                           Structure

If one accepts the notion that in some categories members are not equally representative of the category, one would predict that the extent to which a category member represents the category will affect the time required to verify its membership. The hypothesis under consideration in this study was that subjects would respond "true" more

quickly to a statement of the form "A {member} is a {category}" when the member is a central example (a prototypical case) than when the member is a peripheral or nonprototypical exemplar.

Method

Subjects. Subjects were 30 students from various classes at the University of British Columbia. Participation was voluntary.

Materials. Subjects were required to respond "True" or "False" to 80 statements of the form "{X} is a/n {Y}". The pool of statements consisted of:

1) Ten true central Emotion statements such as "Anger is a/n emotion".

2) Ten true peripheral Emotion statements such as "Awe is a/n emotion".

3) Ten false central Emotion statements such as "Joy is a/n clothing".

4) Ten false peripheral Emotion statements such as "Respect is a/n fruit".

5) Ten true Central Vehicle statements such as "Truck is a/n vehicle".

6) Ten true peripheral Vehicle statements such as "Wagon is a/n vehicle".

7) Ten false central Vehicle statements such as "Car is a/n tool".

8) Ten false peripheral Vehicle statements such as "Carriage

is a/n bird".

Emotion terms were the 20 listed in Table 2. The ten central terms were the ten terms with the highest prototypicality ratings in Study Three. Conversely, the ten peripheral emotions were the ten terms with the lowest prototypicality ratings. The vehicle statements were included in order to replicate Rosch's (1973) findings and to provide "filler" items for the task.

A computer program was designed to present the 80 statements in a different random order for each subject. The following instructions were presented on the screen of a TRS-80 Radio Shack Computer:

> This is a study of the 'belongingness' of items in categories. You will be presented with a series of statements of the form 'X is a/n Y'. Your task is to respond TRUE or FALSE to each statement as fast as you can. So, for example, if the sentence 'Apple is a/n fruit' appeared on the screen, you would press the "1" key for TRUE. If the statement 'Apple is a/n clothing' appeared, you would press the "2" key for FALSE. Try to respond as quickly and as accurately as you can.

Procedure.

Subjects were ushered into the laboratory where the instructions for the task were displayed on the computer terminal. Subjects were told to read the instructions and press the <ENTER> key if they understood the instructions and were ready to begin. The word READY appeared before each sentence to alert the subject that a sentence would be displayed. Subjects took approximately 15-20 minutes to complete the task.

Results and Discussion

A response was considered correct if the subject responded "True" to a True central or peripheral statement, and "False" to a False central or peripheral statement. Conversely, a response was considered incorrect if the subject answered "False" to a True sentence or "True" to a False sentence. The decision to consider a response correct was in some sense an arbitrary one, in that one could argue that the peripheral category members might in fact not be members of the category emotion, but might rather belong to some neighboring category. The rationale for regarding the peripheral exemplars as category members was as follows: First, each of the terms used was given as a member of the category emotion (by at least 2% of the sample) in the Study One free listing situation. Secondly, when the target terms were rated for goodness of membership (Study 3), the lowest prototypicality rating received by any of the peripheral terms was 2.49 (respect) on a scale of 1-6, where 1 meant

"extremely poor example", and 6 meant "extremely good example". The fact that the lowest rating fell between "poor example" and "slightly poor example" on the scale suggests that the peripheral category members were indeed considered category members, albeit poor ones.

Reactions times were analyzed only for correct responses. Mean reaction times and number correct for each of the emotion and vehicle statements appear in Table 7.

Dependent-sample t-tests revealed a significant difference between reaction times to prototypical and nonprototypical true emotion statements, $t(29)=2.69$, $p<.01$, one-tailed, such that sentences containing central members were responded to more quickly. The difference between prototypical and nonprototypical false emotion statements was not significant, $t(29)=1.31$, $p>.10$. The difference between the number correct for prototypical and nonprototypical true emotion statements was significant, $t(29)=2.34$, $p<.05$. Subjects responded "True" more often to True central statements than they did to True peripheral statements.

For the vehicle statements, a significant difference was found between prototypical true and nonprototypical true vehicle statements, $t(29)=1.86$, $p<.05$, one-tailed. The difference between prototypical and nonprototypical false statements was not significant, $t(29)=1.45$, $p>.10$. The number correct differed between prototypical and nonprototypical true vehicle statements $t(29)=6.67$, $p<.0001$.

The results were as hypothesized. Subjects took longer

Table 7

Mean Reaction Time in a Category Verification Task

Emotion Statements	Mean Reaction Time (msec)	Mean Number Correct
True Central	1193	8.3
True Peripheral	1361	7.0
False Central	1541	7.6
False Peripheral	1626	7.7

Vehicle Statements	Mean Reaction Time (msec)	Mean Number Correct
True Central	1257	9.3
True Peripheral	1425	6.3
False Central	1306	7.8
False Peripheral	1380	8.0

Note: Maximum possible number correct is 10.00.

to verify the truth of a statement like "Awe is an emotion" than a sentence like "Anger is an emotion". Central members of the category emotion were identified as such more quickly, while more deliberation occurred before peripheral membership was verified. This finding was corroborated in the number correct results. Subjects made more errors in the case of nonprototypical category examplars.

The same pattern of results emerged for the vehicle statements, a condition designed to replicate Rosch's findings. Subjects took longer to verify the truth of a statement like "Wagon is a vehicle" than a sentence like "Truck is a vehicle". The most errors were made when nonprototypical true statements were presented.

Fewest errors were made when prototypical true statements were presented. The fact that subjects made the most errors when nonprototypical true statements were presented suggests that subjects were unsure of, and therefore hesitant to verify the category membership of the peripheral cases, while that of the central members was not contested.

These results suggest that sentences of the form "X is an emotion" cannot be taken, as the classical view would have it, as absolutely true or false. Rather, their truth seems to be a matter of degree.

<u>Study Five</u>   <u>Generating the Superordinate Name</u>

Rosch (1973) found that more central members (i.e. good

examples of the category) were more likely to elicit the superordinate category name than were peripheral category members. The primary purpose of this study, therefore, was to discover if "emotion" would be given as the superordinate name more often for the terms that had been rated as highly typical than those which were regarded as less exemplary of the category. Another purpose of this study was to discover what other kinds of superordinates are generated for the 20 target emotion terms.

Method

   Subjects. Subjects were 120 students enrolled in various psychology classes at the University of British Columbia. Participation was voluntary.

   Procedure.

The task was described as follows:

> This study is part of a larger project on the sorts of things that people have in mind when they hear and use words. On this questionnaire, we are interested in the general categories to which things might belong. We will give you a word and you will give us the general category. For example, if given the word 'truck', you might write in 'vehicle' or 'motor vehicle'. For the word 'polio', you might respond with 'disease' or 'illness'.

>   The list below refers to things you

can experience. For each of the items,
your task is to provide the general
category to which it belongs. You may use
the same word as often as you wish. Don't
worry about whether your answer is right
or wrong. This is not really a test of
knowledge, but a study of ordinary
language. There are actually many
possible answers. All we want is your
opinion.

