INVESTIGATION OF AFFECTIVE FACIAL EXPRESSIONS THROUGH SLOW MOTION AND NORMAL SPEED VIDEOTAPE TECHNIQUES

Dissertation for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

DAVID J. INMAN

1976

This is to certify that the

thesis entitled

Investigation of Affective Facial Expressions through Slow Motion and Normal Speed Videotape Techniques

presented by

David J. Inman

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Counseling, Personnel Services and Educational Psychology

William W. Farquhar (signature)

Major professor

Date August 4, 1976

INVESTIGAT
THROUG

Facial ex
related to inter
have had mixed
relationship.
of trained pers
facial expressi
categories: in
startle, distre
disgust.

Facial ex
the effect of t
varied in two
dependent meas
fication of em
number of emot

A videot
segments was p
while spontane

ABSTRACT

INVESTIGATION OF AFFECTIVE FACIAL EXPRESSIONS
THROUGH SLOW MOTION AND NORMAL SPEED
VIDEOTAPE TECHNIQUES

By

David J. Inman

Facial expressions have often been thought to be related to internal emotional states, but previous studies have had mixed success in determining the nature of this relationship. The present study investigates the ability of trained persons to identify emotions from spontaneous facial expressions using the following six affective categories: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, and contempt-disgust.

Facial expressions were recorded on videotape, and the effect of tape speed (normal vs. slow motion) were varied in two presentations (time 1 and time 2). Two dependent measures were recorded: the accuracy of identification of emotions from facial expressions and the overall number of emotions observed.

A videotape composed of a series of five second segments was produced; in each segment a subject was filmed while spontaneously displaying a recognizable facial

expression. An
tion so that
e-sixth normal
Twenty-ni
Michigan State
expressions of
ories. Subjec
with each group
viewed the norm
normal speed ta
group three vie
and group four
Two depen
of identificati
and number of a
analysis of var
effects of tape
of these two de
was mailed to a
questionnaire m
the tapes, the
value of the o
The prim
1. Trai
facial express
each of the si

expression. An identical videotape was edited in slow motion so that each segment was slowed to approximately one-sixth normal speed.

Twenty-nine students in the College of Education at Michigan State University were trained to identify facial expressions of emotions in each of the six affective categories. Subjects viewed the stimulus tapes in four groups, with each group viewing the material twice. Group one viewed the normal speed tape twice; group two viewed the normal speed tape followed by the slow motion version; group three viewed slow motion followed by normal speed, and group four viewed the slow motion version twice.

Two dependent variables were recorded: accuracy of identification of the predominant affect in each segment, and number of affects seen during a segment. A multivariate analysis of variance for repeated measures analyzed the effects of tape speed and test-retest procedures on each of these two dependent variables. A post hoc questionnaire was mailed to all people who rated the tapes. Items on the questionnaire measured raters' state of mind while viewing the tapes, the quality of the tapes themselves, and the value of the overall study.

The primary results of this study were as follows:

1. Trained subjects can accurately identify facial expressions in both slow motion and at normal speed in each of the six emotional categories.

2. In ge

of facial expre

of emotions tha

speed.

3. Train

pressions in sl

accurately than

speed.

4. If a

not record a gr

trials.

5. If a

identify emotic

in later trials

6. Rate

the retest ra

raters who view

These res

theories of fa

videotapes of

observers to t

and thereby fa

emotion from f

2. In general, trained raters who view a videotape of facial expressions in slow motion record a greater number of emotions than if they view that same videotape at normal speed.

3. Trained raters who view a videotape of facial expressions in slow motion do not identify expressions more accurately than if they view that same videotape at normal speed.

4. If a slow motion tape is viewed first, raters do not record a greater number of facial expressions in later trials.

5. If a slow motion tape is viewed first, then raters identify emotions from facial expressions more accurately in later trials.

6. Raters who view a videotape in slow motion during the retest rate the value of the overall study lower than raters who view the normal speed tape during retest.

These results are discussed in relation to several theories of facial expression. It is theorized that playing videotapes of facial expressions in slow motion sensitizes observers to the nuances of minute facial muscular movement and thereby facilitates more accurate identification of emotion from facial expression.

INVESTIG

THR

in pa

INVESTIGATION OF AFFECTIVE FACIAL EXPRESSIONS THROUGH SLOW MOTION AND NORMAL SPEED VIDEOTAPE TECHNIQUES

By

David J. Inman

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1976

To Linda,

thousand incon

appreciate the

to be believed

DEDICATION

To Linda, who has lovingly endured through a thousand inconveniences, and who will never fully appreciate the importance of her constancy. It helps to be believed in.

Without t
would never ha
mentioned here.

To Bill
support served
times.

To Sam P
on my life wil

To Cecil
energy, and wh
development as

To Alber
influence on

To Bob
and experiment
would be nothi

And fin
contributed t
Landvoy, Bo
Stott, Mike T
the students

ACKNOWLEDGMENTS

Without the help of a great many people, this project would never have been possible. A few of them are mentioned here.

To Bill Hinds whose unfailing encouragement and support served as much needed sustenance during many trying times.

To Sam Plyler, whose gentle but powerful influence on my life will long be cherished and remembered.

To Cecil Williams, who freely gave his time and energy, and who significantly contributed to my growth and development as a counselor.

To Albert Rabin, whose teachings had a great influence on me during my graduate studies.

To Bob Wilson, without whose knowledge of statistics and experimental procedures, this noble edifice of research would be nothing but a clapboard shanty.

And finally, to the many people who graciously contributed their time and energy to this project: Roger Landvoy, Bob Tomory, Fritz Johnson, Larry Serna, Fran Stott, Mike Talmo, Michael Gieser and the twenty-nine students who rated the videotapes.

TABLE OF CONTENTS

CHAPTER

CHAPTER

CHAPTER Page

Table

LIST OF TABLES

Table

Figure

LIST OF FIGURES

APPENDIX

LIST OF APPENDICES

APPENDIX

Q. Answer

R. Answer

S. Prelimi
Quest

T. Post Ho

U. Data Ma
of Ri

V. Data Ma
Perce
Answe

W. Data Ma

APPENDIX Page

The prob

emotion is on

psychology.

feelings and

scientific te

cover specifi

sponses that

ences. The f

facial behavi

emotions.

It is c

site of emoti

a great deal

pressions are

states. Who

mouth," "a tr

your umbrella

Phrases such

were not thou

The relevant

CHAPTER I

INTRODUCTION

The problem of how to analyze, measure, or record emotion is one of the most complex areas in the field of psychology. Human beings commonly react to their inner feelings and emotions, and yet experimental methods and scientific technology have for the most part failed to uncover specific patterns of behavioral or physiological responses that reliably correspond to these subjective experiences. The focus of this study is to delineate patterns of facial behavior which correspond to these subjectively felt emotions.

It is commonly believed that the face is the primary site of emotional communication, and that people can discern a great deal from facial expressions. Moreover, facial expressions are commonly thought to be associated with inner states. Who has not heard such expressions as, "down in the mouth," "a troubled brow," or proverbs like, "let a smile be your umbrella" and "the eyes are the window to the soul." Phrases such as these would be meaningless if inner feelings were not thought to be associated with facial expressions. One relevant question would appear to be "Why are the emotions so co

through the fa

Ekman (1

in its locati

attributes re

The face is t

nose and mout

face commands

Moreover, the

cate and comp

muscles are s

movable parts

the muscular

But wha

of facial mus

for the manip

but lower ani

a less comple

1929). It se

muscles is to

Izard (1971)

movement of

nerves) they

placed in a

must communic

aggression to

emotions so commonly thought to be communicated specifically through the face?"

Ekman (1972), notes that the face is both commanding in its location and complex in its musculature; these attributes render it an excellent medium of communication. The face is the locus of many sensory organs--eyes, ears, nose and mouth; and being situated on top of the torso, the face commands more attention than other parts of the body. Moreover, the muscles of the face form one of the more intricate and complex muscular systems in the body. The facial muscles are small, highly mobile, and attached to easily movable parts. Thus the great potential for movement and the muscular complexity of the face also commands attention.

But what is the purpose of this highly complex system of facial muscles? Of course some muscles are necessary for the manipulation of the mouth and the sensory organs, but lower animals move these organs very efficiently with a less complex facial muscular system (Huber, 1931; Gregory, 1929). It seems possible that a partial function of facial muscles is to communicate information about the organism. Izard (1971) reported that when Rhesus monkies were denied movement of facial muscles (through cutting the facial nerves) they were attacked twice as often as normals when placed in a new colony. Thus the face of the normal monkies must communicate some information which serves to inhibit aggression toward them in other monkies of the same species, and thus are

The fac

nicate inform

mobile set of

tion to occur

and the conte

most facial e

the purpose c

communication

in the verbal

felt that the

nication. Th

summed up by

human mind is

which the pas

energy, in wh

line and each

the expression

signs the im

There a

facial expre

The first is

explains how

level) with

facial expre

and thus are less likely to be attacked.

The facial muscle system may then function to communicate information to other organisms, and a complex and mobile set of facial muscles is necessary for this communication to occur. The process by which the face communicates and the content of this communication are the topics of most facial expression research. Ekman (1969) noted that the purpose of most research in the area of non-verbal communication is to gain information which is not available in the verbal channel. Most researchers in this area have felt that the face is the primary source of emotional communication. The importance of facial behavior was eloquently summed up by Duschenne in 1862 when he stated, "When the human mind is perturbed, the face becomes a vivid picture in which the passions are rendered with much tenderness and energy, in which each motion of the mind is reflected by a line and each action by a vivid impression which precedes the expression of will. It uncovers and reflects by varying signs the images of our most secret emotions."

Theory

There are several issues involved in explaining how facial expressions might be embued with emotional meaning. The first issue involves the development of a theory that explains how emotions are associated (on a physiological level) with facial expressions. Another issue is how such facial expressions have developed in an evolutionary context.

The final iss

variability o

Emotions and

The fir

mechanisms by

expressions.

theorists who

back as a com

Cannon (1927)

general skeleta

this concept

particular is

William

an affective

directly the

feelings of

(James, 1884

enced, the e

the body mus

changes whic

James' theor

primarily on

However, Jam

muscles as i

skeletal mus

to extend Ja

The final issue involves the question of why there is such variability of research success in this area.

Emotions and Facial Expressions

The first issue to be reviewed is the theoretical mechanisms by which emotions become associated with facial expressions. The discussion here is confined to those theorists who provide some basis for skeletal muscular feedback as a component of emotional experience. James (1884), Cannon (1927), and Arnold (1960), all emphasize the importance of general skeletal feedback in producing emotions. Tomkins extends this concept and argues that facial muscular feedback in particular is essential to emotional experience.

William James, perhaps the most famous originator of an affective theory, states that "the bodily changes follow directly the perception of the existing facts and that our feelings of the same changes as they occur IS emotion" (James, 1884). Thus in order for an emotion to be experienced, the environmental situation must first be perceived, the body must then react to this perception, and the bodily changes which ensue are experienced as emotion. Reviews of James' theory (Cannon, 1927; Wenger, 1950) have focused primarily on visceral changes and their effect on emotion. However, James also included the skeletal or voluntary muscles as important in emotional experience. Since the skeletal muscles include the facial system, it is possible to extend James' theory to include facial reactions to

stimuli. Th
along with ot
the experienc

Other a
Arnold) also
an integral p
James, howeve
muscular and
Rather, musc
essential co
are constru
of sources:
processes (
1957). No
specifical
involvemen
feedback.

Syl
1964) is
essentia
Tomkins,
He dist
provide
system,
defici
recei

stimuli. Thus feedback from the facial muscular system along with other visceral and muscular changes would produce the experience of emotion in James' system.

Other affective theorists (Cannon, Lindsay, and Arnold) also include feedback from the skeletal muscles as an integral part of the experience of emotion. Unlike James, however, these theorists do not believe that muscular and visceral feedback is the sole cause of emotions. Rather, muscular feedback is seen as an important but not essential component of the experience. Sensations which are construed as emotions are felt to arise from a variety of sources: thalamic structures (Cannon, 1927), cortical processes (Arnold, 1960) or reticular structures (Lindsay, 1957). None of these authors discuss facial muscles specifically, but each has implied possible facial muscular involvement under the general heading of skeletal muscular feedback.

Sylvan Tomkins' theory of emotion (Tomkins, 1962, 1963, 1964) is significant in its treatment of the face as an essential part of affective experience. According to Tomkins, affects are the primary motives of human beings. He distinguished affects from drive stimuli in that drives provide information about deficiencies in the physiological system, while affects provide motives for responding to these deficiencies. Regardless of what information an individual receives about his drives, he is not likely to act on it until he has

example, if a

ily, he is l

in eating (in

affect). On

middle of a h

although he m

drives (i.e.,

rectify this

anger, thus

According to

one is hungr

Tomkin

which he cal

affects he h

both the mil

cular affec

include: i

startle, di

fear-terror

differentia

and each ha

perienced

positive a

rewarding

gust, ange

until he has some affect associated with the drive. For example, if an individual experiences hunger while sitting idly, he is liable to eat because he becomes interested in eating (interest-excitement is defined by Tomkins as an affect). On the other hand, if this individual is in the middle of a heated argument, and is experiencing anger, then although he might obtain the same information from his drives (i.e., that he is hungry), he will not behave to rectify this situation until he has achieved closure on his anger, thus permitting him to attend to the hunger drive. According to Tomkins then, one does not eat merely because one is hungry: one must also be interested in eating.

Tomkins defines eight specific motivational states which he calls affects (Tomkins, 1963, 1964). Each of these affects he has labeled with a dual term which symbolizes both the mild and the severe manifestations of this particular affective state. The emotions defined by Tomkins include: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, contempt-disgust, fear-terror, and shame-humiliation. These eight states are differentiated by varying rates of neural firing over time, and each have specific reward values, being innately experienced as either positive or negative conditions. The positive affects (joy, interest, and surprise) are innately rewarding experiences, and the negative states (fear, disgust, anger, distress, and shame) are innately unpleasant and negative e

motivational a

internal syst

are triggered

Perhaps

theory is his

of affective

internal inte

communicate a

other and inw

or sneers or

1964). The e

an affect is

has a positi

taneously it

value in that

state of the

mirror of the

communicates

Evolution of

Charles

in Man and A

facial expre

states (Darw

pressions (D

sions as obs

and negative experiences. Thus, through a system of motivational affective states, Tomkins has contructed an internal system of affective rewards and punishments which are triggered by events in the environment.

Perhaps the most significant aspect of Tomkins' theory is his belief that the human face is the primary site of affective behavior. "Affects are not private obsure internal intestinal responses but facial responses that communicate and motivate at once publicly outward to the other and inwards to the one who smiles or cries or frowns or sneers or otherwise expresses his affects" (Tomkins, 1964). The expression of affects has then a dual outcome: an affect is at once an internal differentiated state which has a positive or negative motivational value, and simultaneously it is a facial expression which has communication value in that it informs the environment of the internal state of the organism. To Tomkins, the face serves as the mirror of the emotional state of the individual, and communicates this internal state to the world at large.

Evolution of Facial Expressions

Charles Darwin, in his work The Expression of Emotion in Man and Animals was the first theorist to explain how facial expressions may have become associated with emotional states (Darwin, 1872). Utilizing Duschenne's work on expressions (Duschenne, 1862), Darwin treated facial expressions as observable behavioral correlates of internal affective s

had surviv

the specie

Darw

value for

behavior.

Darwin ex

devotion,

shame. I

investiga

fifty yea

bution to

expressio

Si

theory o

The Emot

postulat

small nu

are comb

Plutchik

physiolo

merely

logical

the pri

elation

ted wit

affective states. He believed that these external displays had survival value by communicating to various members of the species the internal state of the organism.

Darwin's recognition that facial affects had survival value for a species was vital to his understanding of human behavior. In The Expression of Emotion in Man and Animals Darwin examined such states as weeping, laughter, love, devotion, anger, contempt, disgust, surprise, fear, and shame. It is noted that many of these affective categories investigated by Darwin are those which Tomkins mentioned fifty years later. Thus Darwin had made a lasting contribution to the field long before emotions and facial expressions were popular topics of research.

Sixty years after Darwin, Plutchik forewarded a theory of emotional development. In his book entitled The Emotions: Facts, Theories, and a Model, Plutchik (1962) postulated several ideas. First of all, there exist only a small number of pure emotions; other more complex affects are combinations of the few primary affects. Moreover, Plutchik believed that the primary affects differed both in physiology and behavior. Thus the affects themselves were merely hypothetical constructs defining a variety of physiological and behavioral responses. According to Plutchik, the primary affects consisted of fear, disgust, wonder, anger, elation, and tenderness. Each of these emotions is associated with a behavioral "instinct" which has survival value

for both i
species it
survival w
learning t
from that

Plut
correspond
for the em
der, pugna
the emotio
tion of t
instinct
environme
the indiv

Ire
identifie
from eith
Accordin
function
dating b
example,
a specie
members
to the g
deference
the domi

for both individual members of a species and for the species itself. The affect of fear, for instance, has survival value in the instinct of flight. Obviously, learning to be afraid of a situation and learning to flee from that situation are both essential elements of survival.