Four forms of the questionnaire were distributed. In
three versions, subsets of the 20 target emotions were
interspersed with fillers such as "tingle", "dizziness",
"stubbornness", "moody", "alertness". Subjects generated
superordinates for a total of 20 items. The 20 targets were
distributed as: seven in two forms of the questionnaire, and
six in the third. In the fourth version all 20 target
emotions were listed--there were no filler items. The
rationale for this last version was that listing all 20
emotion terms might create a demand characterisitic such that
subjects would be reluctant to give "Emotion" as a response
to each item. The purpose of this manipulation, therefore,
was to create an implicit bias against giving "emotion" and
to help discover what superordinates other than "emotion"
would be generated. Each form of the questionnaire was
administered to 30 subjects.

Results and Discussion

Each of the 20 target terms generated "emotion" as its superordinate. The percentage of subjects who simply gave "emotion" for each term is shown in Table 8. The word "emotion" embedded in a phrase, or prefaced by an adjective (e.g. "negative emotion") also occurred fairly often. Therefore another set of percentages is shown for responses that either were "emotion" or included the word "emotion" as part of the response. This was done separately for questionnaires with and without filler items. These data also appear in Table 8.

To assess whether "emotion" was elicited as a superordinate label more often for the more prototypical exemplars, the responses for the instances with the 10 highest typicality ratings (Study Three) were averaged. Responses for the 10 less prototypical instances were also averaged. T-tests between mean per cent emotion responses for these two groups were computed for each of the four conditions listed. As shown in Table 9, results were significant and in the expected direction in every case. "Emotion" was elicited as the superordinate category name significantly more often for highly prototypical than for less typical instances regardless of type of questionnaire or type of response considered.

Table 10 depicts the kinds of superordinates given in cases where the word "emotion" was included as only part of the response. Only responses given for two or more terms were

Table 8

Generation of the Superordinate Category for 20 Target Emotion

Terms

| Category | "EMOTION" AS THE RESPONSE | | "EMOTION" INCLUDED AS PART OF THE RESPONSE | |
	No fillers % Subjects	with fillers % Subjects	No fillers % Subjects	with fillers % Subjects
Love	50.00	50.00	64.29	60.00
Sadness	35.71	60.00	53.58	66.67
Hate	35.71	50.00	46.43	50.00
Happiness	32.14	56.67	46.43	60.00
Joy	32.14	46.67	46.43	50.00
Anger	28.57	46.67	46.43	56.67
Depression	28.57	10.00	42.86	10.00
Envy	25.00	30.00	39.29	36.67
Disgust	25.00	36.67	35.71	40.00
Fear	25.00	33.33	39.29	46.67
Guilt	25.00	26.67	39.29	36.67
Pride	25.00	3.33	35.71	3.33
Worry	25.00	26.67	39.29	30.00
Anxiety	21.43	30.00	35.71	30.00
Excitement	21.43	30.00	32.14	40.00
Respect	21.43	0	32.14	3.33
Awe	17.86	10.00	28.57	10.00
Embarrassment	17.86	20.00	35.71	23.33
Boredom	10.71	3.33	25.00	3.33
Calm	10.71	6.67	21.43	6.67

Table 9

Per Cent Subjects Giving "Emotion" as Superordinate Category

	NO FILLERS		WITH FILLERS	
	"Emotion" as the response	"Emotion" as part of the response	"Emotion" as the response	"Emotion" as part of the response
Prototypical Exemplars	31.43	45.76	41.00	47.67
Nonprototypical Exemplars	20.00	32.86	16.67	18.67
t	3.93*	5.28*	8.27**	7.94**

*p < .01

**p < .001

Table 10

Responses Given for Generation of Superordinate Category Task

| | | % OF 20 TERMS |
Category	No fillers	with fillers
Emotion	100	100
Negative Emotion	60	5
Unpleasant Emotion	60	0
Positive Emotion	35	5
Spontaneous Emotion	35	0
Neutral Emotion	30	0
Unhappy Emotion	25	0
Happy Emotion	20	0
Uncontrolled Emotion	20	0
Controlled Emotion	10	0
Pleasant Emotion	10	0

included in this table. When the targets were embedded in other semantically related categories, subjects responded with only the word "emotion" in almost all cases. When the targets appeared alone, more specific responses like "pleasant emotion", "unpleasant emotion", for example, occurred with much greater frequency.

Finally, some superordinates did not include the word emotion. "Feeling" ("feeling", "negative feeling", or "positive feeling") was given as the superordinate response at least once for all 20 emotion categories in both forms of the questionnaire (fillers or no fillers). "State" ("state", "state of mind", "state of being") was given as the superordinate response at least once for 17 of the 20 categories in the "no fillers" version, and for 15 of the 20 categories in the "fillers" version. No other superordinates were generated for more than one category by more than one subject.

The issue of how "emotion" is different from other possible superordinates is an important but neglected issue. Perusal of the definitions offered in the literature on emotion unfold two major interrelated issues. The first is: how is emotion defined? The second, related to the first, is: how is emotion distinguished from other psychological states? The present data suggest that there is an overlapping relationship between "emotions", "feelings", and "states". "Feelings" was given as the superordinate at least once for each of the target terms, and "state" for a majority. Perhaps

emotion, feeling, and psychological state are all terms on one level of a hierarchy, the level here called superordinate. Alternatively, emotion may be a type of feeling, if feeling includes not only emotions, but beliefs, proprioceptive feedback, pains, and illnesses. The relationship between these pyschological states invites further exploration.

<u>Study Six</u>   <u>Family Resemblances</u>

A potential source for prototype emergence in semantic categories is the relationship of particular members of a category to the other members of that category. Rosch and Mervis(1975) demonstrated that the exemplars that share the greatest number of features with other members come to be regarded as protoytpical. This argument is based on the notion that for some natural language categories, category members do not share the same attributes or same set of attributes. Rather, the members are linked through a pattern of shared attributes, and the degree of fit to such a pattern is referred to as family resemblance. The idea is that each exemplar shares one or more features with most other category members. To use a human family as a concrete example, several members of a family may have buck teeth, but all members need not have this feature. Several may have reddish hair, but not all are necessarily redheads. While no particular family member may have all of the family traits, all members probably have several of the traits, although not necessarily

the same ones. The most typical member of the family will have buck teeth and red hair.

Rosch and Mervis(1975) found that more prototypical category members share more of the family attributes. Less typical members have fewer attributes in common with other category members, and have more attributes in common with neighboring categories than do the prototypical cases. For example, consider members of the category furniture: tables and chairs have many features in common. Rugs and lamps do not share as many attributes with each other, nor do they share many attributes with tables and chairs.

The purpose of this study was two-fold. The first purpose was to see if all members of the category emotion have one or more attributes in common (which would enable us to define the concept by listing the criterial attributes). The other purpose was to discover if the category exemplars sharing more attributes with other instances of the concept were those regarded as prototypical.