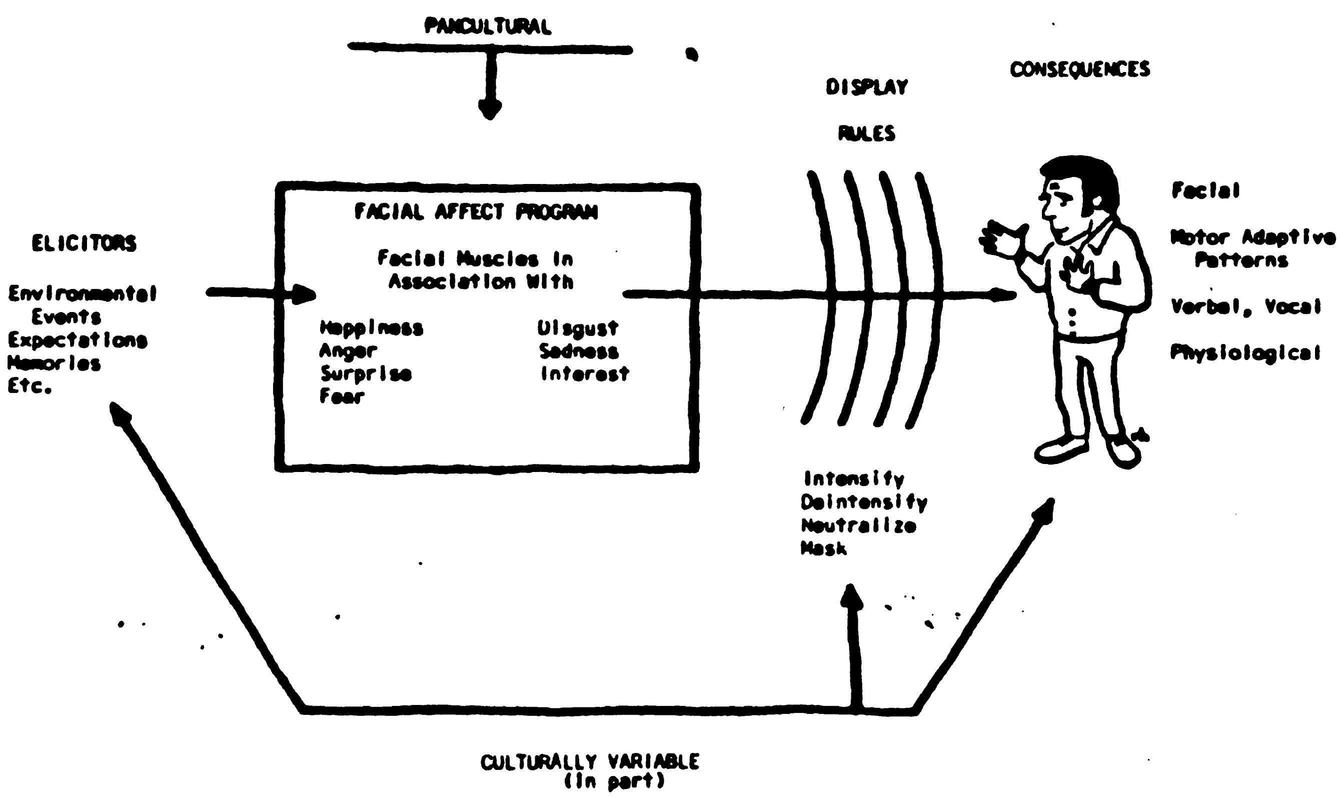
Plutchik deliniates the following instincts which correspond to different emotions: repulsion is the instinct for the emotion of disgust, curiosity for the emotion of wonder, pugnacity for the emotion of anger, self-assertion for the emotion of elation, and parental instincts for the emotion of tenderness. Each emotion is associated with an instinct or pattern of behavior which occurs in response to environmental situations and contributes to the survival of the individual and the prolongation of the species.

Irenäus Eibl-Eibesfeldt in his book, Love and Hate identifies various facial expressions of emotion which differ from either Plutchik or Darwin (Eibl-Eibesfeldt, 1970). According to the author, affective facial displays have two functions: mediating intraspecific aggression, and consolidating bonding behavior among members of a species. For example, behavioral displays of deference among members of a species short circuit the aggressive behavior of dominant members which, if carried to an extreme, would be harmful to the group. To communicate surrender by a facial deference display causes further violence on the part of the dominant member to be unnecessary, thereby maintaining dominance heirarchies with little physical harm to group members. Correspondingly, the author believes that the communication of positive affect among members of the species consolidates bonding behavior. For example, a smile accompanied by an eyebrow flash (a quick raising of the eyebrows) is a positive affect display which is mutually reinforcing for the participants. This type of communication serves to tighten the interpersonal bonds between members of a species, and this bondedness has lasting survival value (Eibl-Eibesfeldt, 1970).

Universals and Deception in Facial Expressions

Thus far the question of how certain recognizable facial expressions are associated with specific emotions has been examined from both a theoretical and evolutionary perspective. However, the question of why facial expressions sometimes do not correspond to these emotional states has not yet been discussed. In this regard Ekman's model of facial displays and Haggard and Issacs' theory of Micromomentary Expressions will be examined.

Ekman believes that certain affects occur in all cultures (Innate Affect Programs). However different cultural norms alter the situations that trigger these affects (Elicitors) and the way these affects are displayed (Display Rules). In his work entitled Universals and Cultural Differences in Facial Expressions of Emotion (1973), Ekman forwards a model which takes into account both the consistency of facial expressions across cultures, and the inaccuracy some studies have found in the identification of emotions from facial expressions. In Ekman's model (see Figure 1.1) there are four elements: the Elicitors, the Innate Affect Program, the Display Rules and the Consequences.



Source: "Universals and Cultural Differences in Facial Expressions of Emotion" (Ekman, 1972).

Figure 1.1 Model Integrating Universal Facial Expressions, Culturally Learned Elicitors, and Display Rules.

The Innate Affect Programs which Ekman discusses involve several facial expressions which are associated with affective states across several different cultures. Although

the cross
greater d
states ar
facial ex
by cultur
which _eli_
cultures,
affective
interpers
by minute
of a joyf
stimulate
the uptur
around th
studied

Th
stimulat
learned
cultural
most mem
uncooked
the othe
disgust
scribing
for the
raw meat

the cross cultural comparison studies will be discussed in greater detail in Chapter II, Ekman believes that affective states are identifiable across cultures through common facial expressions, and these expressions are not modified by cultural learning. This is not to say that the events which elicit the facial expression are constant across cultures, but the expression itself, as indicative of an affective state, is not modifiable through cultural or interpersonal experience. For example a smile accompanied by minute muscular movements around the eyes is indicative of a joyful state across cultures. The situations which stimulate this joyful state may vary, but the expression of the upturned corners of the mouth and the muscular movements around the eyes have the same meaning in every culture studied (Ekman, 1973).

The Elicitors involve learned situations which stimulate a particular emotional response; these can be learned both culturally and interpersonally. An example of cultural learning of eliciting circumstances is that for most members of American culture, the devouring of raw, uncooked meat, might stimulate the affect of disgust. On the other hand, members of another culture might not feel disgust when eating raw meat since their cultural norm proscribing the cooking of meat differs from our own. Thus for the same eliciting conditions (i.e., the eating of raw meat), the emotional and facial response might be very different

Interperso

as those c

scribed c

the famil

interpers

The

ing contr

Rules are

is modifi

obvious t

to experi

in the en

it is not

sion publ

display r

disguise

The

intensify

Intensify

is being

facial e

readily

facial m

Masking

another

different because of the individual's cultural learning. Interpersonally learned elicitors operate in the same way as those culturally learned, except they are not the proscribed cultural norm. These elicitors may be learned in the family, through peer interaction, or through almost any interpersonal situation.

The concept of Display Rules is Ekman's most interesting contribution to a theory of facial expressions. Display Rules are processes through which the innate affect program is modified so that the display of the affect is less obvious to an observer. For example, a male may have learned to experience fear when confronted with a particular object in the environment. However he may also have learned that it is not appropriate for males to display a fearful expression publically. A male in this culture might then utilize display rules to alter the expression of fear and thus disguise his expression of the affect.

The display rules that Ekman describes include intensifying, de-intensifying, masking, and neutralizing. Intensifying is the facial exaggeration of the emotion which is being experienced. De-intensifying is diminuation of a facial expression so that it might not be noticed so readily by observers. Neutralizing involves inhibition of facial musculature so that the expression is suppressed. Masking involves displacing one facial expression with another which the person has learned as more acceptable in this particu

rules, the i

in such a wa

accurately r

Ekman'

cross-cultur

and the extr

within a par

facial expre

internal af

message. T

is to filte

learn the t

environment

A dis

Haggard and

shortening

Their proce

judges, bot

normal spee

occur in a

unobservabl

"Micromomen

Using Ekman

Viewed as t

"compress"

this particular situation. Through these four display rules, the individual is able to alter the affect program in such a way that the innate facial behaviors do not accurately represent the felt experience.

Ekman's theory of display rules explains both the cross-cultural identification of certain facial expressions and the extreme variability of learned expressions even within a particular culture. He concludes that although a facial expression is sometimes an accurate reflection of an internal affective state, it may be at times a deceptive message. The problem in many studies of facial expressions is to filter out facial deception in order that one may learn the true facial expression which is elicited by an environmental situation.

A display rule not mentioned by Ekman but studied by Haggard and Issacs (1969) might be called compacting--a shortening of the time in which a facial expression occurs. Their procedure was to play films of a therapy hour to judges, both at normal speed and in slow motion (one-fifth normal speed). The authors found that many expressions occur in a fraction of a second and were therefore almost unobservable at normal speed; they dubbed this phenomenon "Micromomentary Expressions" (Haggard and Issacs, 1969). Using Ekman's model, micromomentary expressions could be viewed as the consequence of a display rule operating to "compress" unacceptable affect into a form which is not

visible
face in
Haggard
affect
time so
be almo

F
of faci
physiol
set up
express
emotion
communi
had sur
recogni
sions c
and ca

A
express
graphs
determ
on vide
used in
initial
a contr

visible to the observer. Thus rather than altering the face in a particular way in order to mask an affect, Haggard and Issacs suggest that the facial expression of affect might not itself be altered, but merely compacted in time so that the occurrence of the facial expression would be almost unobservable.

From this discussion of the theoretical background of facial expressions, several key points emerge. The physiological system of affects in the human organism is set up in such a way that muscular feedback from facial expressions could be important to the felt experience of emotion. Secondly, in our evolutionary history, the communication of affect through facial expression may have had survival value. Finally, although several universally recognized facial expressions seem to exist, these expressions can be modified in many ways to mislead observers and cause inaccuracies in studies of facial expressions.