Method

Subjects. Subjects were 145 students enrolled in pyschology classes at the University of British Columbia. Participation was voluntary. In the first phase, 40 respondents generated attributes for the 20 target emotions (Table 2). In the second phase, 105 respondents rated one emotion term for the presence or absence of the attributes that had been generated by subjects in the first phase.

Phase One: Attribute Generation

The task was described to subjects in the following way:

This is a simple study to find out the characteristics and attributes that are common to people experiencing psychological events. For example, if you were asked to list the characteristics of a person experiencing terror, you might write:

-possible danger occurs--may be real like a bear; may be imaginary like a ghost

-attention is focused on the threat

-heart beats quickly

-eyes open wider

-eyebrows lift

-palms and soles sweat

-thoughts race through the person's mind

-unpleasant sensations are experienced

-the person runs as fast as they can

-hands tremble

-relief is experienced after a few minutes

It might help to imagine you're explaining the meaning of the word terror to a foreigner or to someone who has never experienced it. So, include the obvious. Tell how it comes about and what

happens after. But emphasize a description of how one feels and acts.

Try not just to free associate. If "terror" makes you think of elevators, don't write elevators. We're interested in what is <u>common</u> to instances of terror.

Subjects were instructed to take 2 or 3 minutes to list the attributes for each of ten emotions presented in random order. The particular emotions rated varied from one subject to the next.

Phase Two: Rating Task

In the second phase of this study, subjects were required to act as judges, rating emotions with respect to some of the attributes generated in phase one. The following instructions were provided:

This is a study about our beliefs concerning important psychological states. This study is part of a larger project on the topic.

Please begin by considering one such state, namely, {X}. Remember several occasions in which you or someone you know has experienced {X}. Pause to consider the various forms it might take and some of the various events that might be associated with it.

On the remaining pages of this booklet is a long list of various events that could be involved in any psychological state. Some occur often, some rarely. Your task in this study will be to rate the extent to which each event goes with or is part of {X}.

The attributes were rated using a scale of 0-4 for each of the 20 target emotions as well as the word "emotion", where 0=never; 1=rarely; 2=sometimes 3=often; and 4=always. Each subject provided ratings for one term on 161 attributes.

Results and Discussion

Phase One

The total number of responses generated in phase one was 2425. Creating family resemblance scores therefore required some decision as to which of these responses represented the same and which represented different attributes. The attempt was to be conservative, but still count as the same attribute words or phrases highly similar in meaning. The decision to group responses required a consensus. Two judges, graduate psychology students, performed this task. Most groupings were of identical responses. Some examples of groupings of non-identical responses are "eyes open wider, eyes widen, eyes open, eyes are wide, and widened eyes" were all grouped as "eyes open wide". However, "pupil dilation", "eyes averted", "squinted, narrow eyes", and "bright, sparkling eyes" were

treated as separate attributes. This grouping procedure reduced the number of attributes to 642.

Next, attributes mentioned only once (315) were eliminated, leaving 327 attributes that were mentioned on two or more occasions, either by different subjects for one emotion, or by the same subject for different emotions. The point here is that idiosyncratic responses for single emotion categories were omitted from consideration for the family resemblance scores, since the attributes unique to single members do not contribute to the structure of the category per se.

Each attribute was then weighted by the number of emotions for which it had been generated. For example, a weight of 16 was given to "heartrate increases", because it was listed as an attibute for 16 of the 20 emotions. This was, in fact, the highest weight obtained. A weight of 1 was given to "doesn't care about appearance" because it was endorsed (by two or more subjects) for one emotion (depression).

The 327 attributes and the weight for each appear in Table 11.

Figure 2 depicts how many emotions were credited with a given number of attributes. As can be seen from Figure 2, the number of attributes decreases as the number of emotions to which it applies increases. There were no attributes common to all 20 emotions. In fact, with one exception, there were no attributes in common to more than half the 20 emotions

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Table 11

Attributes Listed for 20 Target Emotion Categories

eyes open wide(9)	pupil dilation(2)	fixed eyes(3)
eyes averted(5)	squinted, narrow eyes(7)	bags under eyes(2)
eyes cold and hard(1)	glaring eyes(1)	bright, sparkling eyes(2)
smiling(7)	laughing(4)	dry mouth and lips(3)
clenching teeth(3)	frowning(5)	scowl(3)
pursed mouth(2)	mouth drops open(2)	lips curl(1)
fists clenched(5)	tears/crying(9)	face turns red(7)
breathe in rapidly and shallow(4)	breathless(2)	easy, relaxed breathing(2)
expel air suddenly(1)	breathe heavily(4)	perspiration/sweat(10)
sweaty palms(7)	trembling/shaking(10)	tingling sensation(5)
voice becomes high-pitched(2)	relaxed(7)	erect, upright posture(3)
knitted brow(3)	raised eyebrows/lifted brow(4)	wrinkling nose(1)
head bowed(2)	bent over posture(4)	body stiff and rigid(3)
look of contentment(1)	pleasant facial expression(2)	look of disdain on face(2)
stern facial expression(2)	unhappy, gloomy expression(1)	strong facial expressions(1)
doesn't care about appearance(1)	hairs raise(2)	feel energetic(4)
chin in palm(1)	increased heartrate(16)	heart pounds(2)
heart races(3)	heartrate slows(5)	heart flutters(2)
heartache(2)	heart and pulse rate regular(1)	adrenalin flow(7)
knot in stomach(5)	stomach muscles tighten(4)	sick feeling in stomach(5)
butterflies in stomach(5)	queasy stomach(5)	stomach churns(3)
feeling localized in stomach(2)	feel heat in body(4)	feel warm inside(6)
body (especially hands) is cold(3)	ears burning(2)	increased blood pressure(2)

tense(9)　　　　　　　　　　muscle tension(4)　　　　　　　　feel tired(3)

no energy, lethargic(4)　　　feeling of lightheadedness(5)

ringing in the ears(3)　　　floating feeling(4)　　　　　heightened arousal(4)

loss of appetite(5)　　　　　bad taste in mouth(1)　　　　heightened senses(4)

pleasant sensations(4)　　　unpleasant sensations(2)　　weak, numb legs(1)

withdrawn(4)　　　　　　　　　ignore people around you(2)　quiet(6)

shout and scream(4)　　　　　rambling talk(2)　　　　　　　talking illogically(5)

impaired verbalization(3)　speechlessness(5)　　　　　　swearing(3)

talkative(6)　　　　　　　　　difficult to verbalize feelings(3)　talk louder(4)

mumbling(2)　　　　　　　　　　stuttering(2)　　　　　　　　　untalkative(2)

talks faster(3)　　　　　　　exclamatory speech(4)　　　　talks softly and quietly(2)

sighing(5)　　　　　　　　　　singing(3)　　　　　　　　　　　humming(2)

staring into space(4)　　　onlooker with amazement(1)　yawning(1)

sleep(2)　　　　　　　　　　　can't sleep(1)　　　　　　　　pleasant to everyone(1)

acting kind to compensate for wrongdoing(1)　　　　　　　engage in violent actions(1)

　　　　　　　　　　　　　　　generous(2)　　　　　　　　　　　running(2)

hugging people(3)　　　　　　avoid object of emotion(2)　escape from object of emotion(2)

try to hide face(1)　　　　cover up by changing subject(1)　laugh it off(1)

don't feel like laughing or smiling(1) feel like celebrating(4)　restlessness(5)

fidget(6)　　　　　　　　　　shuffling, tapping feet(4)　doodle on paper(2)

hands twisting(2)　　　　　　tapping hands and fingernails(2)　hyperactive(4)

jumpy(3)　　　　　　　　　　　quick to react(4)　　　　　　unreactive/unresponsive(2)

slower reflex time(3)　　　slow movements(5)　　　　　　　impaired mobilization and coordination(5)

listens to music(2)　　　　eating(2)　　　　　　　　　　　smoking(2)

drinking(3)　　　　　　　　　in a comfortable physical position(2)　show off(1)

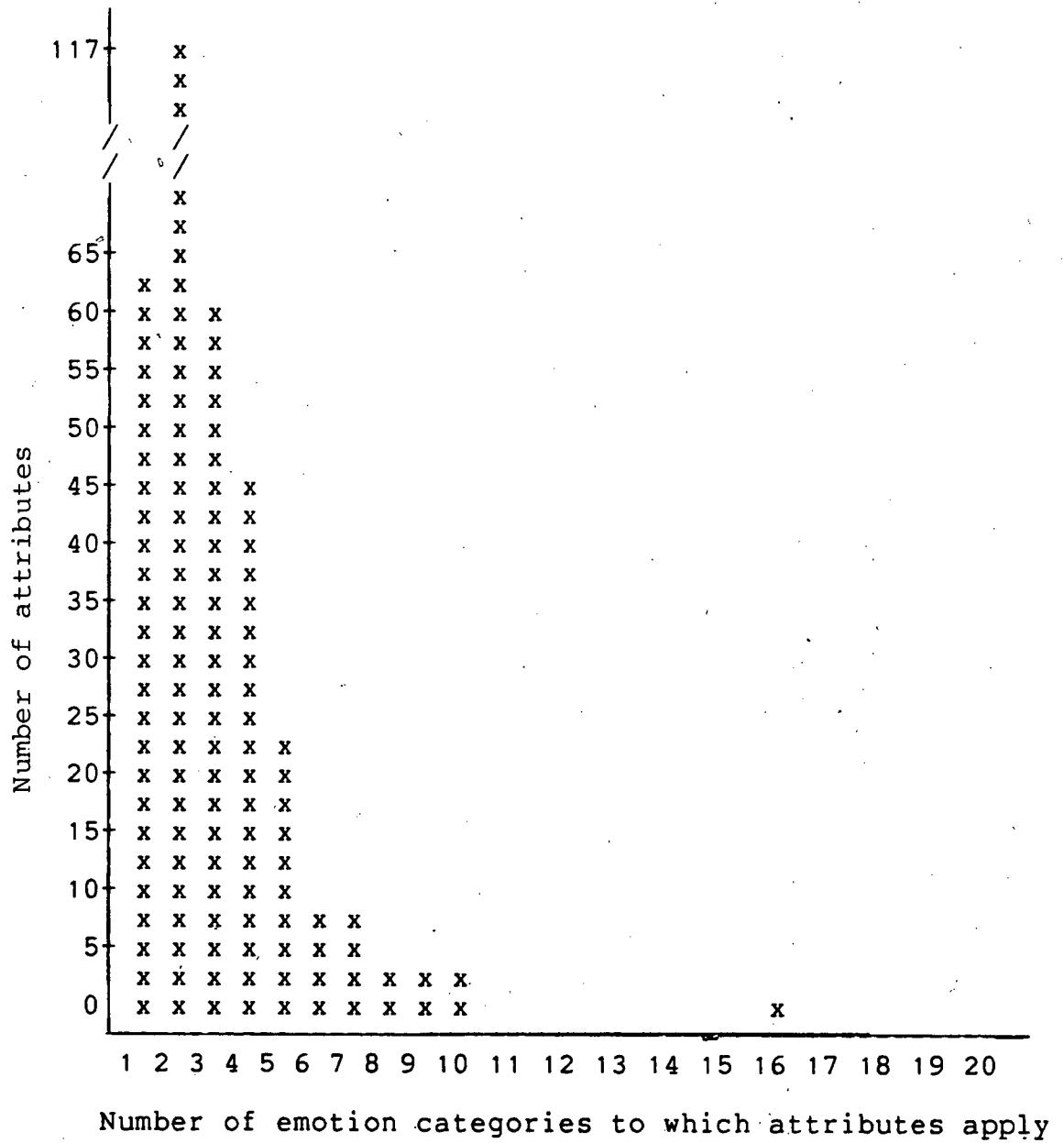avoid notice(2)　　　　　　　stare or look fixedly(3)　　talking things out(2)

make light conversation(3) agree with object of emotion(1) pacing(5)

dancing/jumping(4) bouncy(3) arms wave about(2)

running to the bathroom all the time(1) seek physical release(3)

rapid body movements(3) easy body movements(3) inactive(3)

remain motionless(2) bite lips(3) biting nails(3)

nervousness(7) uneasy(3) can't concentrate(8)

concentration short(2) obessive concern with situation(10) hard to concentrate on anything else(2)

concentration on object of emotion(4) preoccupation with event(5) deep in thought(2)

thoughts race through mind(3) empty thoughts(2) sense of disbelief(2)

happy or pleasant thoughts(4) unpleasant thoughts(3) unorganized, scattered thoughts(3)

evaluation of situation(4) consider solutions(2) irrational thoughts(4)

thinks logically(1) very attentive(2) aware(5)

unaware of surroundings(5) loss of interest(1) thinking is elsewhere(2)

feel unstimulated(1) acute interest(1) closed-minded(2)

feel aggressive toward object of emotion(4) feel hostile(2)

feel confused(4) experience contempt and disdain(1) feel revolted(1)

feel lazy(2) motivated(1) hopeless feeling(2)

everything looks dark(2) feeling of inner emptiness(1) feel lonely(2)

feel isolated(2) want to die(2) feel stupid or foolish(1)

feel self-pity(3) feel humble(2) vulnerable and easily hurt(3)

feel inadequate(5) questioning self(1) feeling of self-worth(3)

feel uncomfortable(3) feel unsure of self(4) disappointed with yourself(1)

feel superior(2) selfish(1) in control(1)

feeling of helplessness and loss of control(4)

revengeful(1)

indecisive(2)

unpleasant expectations(3)

daydreaming(2)

alert(3)

peaceful(2)

feel secure(4)

cheerful(2)

sense of well-being(3)

nothing can possibly go wrong(2)

easygoing attitude(2)

good mood(2)

jubilant(2)

psychological high(2)

feel strong(3)

expressive(2)

feeling of anger(8)

fear or dread(4)

worry(3)

feel down or low(2)

apathetic(2)

remorseful(2)

eager to please(2)

feel discontent(1)