Need

Although there is evidence to suggest that facial expressions are associated with emotions in still photographs (Ekman, 1972; Izard, 1971), no previous study has determined whether spontaneous facial expressions recorded on videotape can be accurately identified with the categories used in the cross-cultural studies. Moreover although some initial work has been done (Haggard and Issacs, 1969), a controlled study has yet to examine the effect of observing a vide

if as

observ

alter

speed

answer

whethe

accura

dition

are th

and th

<u>number</u>

<u>accura</u>

in the

under

this s

employ

tured

ject i

which

cuss th

a videotape of facial expressions in slow motion. Finally, if as Haggard and Issacs suggest, slow motion speed changes observers' perception of facial expression, does this change alter the perception of later tapes played in the normal speed condition. The present study seeks to determine the answers to these important questions.

Purpose

The purpose of the present study is to determine whether the emotional meanings of facial expressions can be accurately identified on videotape under a variety of conditions. Variables which are thought to influence judgments are the eliciting circumstances, speed of the videotape, and the order in which different speeds are presented. The number of facial expressions identified as well as the accuracy of the identifications are both dependent measures in the present study.

Definition of Terms

Eliciting circumstances are defined as those conditions under which the subject displays a facial expression. In this study, two types of eliciting circumstances are employed: a structured intervew and a relatively unstructured interview. During the structured interview, the subject is presented with photographs of facial expressions which have previously been validated, and is asked to discuss the emotions depicted in these photographs. During this time the sub

expressions

tured inter

own categori

condition h

experimente

for later vi

The vi

interview c

<u>videotape s</u>

tape is pla

feet/second

at an avera

The <u>p</u>

the first t

followed by

slow motion

speed tape.

The e

cumstances,

be recorded

is the <u>acc</u>

expressions

of facial

of the tap

time the subject is being video-taped so that his own facial expressions can be later viewed and rated. In the unstructured interview, the subject is asked to define and label his own categories of emotions and discuss them, but in this condition he is not provided with photographs or with the experimenter's list of labels. This interview is also taped for later viewing

The videotapes of facial expressions made in the two interview conditions are re-played to raters in two videotape speeds. In the slow motion condition, the videotape is played at approximately 1/6 normal speed, or 10 feet/second; in the normal speed condition, the tape moves at an average of 60 feet per second.

The presentation order refers to two treatments. In the first treatment, normal speed videotape is shown first followed by slow motion, and in the second treatment, the slow motion tape is shown first, followed by the normal speed tape.

The effects of these three variables--eliciting circumstances, videotape speed, and presentation order--will be recorded in terms of two dependent measures. The first is the accuracy of the rater's identification of facial expressions. the second dependent measure is the number of facial expressions observed by a rater during a segment of the tape.

Hypotheses

The first hypothesis is that a slow motion videotape will allow observers to judge facial expressions more accurately, and will allow observers to see a greater number of facial expressions.

The second hypothesis is that observers will record a greater number of expressions and have greater accuracy in identifying these expressions when viewing the unstructured interview than when viewing the structured interview.

The third hypothesis is that when the slow motion videotape is seen first, the subsequent videotape will be perceived more accurately and a greater number of facial expressions will be observed than when the normal speed tape is seen first.

Overview

In Chapter II the literature pertinent to the area of facial expressions and emotions will be reviewed. In Chapter III the design of the study will be described including the sample employed, the measures used, the specific hypotheses to be tested, and the data analysis techniques employed. In Chapter IV the analysis of the results will be presented, and in Chapter V the study will be discussed and the conclusions will be reviewed along with a consideration of implications for future research.

varie
numbe
early
the re
are m
sugge
facia
resul
Murph
psych
perio
invis
After
the r
look
psych
emoti
(Ekma

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The popularity of research on facial expressions has varied widely during this century. Ekman (1972) cites a number of studies on facial affect during the late 1920s and early thirties followed by a dearth of studies for 15 years thereafter. Possible reasons for this change in popularity are many. Early studies by Landis (1924, 1929) strongly suggested that there was no consistent relationship between facial expression and emotional state. Although these results were soundly rebutted by later researchers (Murphy, Murphy and Newcomb, 1937; Davis, 1934), the field of psychology thereafter immersed itself in a behavioral period where there was little interest in investigating such invisible, and therefore hypothetical, states such as emotions. After 1950, improvements in recording techniques, along with the realization of the flaws in early studies, led to a new look at facial expressions. Moreover, at this time psychology was entering a period wherein the topic of emotion was more acceptable in experimental research (Ekman, 1972).

The

research b

to the lac

One of the

Bruner and

of facial

gained fro

of other

study see

generaliz

for an ex

note that

stimulate

photograp

stimuli,

have been

categorie

Because o

expressio

until the

facial ex

of resear

Duffy (19

measuring

ther and

not be so

feasible.

The improvement in respectability of facial expression research has not deterred any of its critics from pointing to the lack of success in many facial expression studies. One of the shortcomings in facial research, pointed out by Bruner and Tanguri (1964), is that the results in the field of facial research have not been "additive;" the knowledge gained from one study has not contributed to the performance of other studies. Though much research has been done, each study seems to exist in isolation and it is difficult to generalize the conclusions to other studies. In searching for an explanation of this phenomenon, Bruner and Tanguri note that a variety of techniques have been employed to stimulate and record subjects' emotional responses: still photographs, motion pictures, drawings, transcripts, vocal stimuli, and models. Moreover, different methodologies have been used to measure dependent variables: dimensions, categories, free vs. forced choice, and electromyography. Because of this variety of procedures, studies of facial expression have met with mixed success, and it was not until the late 1960s that reliable and effective studies of facial expression were performed. The early discouragement of researchers on the topic of emotions was expressed by Duffy (1941) who suggested that because of the problems in measuring emotions, the concept should be abandoned altogether and other concepts developed where the meanings would not be so idiosyncratic, and research would prove more feasible.

The following review of the literature will be organized by procedures rather than by historical development. The aspects of procedures to be examined will include: eliciting conditions, recording procedures, subject and rater variables, and dependent measures. Through this format it is possible to isolate both what has been learned from previous research and what has yet to be studied definitively on the topic of facial expressions of emotion.

Eliciting Variables

The "eliciting circumstances" is a term borrowed from Ekman (1972) which refers to a procedure or set of conditions which are employed by the experimenter to stimulate or elicit the facial expressions to be portrayed. There are two types of eliciting circumstances employed in most studies: when the subject is asked to react to an environmental situation, he is responding spontaneously to external stimuli. On the other hand, when the subject is instructed to pose an emotion, he is responding to internal, proprioceptive stimuli in order to produce a facial expression. The type of instructions used--spontaneous vs. posed--seems to have an effect on the elicited facial expression, and therefore these two conditions will be considered separately.

Environmental Elicitors--Situations

Eliciting conditions relying on environmental stimuli were first employed to study facial expressions by Feleky

(1914);
of situa
Although
cal tes
were co
expressi
Li
eliciti
from su
In study
expressi
could ac
elicited
present
to photo
Faces of
more obs
photos w
expressi
to popul
of a li
found no
and envi
sion was
felt emo
that "em

(1914); he photographed one hundred subjects in a variety of situations spontaneously expressing a number of affects. Although this study was basically exploratory, and statistical tests were not performed, Feleky believed that emotions were consistently associated with several facial expressions.

Like Feleky, Charles Landis employed environmental eliciting circumstances to obtain emotional responses from subjects (Landis, 1924; Landis, 1924; Landis, 1929). In studying "normal emotional behavior" rather than posed expressions, Landis was interested in whether people could accurately label facial expressions which were elicited by environmental stimuli. His procedure was to present the subject with a variety of situations and then to photograph any facial expression changes he observed. Faces of subjects were smeared with burnt cork to make them more observable. Observers were then asked to match these photos with the situation they thought elicited that facial expression. Examples of Landis' situations were: "listening to popular music, truth or falsehood telling, decapitation of a live rat, and technical music" (Landis, 1924). Landis found no consistent association between facial expression and environmental situations; moreover, no facial expression was found to be correlated with the verbal report of felt emotion. The conclusion drawn from these studies was that "emotion" was more in the perception of the nature of the situation and was not a differentiated state. Landis believed that facial expressions were learned reactions corresponding to particular environmental situations. Because individual learning is so variable, emotions could not be accurately judged from facial expressions alone (i.e., without knowledge of the environmental situation).

Landis' conclusions were controversial, and many criticisms of his procedure were forthcoming. Davis (1934), in his review of Landis' studies, cited the accumulative effect of the series of eliciting circumstances as a possible confounding variable. For example, a subject may have first been asked to decapitate a live rat (to elicit the affect of disgust) and later been told an amusing story by the same experimenter (to elicit amusement). The disgust response from the previous condition may have generalized to the later condition, thereby invalidating the later eliciting condition. A three hour series of such a diverse array of treatments for a single subject could have profound effects on the expressions elicited.

Fois-Whittman (1930) cited the effect of individualized learning on the facial expressions recorded by Landis. Emotional responses to particular stimuli are usually learned, and thus not generalizable across subjects. A particular situation (classical music listening, for example) may elicit the affect of joy in one subject while eliciting the affect of boredom in another. Ekman (1972) also cites this criticism as limiting the validity of Landis' findings. The same situation may have elicited different affects across subjects, and thus a consistent association between a facial expression and an eliciting situation would be unusual.

Murphy, Murphy, and Newcomb (1937) have argued that Landis' procedures encouraged the masking of facial expressions. Subjects' faces were marked with burnt cork, possibly causing self-consciousness about facial movement. Moreover, all of the subjects employed by Landis were psychologists with professional status to maintain, and all of them were personal aquaintances of the experimenter. These subjects, the authors argue, may have been motivated to mask or obscure specific emotions in certain situations.