feel guilty(2)

prefer to be alone(3)

collected(2)

emotional buildup(2)

getting ready for an event(1)

feeling of unreality(2)

senses are sharpened(3)

sedate(3)

joy(3)

lighthearted(2)

feel lively(2)

nothing bothers you(2)

everything looks good(4)

feel excited(6)

exhilaration(2)

feeling of fulfillment(2)

admiration(3)

frustration(7)

irritable(6)

feel timid(2)

feel depressed(4)

feel jealous(2)

unpleasant feelings(3)

feel shame(2)

polite/proper(2))t3 want what someone else has(1)

hatred(2)

like to be around object of emotion(1)

seek companionship(2)

cool(2)

anticipation(6)

feel dazed(2)

dreamy feeling(2)

feel self-confident(4)

glad(2)

feel happy(6)

feel contented and satisfied(4)

few worries(2)

not uptight(2)

sense of unity, harmony(1)

elated(4)

bubbly(3)

loyalty(2)

pleasant feeling(4)

feel sad(2)

not easily irritated(2)

fear of outcome(3)

fretful(2)

bitter feelings(2)

sorrow(2)

feel self-conscious(2)

embarrassment(2)

look away from object of emotion(1)

need to talk about situation(5)

want to forget situation(2)   need to mobilize(2)   don't feel like doing anything(3)

want to escape from situation(4)   want to remove object of emotion(3)   feel like crying(2)

want to be verbally/physically violent(1)   wish you could change things(2)

perhaps want to hug someone(1)   want to hide(1)   want to share feeling with others(1)

ecstasy(3)   caring for person(1)   intimate(1)

need to physically touch object of emotion(1)   feel courageous(2)

agitated(1)   debilitated(2)   feeling dissipates quickly(4)

continues until another feeling overrides it(2)   feeling doesn't go away fast(3)

feeling dissipates once incident is over(3)   relief when incident ends(3)

feeling of relaxation when incident ends(2)   spectucular sight-seems unbelievable(1)

losing someone you love(2)   tragic event occurs to self or others(1)

kind(1)   dignity and pride(1)   feel accomplishment(1)

stressed facial expression(1)   feel like screaming(2)

Note: The number in parentheses is the weight assigned to each attribute--each attribute was weighted by the number of
emotions for which it was generated.