Ekman (1972) notes that Landis used still photographs rather than film; some research (Haggard and Issacs, 1964) indicates that certain facial expressions occur so quickly that they are unrecordable except through the use of slow motion equipment. Moreover, Landis makes no mention of how some photographs were chosen for presentation in the study while others were screened out. Ekman argues that the procedures for screening photos or film is important to the validity of the findings. Ekman's final criticism of Landis' work falls into the category of dependent measures, i.e., how results are recorded, what labels are used for facial expressions, and how these labels are chosen. Landis allowed s

introduci

The large

it improb

exact ter

Da

there we

of analy

patterns

if the p

Furtherm

specifi

general

Landis

a corre

respons

positio

test,

cues c

that t

patter

studie

posed

ble c

circu

allowed subjects to freely choose their own labels, thus introducing a variety of semantic problems into his study. The large number of emotional labels to choose from renders it improbable that subjects would independently agree on an exact term for describing an emotional state.

Davis (1934) reviewed Landis' data and argued that there were statistical problems with the original method of analysis. He stated that a number of facial reaction patterns could have been obtained from the self-report data if the proper statistical procedure had been utilized. Furthermore, he argued that some facial expressions are specific to situations and others have common features which generalize across situations. Upon reviewing Davis' paper, Landis stated that the chief conclusion (that there is also a correspondence between a subject's self report and facial response) was essentially correct; thus he revised his original position (Davis, 1934).

In an attempt to put Landis' conclusions to a further test, Fois-Whittman (1930), studied the effect of situational cues on the judgment of facial expression. He concluded that there was consistently "a unique and distinctive pattern . . . of muscular involvements" for every emotion studied. In contrast to Landis, Fois Whittman utilized <u>posed</u> subjects in his research and thus there were no possible confounding variables in his environmental eliciting circumstances.

A

the eff

to obse

Frijda,

Frijda

helpful

facial

cues.

to judg

express

the fac

situati

judged

Th

negativ

between

judging

express

<u>force</u> th

Under be

produce

might be

Re

environm

expressi

both stu

tions:

After Fois-Whittman, several studies have compared the effect of presenting photographs of facial expressions to observers with and without situational cues (Munn, 1940; Frijda, 1958; and Watson, 1972). Both Munn (1949) and Frijda (1958) found that although situational cues were helpful in identification, emotions can be judged from facial expressions alone without the help of the situational cues. Watson (1972) found that cues utilized by observers to judge emotions depended on the intensity of the facial expression and the environmental situation involved. When the face was neutral, the emotion was judged from the situation; when the situation was neutral, the emotion was judged from the face (Watson, 1972).

These three studies may in part explain Landis' negative findings. If there is a complimentary interaction between observers' use of facial and situational cues in judging emotion, then the presentation of ambiguous facial expressions (by employing faulty eliciting conditions) would force the observer to respond to the situational cues alone. Under better eliciting circumstances, however, subjects would produce less ambiguous facial expressions, and observers might be able to judge emotions from these expressions alone.

Recently, two studies have explored the effect of environmental eliciting stimuli on spontaneous facial expressions (Gubar, 1966; Lanzetta and Kleck, 1970). In both studies, subjects were observed in two treatment conditions: one treatment group was punished with an electric shock,

watch

or not

conclu

from t

facial

circum

(by li

ability

without

Interna

I

subject

nal prop

questio

emotions

internal

produce

Th

was done

explore

recogniz

are more

16mm fil

external

the film

shock, and the other was not. The observer's task was to watch a videotape of the subject's face and to tell whether or not the subject was anticipating a shock. Both studies concluded that observers could accurately judge the shock from the non-shock conditions through the videotape of the facial expressions. Thus, the use of better eliciting circumstances and the simplification of the judging task (by limiting responses to two categories) improved observers' ability to accurately judge the meaning of facial expression without knowledge of the situation.

Internal Elicitors--Posing

In procedures relying on internal elicitors, the subject responds not to an external situation but to internal proprioceptive cues or emotional states. Two basic questions are usually asked in this research: 1) can emotions be posed and recognized accurately, and 2) do internal and environmental elicitors of the same affect produce different facial responses.

The major work on the topic of internal elicitors was done by Coleman (1949) and had a dual purpose: to explore whether posed expressions could be accurately recognized, and to determine whether some areas of the face are more crucial to recognition than others. Utilizing 16mm film, Coleman recorded expressions elicited by both external and internal stimuli; frames were then chosen from the film and viewed singly by judges.

Col

of elicit

Some expr

spontaneo

when subj

were more

in others

emotions

allowed t

eyes. Co

region, a

accuracy

of emotio

In

50 subjec

the Calif

as did Co

correlate

however,

nized acc

agreed wi

could be

related t

The

type of e

affect th

Coleman found no clear pattern in comparing the types of eliciting circumstances or the importance of facial areas. Some expressions were more accurately judged when they were spontaneous, while others were identified more accurately when subjects were asked to pose them. Certain expressions were more accurately identified through eye movement, while in others the mouth was more important. Overall, posed emotions were more accurately identified when observers were allowed to view the mouth region than when they viewed the eyes. Coleman concluded that personality factors, facial region, and type of stimulus condition all affected the accuracy with which observers judged facial expressions of emotion (Coleman, 1949).

In a similar study, Thompson and Meltzer (1964) asked 50 subjects to pose each of ten affects and administered the California Psychological Inventory to them. They found as did Coleman, that no specific personality variables were correlated with posing ability; the authors did conclude however, that an affect can be posed by subjects and recognized accurately by observers. Thompson and Meltzer, agreed with Coleman in concluding that facial expressions could be posed accurately, but the level of accuracy is related to many personality and situational variables.

The previous two studies have shown that posing ability, type of emotion to be posed, and region of the face all affect the accuracy of raters' judgments. However, both studi

posed

there

quenc

exact

<u>Concl</u>

Ekman

in pr

elici

genera

He po

exper

elicit

in mar

mentio

attemp

indeed

to mat

for th

respon

a stim

across

the su

studies concluded that facial expression can indeed be posed and judged with some degree of accuracy. Moreover, there seem to be differences between the facial consequences of posed and spontaneous elicitors but as yet the exact nature of these differences is not clear.

Conclusion

In reviewing the two kinds of eliciting circumstances, Ekman (1972) makes several recommendations to correct errors in previous research procedures. More than one type of eliciting circumstance should be selected so that the generalizations from the study may be more broadly extended. He points out that many studies have been limited because experimenters have not attempted to include more than one eliciting circumstance. This limited generalizability in many facial studies may contribute to the "non-additivity" mentioned in the area of facial research.

Ekman's second recommendation is that the experimenter attempt to ascertain whether the eliciting stimulus does indeed elicit the intended emotion. Researchers who attempt to match facial expression with situations should account for the effects of social learning in determining the facial response. Thus an attempt should be made either to choose a stimulus which would elicit the same emotional response across subjects, or to tailor the eliciting circumstance to the subject's previous learning and experience.

made

stanc

is em

stimul

neous

subjec

facial

impact

rate r

may be

ways:

Moreov

sented

face a

techni

occurr

videota

Artific

T

viewin

Proced

Early s

Finally, Ekman contends that an attempt should be made to explain the relationship between the eliciting circumstance and the naturally occurring emotion. Thus if posing is employed, the researcher should state how this type of stimulus would effect the facial response. Even in spontaneous conditions, the experimental situation alters the subject's perception of the eliciting circumstance, so the facial response can never truly be "natural."

Recording and Presentation Procedures

The studies reviewed in this section focus on the impact of presentation and recording variables on the accurate recognition of facial expressions. Facial expressions may be recorded for viewing by observers in many different ways: sketches, models, photographs, films, and videotapes. Moreover, different types of recorded data have been presented in various studies: areas of the face, full face, face alone, and face and body together. Finally, special techniques will be discussed which alter the speed of the occurrence of the recorded event; for example, slow motion videotape.

Artificial Modalities

The problem of how to capture facial expressions for viewing by observers is subtle and complex, and many procedures have been used with varying degrees of success. Early studies of facial expression (Langfield, 1918; Buzby,

1924

such

faci

(192

repl

Harr

sket

stud

for

the

stud

gene

moda

natu

Still

recor

and T

expre

stanc

When

modal

the p

author

of the

1924) were forced to rely on artificial recording methods such as sketches or three dimensional models to present facial expressions to observers. Boring and Titchner (1925) improved this procedure by devising a model with replacable features. More recent studies (Cuceloglu, 1972; Harrison, 1964; and Royal, 1959) have utilized simplified sketches of faces to investigate facial expressions. These studies, however, are all beset with the same flaw; in order for a study to generalize about the spontaneous expression, the face must be recorded in a realistic way. Recognition studies that use artificial presentation procedures may generalize facial expressions as perceived in that particular modality, but it is difficult to draw conclusions about naturally occurring facial expressions from this data.

Still Photographs

As the use of still photographs became more common, recording and presentation procedures improved. Goodenough and Tinker (1931) presented still photographs of facial expressions with written descriptions of eliciting circumstances to observers. They found that recognition was best when the photo and the description matched. When the two modalities conflicted, some observers judged the emotion by the photograph and others by the written description. The authors concluded that both facial expression and knowledge of the situation aid in the recognition of emotion.

Good

grap

He a

from

reco

moda

"sad

than

Film

used

stud

comp

expr

expr

stil

that

of f

ease

stud

moda

to p

more

When

LoCastro (1972) performed an interesting variation of Goodenough and Tinker's techniques, presenting the photographs and written statements along with audio recordings. He also separated the sound of the voice (tonal content) from the information (verbal content) provided by the recordings. For "love" and "anger," verbal and vocal modalities seemed more crucial to recognition, while for "sadness" and "joy," the facial channel was more important than either the vocal or the verbal.