Figure 2. Number of attributes generated for each number
of emotion categories.

```
117       x
          x
          x
  /   ∘  /
  /     /
          x
          x
 65       x
        x x
 60     x x x
        x`x x
 55     x x x
        x x x
 50     x x x
        x x x
 45     x x x x
        x x x x
 40     x x x x
        x x x x
 35     x x x x
        x x x x
 30     x x x x
        x x x x
 25     x x x x
        x x x x x
 20     x x x x x
        x x x x x
 15     x x x x x
        x x x x x
 10     x x x x x
        x x x x x x x
  5     x x x x x x x
        x x x x x x x x x x
  0     x x x x x x x x x x                    x

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

Number of attributes

Number of emotion categories to which attributes apply

studied.

Finally, a family resemblance score (termed phase one score) was calculated for each emotion. This score is simply the sum of the weighted attribute scores for that emotion. In this first phase, the family resemblance scores were highly data bound, meaning that the scores were as close to the attribute generation data as possible. These scores are given in Table 13.

Phase Two

A second set of family resemblance scores (termed phase two scores) was more derived than the first set. First, the phase one attributes were re-written in a form amenable to rating on the scale provided. Secondly, any attributes that contained emotion words were eliminated to avoid confounding resemblance with similarity of emotions. Finally, certain phase one attributes that would have been difficult to rate separately were combined. This procedure reduced the number of attributes to 161, which are listed in Table 12. Each subject rated the 161 attributes for either one of the 20 target emotions or the word "emotion". For each term, the attributes were rated by five "judges".

Phase two family resemblance scores were then calculated. The five judges' ratings for a given term were first summed for each of the 161 attributes. The maximum possible sum for any attribute was 20; the minimum sum was 0. The obtained maximum sum was 20; the minimum was 0. An "attribute score" was then computed by taking the mean of the

Table 13

Family Resemblance Scores for 20 Target Emotion Categories

Category	Phase One	Rank	Phase Two	Rank
Excitement	283	1	24632	14
Fear	274	2	28974	11
Worry	261	3	33341	6
Anxiety	248	4	39234	2
Anger	246	5	29459	10
Depression	224	6	29796	9
Joy	220	7	30389	8
Guilt	217	8	39990	1
Pride	211	9	14337	20
Love	202	10	28082	13
Happiness	200	11	31982	7
Embarrassment	190	12	22042	15
Hate	188	13	33985	5
Disgust	183	14	28659	12
Awe	164	15	36560	3
Sadness	155	16	35784	4
Respect	136	17	14635	19
Envy	132	18	15494	18
Boredom	112	19	21351	16
Calm	111	20	17409	17

Note: In the rating task judges were also required to rate the category Emotion. The family resemblance score for this category was 17550.

Table 12

Attributes Rated for 20 Target Emotion Categories

eyes open wider(14.2)   eyes stare(11.05)   pupils dilate(9.35)

eyes are averted (8.7)   person squints; narrows eyes(7.5) bags appear under eyes(8.3)

eyes appear hard and cold(7.25)   eyes appear bright, sparkling(8.45) person smiles(8.85)

person laughs(8.2)   mouth, throat, or lips are dry(9.35) person clenches teeth(7.55)

person frowns(7.3)   person scowls(6.9)   mouth is pursed(8.25)

mouth drops open(7.85)   lips curl(6.4)   fists are clenched(7.2)

person cries, sheds tears(9.3)   face turns red; blushes(9.15)   breathing is shallow and rapid(10)

breathing is easy and slow(8.2)   breathing is heavy(9)   person perspires(9.1)

person trembles(8.55)   person has tingling, prickly, or itchy sensations(7.25)

posture is erect, stiff, or rigid(8.6) brow is knitted(7.35)   brow is lifted(6.7)

nose wrinkles(7)   head bows(7.95)   posture is slumped(7.15)

strong facial expression appears(9.7) hairs raise(8.75)   person feels energetic(9.3)

voice changes(10.15)   heartrateincreases(11.2)   heartrate slows(6.3)

adrenalin flows(9.3)   person feels sensations in stomach(11.7)

body feels cold(6.2)   blood pressure rises(10.05)   muscles tense(10.35)

person feels lack of energy(8.55)   person feels drowsy(5.9)   person feels debilitated(7)

person feels lighthearted(5.9)   there is ringing in the ears(6.55) person feels as if floating(7.6)

person feels highly aroused(9.6)   appetite is lost(9.2)   bad taste is in mouth(5.9)

sensory ability is heightened(8.85) sensations are pleasant(8)   sensations are unpleasant(9.5)

person feels weak or numb in legs(8.25)   body feels warm or hot(9.6)

person feel others are staring(7.6) person is eager to please(7.9)   person acts proper or polite(9.2)

person has strong wants or desires(9.65)   person wants to be near another(10)

person tries to be like another(7.4) person wants to be away from another(9.15)

person wants to run(8.95)

person is quiet, untalkative(10.15)

person swears or curses(6.85)

person mumbles(8.7)

person sighs(8.55)

person yawns(5.25)

person acts friendly and generous(7.35)

person wants to escape from something(8.3)

person doesn't feel like smiling or laughing(8.75)

person shows undirected activity (fidgets, paces, tapping, shuffling, etc.)

person is hyperactive, quick to react(9.9)

coordination and mobilization are slow(8.5)

person is in a comfortable position(8.15)

person is agreeable(9.55)

person wants to be violent(6.4)

movements are vehement(7.8)

person bites lips or nails(8.75)

person tries to evaluate current situation(10.05)

thoughts are irrational(9.4)

person is inattentive or unaware of current enviroment(9.65)

person is unable to concentrate(9.5)

thoughts race though mind(11.05)

person feels worthy, superior, in control, or confident(7.5)

person feels unworthy, inferior, helpless, unconfident(8.05)

person is indecisive(8.9)

there are unpleasant expectations(8)

person wants to withdraw(8.75)

person shouts or screams(7.35)

person is talkative(8.8)

person stutters(7.15)

person wants to sing or hum(6.4)

person can't sleep (7.7)

walk is bouncy(7.7)

person seeks release(9.15)

person wants to show off(4.9)

thoughts are disorganized(10.45)

thoughts are logical(7.25)

person is preoccupied(11)

thoughts are empty(6.5)

person feels concern for another(8.65)

person feels dazed(9.2)

person ignores others(8.4)

ability to speak is impaired(7.7)

person cannot verbalize feelings(8.55)

person speaks fast(8.5)

person stares into space(9.3)

person sleeps(7.85)

person wants to hug another(7.75)

person feels restless(11.45)

person feels like celebrating(7.9)

try to hide face(6.6)

movements and time to react are slow(8.5)

person is optimistic(7.2)

person tries to avoid being noticed(8.1)

arms wave about(7.65)

behavior is repetitive(9.15)

person is inactive or motionless(7.8)

mind is closed(8.55)

person considers plans or solutions(9.6)

person is very attentive or aware(9.65)

person feels unstimulated(7.9)

person is deep in thought(10)

person has a sense of disbelief(7.6)

thoughts are pleasant(8.55)

thoughts are unpleasant(9.35)

there is high anticipation(8.6)

person daydreams(8.95)

person desires to eat, smoke, drink(10.05)

person is pessimistic(8.2)

person feels loyal(7.25)   person admires another(8.85)   person is alert(9.6)

person feels confused(9.16)   person lacks motivation(7.75)   person feels alone or isolated(9.1)

person wants to die(4.85)   person feels stupid(4.85)

person feels vulnerable, easily hurt(6.55)   person feels sense of unreality(8.35)

person feels inadequate(8.95)   person wants to be alone(9.5)   person seeks company of others(8.45)

person wants to talk about current situation(9.75)   person wants to forget(8.15)

person wants to escape(8.7)   person wants to dispose of, or remove situation(10.05)

person wants to touch another(9.25)   person wants to share with another(9.6) person wants to change situation(10.15)

person wants to hide(6.35)   current state will continue(7.05)   current state will dissipate quickly(9.2)

current situation is unexpected(9.25) current situation is tragic(4.8)   face is expressionless(5.3)

Note: The number in parentheses is the attribute score for that attribute. An "attribute score" was computed by taking

the mean of the judges summed responses for a given attribute across the 20 target emotions.

judges' summed responses for a given attribute across the 20 target emotions. The highest possible was 20; the lowest 0. The obtained attribute scores, which ranged from 5.25 to 14.2, are given in parentheses in Table 12. This attribute score was calculated so that attributes more often associated with emotions would contribute more to family resemblance scores than would attributes less associated.

Each term's association with an attribute was then calculated by multiplying the summed judges' ratings by the attribute score. The maximum possible product was 400 (20 X 20); the minimum 0. The obtained maximum product was 227.2; the obtained minimum 0. Finally, these products were summed across all 161 attributes for each term resulting in a family resemblance score for each of the 20 target emotions and the word "emotion". The maximum obtainable score was 64400 (400 X 161); the minimum 0. The obtained range of family resemblance scores was 14337-39990. Phase two family resemblance scores are given in Table 13.

Across the 20 emotion terms, phase one family resemblance scores correlated with phase two scores .44 (correlation of ranks is .34).

Each of the Phase Two family resemblance scores was correlated with the score for the word "emotion". These correlations are given in Table 14.

Subjects found it meaningful to generate attributes for the 20 target emotion terms. The attribute "heartrate increases" received the highest weighting. Other

Table 14

Correlations between Family Resemblance Scores for "Emotion" and

20 Target Emotion Categories

Category	Correlation	Probability
Embarrassment	.25	.01
Guilt	.19	.01
Awe	.17	.01
Excitement	.17	.01
Hate	.16	.02
Anger	.14	.04
Envy	.13	.05
Happiness	.13	.05
Pride	.13	.05
Respect	.12	.06
Love	.10	.11
Worry	.10	.10
Joy	.08	.15
Fear	.07	.20
Anxiety	.06	.21
Disgust	.03	.36
Sadness	.02	.37
Boredom	.00	.48
Depression	.00	.46
Calm	-.04	.30

physiological attributes like "perspiration/sweat" and "trembling/shaking" received a weight of 10, which was the second highest weight assigned to any attribute. The reason for this pattern of results is not readily apparent.

In the second phase, based on attribute ratings, the highest ratings were given to attributes like "eyes open wider", "heartrate increases", "breathing is shallow and rapid", "person feels sensation in stomach", "blood pressure rises", "muscles tense", and so on. Once again, physiological/physical appearance changes were emphasized.

In this phase, five subjects (judges) were required to rate the word "emotion". The attribute for "emotion" that received the highest score was "strong facial expression appears". The sum of the ratings for this attribute was 18 (the highest possible score was 20). The next highest summed rating (16) was for "person seeks release" and for "thoughts race through mind". A rating of 15 was given to the following attributes: "person feels highly aroused", "person wants to be near another", and "person shows undirected activity (fidgets, paces, tapping, shuffling, etc.)".

What emerges from the two sets of family resemblance scores is that the category emotion does not possess a set of defining attributes. Rather, members of the category resemble each other in overlapping and criss-crossing ways that vary in kind and number, with no one attribute being shared by all emotions. Hilgard(1953) commented that, "Emotional states as experienced in ordinary life are complex and little is gained

by trying to distinguish sharply among the various emotions" (Hilgard, 1953, p.142). It may be the case that nothing is gained by making sharp distinctions, and that in fact, the internal structure of the category defies doing so.

GENERAL DISCUSSION OF INTERNAL STRUCTURE

It is through the convergence of operations that the internal structure of a category is demonstrated. In Study Three, prototypicality ratings were obtained for some of the emotion terms generated in Study One. The fact that subjects found it meaningful to rate the terms for goodness of example, and that they agreed with one another, suggests that the category emotion may be internally structured. If this was the case, one would expect that the internal sturcture of the category would affect performance on various measures. To recapitulate, the measures employed in this study were:

1. Free production of exemplars.

2. Reaction time to verify category membership.

3. Probability of elicitation of "emotion"

   as the category name.

4. Family resemblance scores.

Table 15 provides the prototypicality ratings for the 20 target emotions as well as the scores on the other measures for each of the 20 terms. The correlations between these measures, both for raw scores and ranks appear in Table 16. An examination of Table 16 reveals that the degree of representativeness correlates significantly with frequency of

Table 15

Convergence of Operations

EMOTION as Superordinate   Family Resemblances

Category	Study 1 (All)	Rank	Study 1 (1st 4)	Rank	Hunt & Hodge	Rank	Typicality Ratings	Rank	No Fillers	Rank	Fillers	Rank	S's	Rank	Judges	Rank
Happiness	76.0	1	51.0	1	29.75	4	5.00	5	46.43	4.5	60.00	2.5	200	11	31982	7
Anger	74.5	2	49.0	2	27.75	5	5.15	2	46.43	4.5	56.67	4	246	5	29459	10
Sadness	68.0	3	42.5	3	22.75	6	5.04	4	53.58	2	66.67	1	155	16	35784	4
Love	62.0	4	38.5	4	52.25	2	5.46	1	64.29	1	60.00	2.5	202	10	28082	13
Fear	48.0	5	24.5	5	53.25	1	4.78	6	39.29	9.5	46.67	7	274	2	28974	11
Hate	44.5	6	19.5	6	44.50	3	5.26	3	46.43	4.5	50.00	5.5	188	13	33985	5
Joy	41.0	7	13.0	7	15.75	7	4.89	8	46.63	4.5	50.00	.5	220	7	30389	8
Excitement	26.5	8	6.5	8	5.00	10	4.58	9	32.14	16.5	40.00	8.5	283	1	24632	14
Anxiety	25.0	9	3.5	10	7.00	9	4.29	13	35.71	13.5	30.00	12.5	248	4	39234	2
Depression	21.0	10	4.0	9	7.50	8	4.73	7	42.86	7	10.00	15.5	224	6	29796	9
Disgust	13.5	11	2.5	13	1.00	14	3.71	15	35.71	13.5	40.00	8.5	183	14	28659	12
Guilt	11.0	12	3.0	11.5	1.25	13	4.55	10	39.29	9.5	36.67	10.5	217	8	39990	1
Embarrassment	10.00	13	3.0	11.5	2.5	17	4.36	11	35.71	13.5	23.33	14	190	12	22042	15
Worry	9.5	14	1.5	14	.75	15.5	3.84	14	39.29	9.5	30.00	12.5	261	3	33341	6
Envy	7.0	15	.5	15.5	1.50	12	4.13	12	39.29	9.5	36.67	10.5	132	18	15494	18
Pride	6.0	16	0	18.5	.75	15.5	3.33	17	35.71	13.5	3.33	19	211	9	14337	20
Calm	4.5	18	0	18.5	0	19	2.75	18	21.43	20	6.67	17	111	20	17409	17
Boredom	4.0	18	0	18.5	0	19	2.71	19	25.00	19	3.33	19	112	19	21351	16
Respect	3.5	19	.5	15.5	.5	15.5	2.49	20	32.14	16.5	3.33	19	136	17	14635	19
Awe	2.0	20	0	18.5	0	19	3.46	16	28.57	18	10.00	15.5	164	15	36560	3

Table 16

Correlations for 20 Target Emotions Among Measures of Internal Structure

	1	2	3	4	5	6	7	8
1. Frequency of Free Listing-a		.97	.80	.80	.86	.77	.34*	.40
2. Frequency of Free Listing-b	.98		.76	.70	.80	.73	.21*	.32*
3. Frequency of Free Listing-c	.89	.86		.70	.69	.70	.30*	.28*
4. Prototypicality Ratings	.92	.93	.87		.85	.83	.56	.56
5. Probability of "Emotion" as Superordinate-d	.91	.89	.80	.88		.78	.37*	.49
6. Probability of "Emotion" as Superordinate-e	.81	.82	.75	.88	.82		.30*	.37
7. Family Resemblance (Phase One)	.47	.46	.39	.42	.28*	.29*		.44
8. Family Resemblance (Phase Two)	.39	.41	.30*	.45	.43	.40	.34*	

* not significant at .05 level

**"Emotion included as part of the response" data

Note: Correlations above diagonal based on raw scores; correlations below the diagonal based on ranks.

   a=Study One (all responses)

   b=Study One (first four responses)

   c=Hunt & Hodge (1971)

   d="Emotion" included as part of the response data (Fillers)

   e="Emotion" included as part of the response data (No fillers)

listing in a free production of exemplars task. This relationship held true when all Study One responses were considered, as well as when only the first four were used. The Hunt and Hodge frequency data also correlated significantly with prototypicality ratings.

As already mentioned, reaction time to verify the category membership of the prototypical cases was faster than for less typical cases.

It was also predicted that "emotion" would be given as a response to the question "To what general category does this instance belong?" more often for prototypical than nonprototypical cases. As shown in Table 16, ratings of typicality correlated significantly with the number of subjects who gave "emotion" as a response for each item.

Finally, two sets of family resemblance scores were computed with the expectation that the prototypical exemplars would have the highest family resemblance scores. Both sets of family resemblance scores correlated significantly with prototypicality for the raw score data. Only the first set of family resemblance scores correlated significantly with prototypicality for correlations based on ranks. Family resemblance did not correlate significantly with many of the other measures.

In several studies, measures of internal structure were available for an additional 30 emotion categories. Prototypicality was correlated with the frequency of free listing measures. These correlations appear in Table 17.

Table 17

Frequency and Prototypicality Correlations for 30 Categories of

Emotion

	1	2	3	4
1. Frequency of Free Listing-a		.75*	.47*	.46*
2. Frequency of Free Listing-b	.68*		.40*	.23
3. Frequency of Free Listing-c	.51*	.51*		.21
4. Prototypicality Ratings	.42	.29	.21	

* p <.05

Note:

    a=Study One (all responses)

    b=Study One (first four responses)

    c=Hunt & Hodge (1971)

Correlations between frequency and prototypicality ratings for all 50 emotion categories appear in Table 18.

If "emotion" was definable in the classical sense, the category members should not have varied in how much they came to mind. Moreover, it would have been meaningless for subjects to rate instances for goodness of example, since within a classical view each instance is equally representative of the category. Similarly, based on the assumption of equivalence of category members, one would not have expected differential response rates in reaction times to verify category membership. Each category member should have an equal probability of eliciting the category name if all instances were equal, which was not the case in this study. Finally, within the classical view, category members would not demonstrate a family resemblance relationship, but would rather possess a common set of criterial attributes.

Based on the converging results obtained in this study, it appears that the concept "emotion" is more amenable to a prototype, than a classical, conceptualization.

Conclusion