Films

In the preceding studies, only still photographs were used to present facial expressions to observers. Two studies (Frijda, 1953; and Dusenbury and Knower, 1938) have compared still photographs to films in judging of facial expression. Both studies reported that films of facial expressions were judged significantly more accurately than still photographs. These studies present clear evidence that films are a more effective modality for the presentation of facial expressions and it is unfortunate that due to the ease of recording and presenting still photographs, many studies of facial expressions have used this less effective modality. It might also be noted that since films are able to portray facial movement in a more natural way, it is also more possible to generalize beyond the experimental situation when employing the film modality.

Several studies have investigated what attributes of film allow it to be accurately judged. Levitt (1964) presented subjects portraying six emotions in visual, audio, and audio-visual modes. Contrary to his expectation, they found that emotional meanings were communicated more accurately in the visual mode than in the audio. Howell and Jorgensen (1969) compared pleasant and unpleasant emotions in the same three modes and included written transcripts. For pleasant affects, they found that observers were more accurate when viewing the audio-visual mode and less accurate in audio-only and transcripts. Transcripts, however, were superior for some unpleasant affects. Burns and Brier (1973) added the tonal dimension to this type of study and found that audio-visual with either type of sound mode was superior to visual-only, and visual-only was superior to audio-only or transcripts. Thus it seems clear that the audio-visual modality is superior to all others in accurately representing emotional behavior. This superiority seems to stem from the cues available in the visual content, the verbal content, and the tonal content. Visual-only is the next best modality, followed by still photographs and finally transcripts.

Facial Components

The preceding section has dealt only with *how* facial expressions were presented to observers: through photos, through models, or through films. Another aspect of the pre

pre

nee

veri

And

to t

ment

thei

inve

mout

the

proc

diff

compl

of af

of di

Techn

the f

prese

found

some e

entire

Ekman

area i

presentation procedure involves the type of material presented. Does the full face or only a part of the face need to be presented? Do body movement and other non-verbal cues heighten accurate judgment of facial expressions? And finally what non-verbal cues are necessary and sufficient to the accurate recognition of emotion?

Duschenne (1862) in an early study of facial components, divided facial muscles into groups according to their importance in facial expressions. Dunlap (1927) investigated the same phenomenon by substituting various mouth features in facial expressions, but like Duschenne, the study was primarily descriptive and no experimental procedures were employed. Coleman (1949) also studied differential importance of areas of the face and found a complex interaction between facial area observed, the type of affect involved, and the eliciting conditions employed.

An interesting development in studying the importance of different facial areas is the Facial Affect Scoring Technique by Ekman, Friesen, and Tomkins (1971). Dividing the face into three areas--brow, eyes, and mouth--the authors presented various combinations of these to observers, and found that certain areas are crucial to the recognition of some emotions, while other emotions seem to involve the entire face. For example, in Unmasking the Face (1975), Ekman and Friesen note that the brow is the most crucial area in the emotion of sadness, but the involvement of the mout

othe

half

need

Faci

cruc

Anot

does

to p

near

Ekma

that

faci

prim

judg

(Ekm

cues

affe

up t

cues

from

tion

look

cont

mouth intensifies the expression of the affect. On the other hand, the affect of disgust employs only the lower half of the face, the upturned lip being all that is needed to recognize this expression.

Facial and Body Cues

The previous studies examined facial cues which are crucial for accurate recognition of facial expression. Another series of studies investigates a related issue: does facial expression interact with other non-verbal cues to provide a more accurate representation of emotional meaning. Several studies (Ekman, 1974; Ekman, 1975; Ekman and Friesen, 1967; Ekman and Friesen, 1969) conclude that if observers are shown videotapes of body posture and facial expressions separately, the *type* of affect is judged primarily in the face while the *intensity* of the affect is judged from both the head and the body. In a recent study (Ekman and Friesen, 1974) observers watched face and body cues while subjects are motivated to conceal their true affective responses. Untrained observers were able to pick up the deception from body cues more easily than from facial cues, but trained observers were able to detect deception from facial cues alone. The authors conclude: "the information is there on the face if the observer knows what to look for." Thus there is some evidence to support the contention that observers can pick up general information abou

ers

Slow

exte
brie
(193
an a
(thr
litt
Land
are
grou
exam
aver
move
and
Thus
to th
as to
techn

On th
expre
Press
(Hagg

about affective states from bodily cues, but trained observers can glean this information from facial cues alone.

Slow Motion Techniques

While many non-verbal variables have been studied extensively, only a very few studies have investigated the brief duration of some facial expressions. Landis and Hunt (1937) mention that while the magnification of space is an accepted scientific procedure, magnification of time (through slow motion playback techniques) has been studied little. In their investigation of the startle pattern, Landis and Hunt (1939) found that the small facial muscles are the fastest to respond to stimuli, while the larger groups of muscles responded at a much slower rate. For example, the eyeblink of a startle response occurs in an average of 4/1000 of a second after the stimulus while the movement of the head does not occur until 8/1000 afterward, and the full body movement does not occur until much later. Thus the extreme speed of spontaneous facial responses points to the capacity of the face to transmit information so quickly as to be undetectable except with high speed recording techniques.

The only research which has been performed specifically on the slow motion filming and recognition of facial expression is Haggard and Issacs "Micromomentary Facial Expressions as Indicators of Ego Mechanisms in Psychotherapy" (Haggard and Issacs, 1966). The authors define

micro
that
the e
times
film
speed
cont
expe
ball
and
emot
(per

then
Firs
neve
defi
for
fore
segm
sit
In
an
exp
and
dif

micromomentary expressions (MME's) as "facial expressions that that are so short-lived that they seem to be quicker than the eye." In the study, an average of two and one half times more facial expressions were seen when a stimulus film was viewed in slow motion than when viewed at normal speed. Haggard and Issacs felt that MME's did not occur continuously, but were related to areas where the individual experienced emotional conflict. They seem to serve as "trial balloons" by which a patient displays an affect subliminally and finds out whether he can experience a particular emotional state without fear of rejection from the therapist (personal communication, Earnest A Haggard, 1975).

Although Haggard and Issac's study is interesting, there are several procedural flaws which mar the results. First, only two subjects were employed, and the authors never state how many judges or raters participated. No definition of "facial expression" is made, and no schema for attaching facial expressions with emotional meaning is forewarded. Moreover, inter-judge reliability across segments was extremely variable, and finally, the eliciting situation--a therapy hour--was too complex to be useful. In spite of these flaws, however, Haggard and Issacs present an interesting proposition: that significantly more facial expressions are observed at slow motion than at normal speed, and that the types of expressions observed in slow motion are different from those observed at normal speed.

Con

pro
sup
emo
is
cue
rec
emo
non
cap
slo
per

por
fac
rat
whic
sect
whic
in t
judg
chil
race
cult

Conclusion

To conclude this section of recording and presentation procedures it seems first that films or videotapes are superior modalities for observers to accurately label emotional states. The accuracy of the visual-only modality is similar to audio-visual but lacks the tonal and content cues in the voice. Types of emotions are most accurately recognized from facial expressions, while intensity of emotional arousal is most readily discerned from other non-verbal cues. Finally, the facial musculature seems capable of responding at great speed and viewing films in slow motion seems to increase the number of expressions perceived.

Subject and Rater Variables

Subject variables are defined as aspects of the person portraying the emotion that influence the quality of the facial expression. Rater variables include aspects of raters (those who observe the subject portraying the emotion) which might influence the accuracy of their judgment. This section examines differences in both subjects and raters which influence the quality of their performance. Included in this section are developmental differences in posing and judging, differences in expression of blind and sighted children, personality differences in posing and judging, race and sex differences in posing and judging, cross-cultural recognition of facial expression, and finally, the ef

ex

De

ha

ad

an

be

si

(19

ev

fa

of

Ch

the

be

is

an

Goo

pho

and

stu

alth

that

effects of rater training on the judgment of facial expressions.

Development of Facial Expressions

Some studies on the development of facial expressions have investigated the extent to which infants respond to adult facial behavior. Two studies (Wilcox, 1969; Wilcox and Clayton, 1968) found that infants responded to facial behavior no more than any other complex and interesting simulus. However, in a recent study, Goren, Sarty and Wu (1974) have disputed these conclusions and have obtained evidence that infants fixate on stimulus patterns resembling facial features significantly more often than other patterns of equal complexity. Moreover, two studies (Kreutzer and Charlesworth, 1973; Bühler and Hetzer, 1928) found that at the age of 5 to 8 months infants begin to discriminate between positive and negative facial expressions. Thus there is evidence that even for young infants, the human face is an important source of stimulation in the human environment.

In investigating preschoolers' facial expressions, Goodenough (1972) asked university students to judge photographs of children expressing spontaneous emotion, and attained accuracy at six times chance levels. A similar study was performed by Hamilton (1972) with positive results, although the accuracy of the judgments did not approach that of the previous study.

Kw

studied

childre

the sam

express

ing bot

found th

ment as

accurac

the abil

the chil

Facial E

In

innate c

studies

blind ch

"exhibit

months,

vidualiz

(1943) f

expressi

However,

occurren

as they

expressi

similar

Kwint (1934), Gates (1925) and Hoshino (1969) each studied the development of facial expressions in older children (ages 3-14). These studies emerged with essentially the same finding: that children's ability to judge facial expressions improved markedly with age. Furthermore, studying both posing and judging ability, Odom and Lemond (1972) found that posing ability also shows a trend toward improvement as the child matures, though at a slower rate than accuracy of judgment. It seems clear from these studies that the ability to pose and judge facial expressions improves as the child becomes more mature.

Facial Expressions in Blind Children

In order to try to differentiate the learned and innate components of facial expressions, a series of studies have been performed on the facial expressions of blind children. Freedman (1964) noted that blind infants "exhibited reflex-like action" until the age of five or six months, with expressions becoming more prolonged and individualized thereafter. Both Thompson (1941) and Fultcher (1943) found that blind and seeing children showed similar expressions of sadness, joy, and anger while very young. However, in contrast to sighted children, the frequency of occurrence of these expressions decreased in blind children as they matured. Thus although the mechanisms for facial expression in blind and sighted children appear to be similar in infancy, some amount of visual stimulation seems to be ne

authors

learned

facial e

Facial E

A

emotiona

to influ

(1974) i

raters b

expressi

their ow

there wa

of the r

the emot

evidence

the rate

a photog

Se

sonality

and Shaw

correlat

of the p

of anxie

to be necessary to maintain these mechanisms. Many authors conclude from these studies that there is both a learned and an innate component in the development of facial expressions.

Facial Expression and Personality

A number of studies have attempted to alter the emotional state of those judging facial expression in order to influence the accuracy of their ratings. Schiffenbauer (1974) induced various degrees of emotional arousal in raters before they judged still photographs of facial expressions. Raters showed a marked tendency to attribute their own affective state to the photograph. Moreover, there was a high positive correlation between the degree of the rater's emotional arousal and the intensity of the emotional state attributed to the photograph. This evidence suggests that the immediate emotional state of the rater has some effect on the type of emotion seen in a photograph and the intensity of the state perceived.

Several researchers have tried to correlate personality variables with the ability to pose emotions. Drag and Shaw (1967) looked for differences in posing ability correlated with both situational anxiety and the personality of the power. No correlation could be found between amounts of anxiety experienced or personality traits with posing

ability. However it was discovered that some affects were easier for all subjects to pose than others. This finding coincides with the earlier research by Coleman (1949) who concluded that there was a complex interaction between personality of the poser, facial region observed, and type of emotion posed in determining the accuracy of recognition of any given posed expression.

The production and recognition of facial expression as related to diagnostic categories of mental illness is a frequent topic in the literature. Dougherty, Bartlett, and Izard (1969) found that normals were significantly more accurate than schizophrenics in identifying facial expressions. Shannon (1971), however, found no overall differences between normals, schizophrenics and depressives, but did discover differences in recognition of specific emotional states. Schizophrenics and depressives were less accurate than normals in identifying anger, and depressives were less accurate in identifying fear than either of the other two groups. Using more general measures of pathology, Chambers (1961) found a positive relationship between the ability to accurately identify facial expressions and college adjustment during the freshman year.

Several studies have attempted to correlate facial expression recognition with scales on established personality measures. Zlatchin (1955) presented facial photographs tachistoscopically in diminishing exposure times and attempt

with sc

tory an

reliabi

no sign

Carlson

ability

tive Pe

their r

M

persona

with ei

this pr

facial

fied as

pick th

state.

depress

levels

Thus th

have co

cogniti

I

express

Photogr

ing wha

attempted to relate differences in recognition thresholds with scores on the Minnesota Multiphasic Personality Inventory and the Gough Adjective Checklist. Because of the low reliability of the recognition of the photographs, however, no significant correlations were found. In a similar study, Carlson and Levy (1973) attempted to relate recognition ability to Meyers Briggs Types. They found that the Intuitive Perceiving types were significantly more accurate in their recognition than the Sensing Judging Types.

Most of the preceding studies of facial expression and personality have attempted to correlate recognition accuracy with either diagnostic labels or test scores. Varying this procedure, Cohen and Rau (1972) showed photographs of facial expressions to groups of subjects previously identified as normal and depressed. The subjects' task was to pick the photograph that best described their own emotional state. The photographs which were chosen discriminated the depressed group from the normal group and also distinguished levels of severity of depression within the depressed group. Thus through the use of a different procedure, the authors have confirmed a relationship between facial expression recognition and personality adjustment.

In another creative approach to the problem of facial expressions, Tomkins and McCarter (1964) showed still photographs of eight affects to a group of subjects, developing what they called "Affect Sensitivity Contours" for each

subj
attr
embo
Thus
refl
meas
ity

seem
found
tion
varia
a spe
proce
resea

Race

femal
of fa
1972,
is ma
is du
Accord
mobile
judge

subject. Their assumption here was that rather than attributing errors to unknown variables, each mistake embodied a reflection of the personality configuration. Thus each subject's pattern of errors in identification was reflected in his "Affect Sensitivity Contour." Whether this measure correlates with any of the more established personality tests has not been determined.

As studies such as these are compounded, it would seem reasonable to conclude that most researchers have found some relationship between facial expression recognition and personality. However, because of the procedural variations in these studies, it is difficult to emerge with a specific overall conclusion. Again the non-uniform procedures have contributed to the non-additivity of facial research in this area.

Race and Sex Differences

There is consistent evidence in the literature that females are slightly more accurate than males in the posing of facial expressions (Buck, Savin, Miller, and Caul, 1969, 1972, 1974; Black, 1969; and Gitter, 1972). Some suggestion is made (Buck, Miller, and Caul, 1974) that this difference is due to a greater amount of activity in female faces. According to these authors, because female faces are more mobile and expressions more pronounced, it is easier to judge emotions from them.

more

Some

and G

and f

showe

the r

more a

judged

recogn

Two st

posers

simila

In ter

studie

ficant

1969 a

Cross

of fac

a very

such a

innate

only th

here th

Findings are mixed as to whether females are also more accurate in the recognition of facial expressions. Some studies (Buck, Miller, and Caul, 1974; Black, 1969 and Gitter, 1972) have found no differences between males and females in the accuracy of perceiving. Yet Kozel (1969) showed that although there was no overall superiority in the recognition scores of women, they were significantly more accurate than males in four out of seven affects judged.

In investigating the effects of race on portrayal and recognition of emotion, there have also been mixed results. Two studies (Gitter, 1972; and Black, 1969) found that white posers were judged more accurately than blacks. In a very similar study, however, Kozel (1972) found no such effect. In terms of the recognition of facial expressions, the few studies which have been performed have found blacks significantly more accurate than whites in their judgments (Black, 1969 and Gitter, 1972).

Cross Cultural Studies

The controversy over innate and learned components of facial expressions during the past ten years has spurred a very important series of cross-cultural studies. Theorists such as Birdwhistle (1963) have proclaimed that there are no innate facial behaviors and that expressions are acquired only through social learning. Studies will be reviewed here that put this assumption to an experimental test.

both
no m
or A
iden
and
expr
atta
more
(197
four
in Ja
Japan
films
discr
made
regar
judge

photo
cultu
ident
from
studi
quali
howeve

Vinake (1949, 1955) studied recognition of emotion in both Caucasian and Oriental faces, and concluded that no matter what nationality was judging (Japanese, Chinese or American) there were no differences in the accuracy of identification. Dickey and Knower (1941) compared Mexican and American children in identifying photographs of facial expressions. Higher than chance levels of accuracy were attained for both groups, but the Mexican group was slightly more accurate than the American group in the task. Ekman (1971) showed stress films and neutral films to observers in four groups. Americans living in America, Americans living in Japan, Japanese living in America and Japanese living in Japan. He videotaped the subjects facial responses to these films and showed these videotapes to observers. Accurate discrimination between stress and non-stress conditions were made by observers for subjects in all groups, showing that regardless of the nationality of the subject, the face was judged in the same manner.

Ekman (1972) and Izard (1971) showed a series of photographs to observers in a total of thirteen different cultures (see Table 2.1) and found high degrees of correct identification in each of the cultures. One could conclude from this data that observers from all of the cultures studied perceived facial expressions as having the same qualities of emotional meanings. Some critics argued, however, that there is a significant transfer of knowledge

Table 2.1 Literate Cultures, Percentage that Same Emotion Is Identified with Same Stimulus within Each Group

Table 2.1 Literate Cultures, Percentage that Same Emotion Is Identified with Same Stimulus within Each Group

	Dickey & Knower		Izard									Ekman & Friesen				
	Mexican	U.S.	U.S.	English	German	Swedish	French	Swiss	Greek	African	Japanese	Japanese	Brazil	Chile	Argentina	U.S.
Happy	97	95	97	96	98	96	94	97	93	68	94	87	97	90	94	97
Fear	71	55	76	67	84	89	83	67	68	48	58	71	77	78	68	88
Surprise	54	43	90	80	85	80	84	85	80	49	79	87	82	88	93	91
Anger	86	69	69	81	83	82	91	92	80	51	57	63	82	76	72	69
Disgust/ Contempt	61	47	82	84	73	88	78	78	87	55	56	82	86	85	79	82
Sad	61	51	73	74	67	71	70	70	54	32	67	74	82	90	85	73
Number of Observers	616	1244	89	62	158	41	67	36	50	29	60	29	40	119	168	99
Number of Categories Other Than These Listed Here	5	5	2	2	2	2	2	2	2	2	2	0	0	0	0	0

Source: Ekman (1972)

among l

counter

and sho

in New

laden s

observe

(see Ta

Table 2

Happine
Sadness
Anger
Surpris
Fear
from
from
Number

Source:

among highly technological and civilized cultures. To counter this argument, Ekman took his study one step further and showed his series of photographs to adults and children in New Guinea, a "visually isolated" culture. Using emotion-laden stories rather than labels, Ekman found that these observers could accurately identify the expressions studied (see Table 2.2).