The aim of the research reported here was to test the feasibility of viewing the concept of emotion from the perspective of Rosch's theory of concepts. Because no research had previously been done on this topic, these studies were highly exploratory. And yet the results could hardly have been more encouraging. Nearly all of the predictions derived from Rosch's theory worked well when

Table 18

Frequency and Prototypicality Correlations for 50 Categories of

Emotion

	1	2	3	4
1. Frequency of Free Listing-a		.97	.84	.77
2. Frequency of Free Listing-b	.91		.81	.66
3. Frequency of Free Listing-c	.87	.83		.66
4. Prototypicality Ratings	.78	.71	.72	

Note: All correlations are significant at .01 level.

    a=Study One (all responses)

    b=Study One (first four responses)

    c=Hunt & Hodge (1971)

extrapolated to and tested in the domain of emotion.

The focus so far has been on the issue of a definition of emotion. And certainly the success of working within Rosch's framework contrasts with the frustration expressed by the writers who attempted to define "emotion" from a classical perspective of criterial features. It would appear that attempts to classically define the everyday word "emotion" are unlikely to succeed in the future. Atempts to specify the border of the concept emotion (such that, for example, "anger" is and "pride" is not an emotion), or to specify boundaries between specific emotions, are also unlikely to succeed. Attempts to achieve a definitive list of "the emotions" will probably not meet with success, either. Yet the real gain from the evidence uncovered here concerns not the explicit theory of the experts, but the implicit theory of the layperson. This evidence provides a new and interesting picture of how people think about emotions.

People can be thought of as possessing , or capable of creating, an implicit taxonomy for the categorization of emotional states. The taxonomy is hierarchically organized but in quite a simple way. At one level, superordinate, is the category emotion. Below that level is a middle level consisting of a large but indeterminate number of categories such as "happiness", "love", "anger", and "fear". Both of these levels are coded with single words in the English lanugage and are thus easily used. Evidence here indicated that people may be able to create an even lower level by

subdividing the middle level categories, but few such subdivisions are coded in English and subjects do not agree with one another on their subdivisions. In other words, there is no ready-made scheme. Similarly, people can create a level between the middle and superordinate, but again there is no ready-made scheme and no pre-coded categories. The major divisions were pleasant, neutral, and unpleasant, although other divisions were used as well. Notice that unpleasant-pleasant is actually just a single feature, and therefore may be classically, rather than prototypically, defined. Many subordinate level categories, such as "irrational anger" were also of this sort.

Evidence here also indicated that people think of anger, happiness, and love as better examples of an emotion than pride, awe, and respect. This is so even though the latter three are, nonetheless, still classified as emotions by various criteria. These better examples come to mind more readily than do poorer examples when the word "emotion" is mentioned. People hesitate when verifying that the poorer examples are emotions.

These behaviors point to the psychological reality of what Rosch calls the internal structure of a concept. If this evidence for the internal structure of emotion is replicated, then there is strong reason to believe that subjects will show other sorts of behaviors that have been associated with internal structure. For example, Mervis and Rosch (1981) hypothesize that we distort our memory toward the prototype.

Thus an emotional incident might be remembered as more prototypically anger, or love, or whatever, than it actually was.

Rips (1975) showed that internal structure influences inductive judgements. Subjects were more willing to generalize from prototypical members of a category to nonprototypical members than vice-versa. Told that robins (prototypical birds) have a new disease, subjects were more willing to guess that ducks (nonprototypical birds) will catch the disease than they were willing to generalize to robins when told that ducks have the disease. One would expect internal structure to influence judgments in the domain of emotion as well.

Because Rosch's theory has proved successful in the domain of emotions so far, it may be worthwhile to mention two additional hypotheses not addressed in the present set of studies. First, we might hypothesize that actual emotional states consist of a large number of features, no one of which defines "anger", "love", or any other middle level emotion category. Just as these middle level categories vary in their representativeness of the superordinate "emotion" (i.e. as shown here), real world emotional events vary in the extent to which they are representative of "anger", etc. Some occasions involve prototypical anger states, whereas others involve states that only resemble anger to a limited degree. Similar hypotheses can be generated for behaviors, for example (some are more representative of anger than others),

or for facial expressions (some are better expressions of anger than others).

A second hypothesis derived from Rosch's theory is that the middle level of the emotion hierarchy is a basic level. According to Rosch and Mervis, "the most cognitively efficient, and therefore the most basic level is that at which the information value of attribute clusters is maximized" (Mervis and Rosch, 1981, p.92). Rosch et al. (1976a) found that the number of attributes generated between hierarchical levels varied, with more attributes being generated at the basic level. Concerning the content of attributes, they discovered that for superordinate categories, attributes of a very general nature were provided. At the basic level, significantly more nouns and adjectives were used. Those few attributes which were added at the subordinate level were almost exclusively adjectives.

In addition to free listing of attributes for object names, subjects were required to list attributes for visually present objects in the Rosch et al. (1976a) study. The attributes listed in this situation did not differ from those previously generated from memory. Rosch et al. (1976a) have extended these findings to various other domains. For example, they found that the number of motor movements when interacting with the various categories differed significantly between categories, such that more motor movements were given for basic level categories. This number did not significantly increase at the subordinate level. The

results were replicated when a live model performed the actions.

These researchers also overlapped two-dimensional line drawings of items in each category. A large and consistent increase in similarity of the overall look of objects was obtained for basic level over superordinate categories. A significant, but significantly smaller, increase in similarity was obtained for subordinate over basic level categories.

Similar results were obtained when the pictures were superimposed and the lines averaged. Basic level averaged shapes were guessed correctly more times than their corresponding superordinate shape. Again, there was no evidence to suggest that subordinate level shapes were identified better than basic level.

How might one attempt to establish basic level of emotion categories? A direct application of Rosch's techniques seems feasible for priming experiments. She found that in a task requiring recognition of a basic level category name, priming with the basic level name facilitated responding to a greater extent than priming with either the superordinate or subordinate category names (Rosch et al., 1976a). These findings were replicated when the dependent measure was response latency in picture recognition.

In the present research, subjects were required to generate attributes only for the middle level catgories. In future research, subjects could be asked to generate

attributes for superordinate, middle, and subordinate categories. If the conjecture that categories like "happiness", "anger", and "love" are basic level is true, we would expect that more attributes would be generated for these categories than for the superordinate category emotion. Concerning the content of attributes, we would expect attributes of a very general nature to be generated for "emotion". At the basic level, we would expect more nouns and adjectives, while attributes generated for the subordinate level would mostly be adjectives.

Basic level is learned first developmentally and is coded fist in languages historically. If our middle level categories are basic level, we would expect children to learn categories like "happy", "sad", and "angry" before categories like "emotion" (superordinate) or "contentment" (a subordinate of "happiness"). Basic level is more likely to appear cross-culturally than other levels. This finding could also be tested in the domain of emotion concepts.

In sum, an optimistic picture has been painted of emotion as a Roschian concept. In order to make this case with greater certainty, the studies here should be replicated and the new hypotheses generated should be tested.

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