Table 2.2 Identification of Emotion Photographs by Visually Isolated Preliterate Observers

Emotion Category Described in the Story	Percent Choice of the Emotion Expected in Terms of Agreement With the Judgments of Western Literature Culture Observers	
	Adults	Children
Happiness	92	92
Sadness	79	81
Anger	84	90
Surprise	68	98
Fear		
from Anger/Dusgust or Sadness	80	93
from Surprise	43	--
Number of Observers	189	130

Source: Ekman & Friesen (1972)

Th

least si

studied-

disgust.

relation

occurs i

than lea

Effects

In

can impr

studies

accuracy

cluded t

but also

accuracy

training

to begin

training

culty in

In

every ot

this typ

Moreover

ing prog

greater

results

This research presents conclusive evidence that at least six facial displays are recognizable in all cultures studied--happy, sad, fear, anger, surprise, and contempt/ disgust. This pan-cultural accuracy seems to indicate a relationship between facial expressions and emotions which occurs in all peoples and which seems to be an innate rather than learned component of the human repitiore.

Effects of Rater Training

In seeking to ascertain the extent to which learning can improve the recognition of facial expressions, two studies have investigated the effect of training on the accuracy of raters. An early study (Jenness, 1932) concluded that training significantly improved rating scores, but also found a negative correlation between initial accuracy and subsequent amount of improvement across training sessions. In other words, if the rater was accurate to begin with, then further training was not very helpful; training was most beneficial to raters who had initial difficulty in assigning the correct labels to facial expressions.

In a similar study, Guilford (1929) trained judges every other day over a period of ten days, and found that this type of procedure improved overall accuracy greatly. Moreover, the rating roups became more uniform as the training progressed, with poor initial raters showing much greater improvement over time. It is clear that Guilford's results correspond with Jenness' findings showing that

training significantly improves the accuracy of judgments, especially for raters whose beginning scores are particularly poor.

Conclusion

In reviewing the findings on subject and rater variables, several key points emerge. First it would seem that certain facial expressions are innate human behaviors and occur without prior learning. Evidence supporting this argument is found in studies of infants, blind children, and cross-cultural research. Secondly, although there seem to be differences in the area of sex and race for posing and judging emotions, all groups studied were able to recognize facial expressions at above chance accuracy, thus the similarity of these diverse groups is far more striking than are the differences between them. Finally, it is possible for observers to recognize these facial expressions without prior learning; observers who are trained in the recognition of facial expressions are significantly better at the identification task. It is reasonable to conclude therefore that even though innate facial expressions of emotion can be identified without prior learning, some training tends to sharpen the identification of these expressions.

Thi

measuring

One popul

is the a

expressi

such as

of desc

etc."

employi

electr

demons

on fre

1931;

own la

choices

subject

Languag

describe

own shad

labeling,

sion appr

expressio

Dependent Measures

This section explores a number of methodologies for measuring or describing facial expressions of emotion. One popular device for the measurement of facial expressions is the assignment of a written or verbal label to each expression. These labels may be in the form of categories such as "happiness, fear, love, etc." or dimensions composed of descriptors such as "active-passive, pleasant-unpleasant, etc." Other techniques will be examined which, rather than employing labels, measure facial activity directly through electrical activity of the facial muscles.

The importance of labeling methodologies is indirectly demonstrated by the poor success of studies which have relied on free labeling of facial expressions by subjects (Kramer, 1931; Landis, 1924). If subjects are allowed to apply their own labels to facial expressions, the number of possible choices is so great it would be exceedingly rare for subjects to agree on one label. Davitz (1969) in The Language of Emotion, found hundreds of words which could describe an emotional state, with each of these having its own shade of meaning. To escape from the problem of free labeling, most researchers have relied either on the dimension approach or the category approach to describe the expressions.

The Di

the di
Schlos
of fac
1938.
happin
These
each b
Woodwo
Schols
"conte
expres
showed
descri
unplea

(Secor
Schlos
findin
sions
be dis
pleasa
compile
finding

The Dimension Approach

In a series of studies, several investigators employed the dimension approach to study facial expressions. Schlosberg (1941) investigated a scale for the description of facial expressions first proposed by Woodworth in 1938. The affects in Woodworth and Schlosberg's model were: happiness, surprise, fear, anger, disgust, and contempt. These affects were arranged along a continuous dimension, each blending into the next along the scale. Although Woodworth first proposed that the scale was linear, Scholsberg's results showed it to be circular, with the "contempt" expression blending with the "happiness" expression to form a complete circle. Schlosberg also showed that the facial expressions in the study could be described on scales of attention-rejection and pleasantness-unpleasantness (Schlosberg, 1941).

Other experimenters investigated Woodworth's model (Secord, Dukes, and Bevan, 1954, 1956; Engen, Levy, and Schlosberg, 1958) and essentially replicated the earlier findings: that it is possible to identify facial expressions using Woodworth's scale, and that expressions can also be distinguished on dimensions of attention-rejection, and pleasantness-unpleasantness. Moreover, some evidence was compiled as to the cross-cultural reliability of these findings (Triandis and Lambert, 1958).

tiate

them (

unplea

tensic

Philip

Each s

third

expres

(Bartl

Philip

Sermat

the pl

are us

sions.

findir

The Ca

employ

expres

approa

assume

catego

indepe

approac

Many other investigators have attempted to differentiate facial expressions by asking subjects to place them on several dimensions. Most have included a pleasant-unpleasant dimension and an activity dimension ranging from tension to sleep (Abelson and Sermat, 1962; Frijda and Philipszoon, 1963; Bartlett, 1971; and Gladstones, 1962). Each study has discovered a third dimension; however, this third factor has been labeled differently in each study: expressionless-mobile (Gladstones, 1962), self assurance (Bartlett, 1971), intensity vs. control (Frijda and Philipszoon, 1963) and attention-rejection (Abelson and Sermat, 1962).

From this data it has been established that both the pleasant-unpleasant dimension and the activity dimension are useful in making discriminations between facial expressions. The third dimension also seems important, but the findings are ambiguous as to its composition.

The Category Approach

Another series of studies of facial expressions have employed discrete emotional labels to describe facial expressions. The basic difference between the dimension approach and this approach is that while the former assumes a relationship between different emotions, the category approach assumes that each affect is distinct and independent of all others. As an example of the category approach, Tomkins and McCarter (1964) showed 69 still photogr

asked

eight

surpris

contem

McCarte

correla

judged,

to accu

this pa

E

studies

McCarte

basis f

cross-c

major s

senting

surpris

interes

cross c

tion sc

employe

labels,

with the

there ha

facial e

photographs of facial expressions to 24 subjects and asked them to place each photo in one of the following eight categories: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, fear-terror, contempt-disgust, and shame-humiliation (Tomkins and McCarter, 1966). The investigators obtained an average correlation of +.858 between the affect posed and the affect judged, and they concluded that it was therefore possible to accurately judge the meanings of facial expressions using this particular set of affective labels.

Ekman (1972) has compared results from five major studies of affective categories, including Tomkins and McCarter, and has emerged with a synthesis which formed the basis for the categories included in his very successful cross-cultural work (see Table 2.3). He argued that all major studies of facial expressions included labels representing each of the following categories: happiness, surprise, fear, sadness, anger, disgust-contempt, and interest. As mentioned before, the success of Ekman's cross cultural work points to the utility of this categorization scheme. Moreover, Izard's cross cultural work (1971) employed Tomkins' and McCarter's set of eight emotional labels, thereby corresponding to seven of Ekman's categories with the addition of shame. In conclusion it seems that there have emerged at least six distinct categories of facial expressions: happiness, surprise, fear, sadness,

Table 2.3 Emotion Categories Proposed by Five Investigators

Table 2.3 Emotion Categories Proposed by Five Investigators

Woodworth 1938	Plutchik 1962	Tomkins & McCarter 1964	Osgood 1966	Frijda 1968b	Proposed
Love Mirth Happiness	Coyness Happiness Joy	Enjoyment Joy	Complacency Quiet pleasure ――― Joy Glee Worried laughter	Happy	Happiness
Surprise	Surprise Amazement Astonishment	Surprise Startle	Surprise Amazement Bewilderment Awe	Surprise	Surprise
Fear	Apprehension Fear Terror	Fear Terror	Fear Horror	Fear	Fear
Suffering	Pensiveness Sorrow Grief	Distress Anguish	Despair Boredom Dreamy sadness ――― Acute sorrow Despair	Sad	Sadness
Anger Determina- tion	Annoyance Anger Rage	Anger Rage	Sullen Anger Rage Stubbornness Determination	Anger	Anger

Source: Ekman, 1972

Table 2.3 Continued

Table 2.3 Continued

Woodworth 1938	Plutchik 1962	Tomkins & McCarter 1964	Osgood* 1966	Frijda** 1968b	Proposed
Disgust Contempt	Tiresomeness Disgust Loathing	Disgust Contempt	Annoyance Disgust Contempt Scorn Loathing	Disgust	Disgust/ Contempt
	Attentiveness Expectancy Anticipation	Interest Excitement	Expectancy Interest	Attention	Interest
	Acceptance Incorporation	Shame Humiliation	Pity Distrust Anxiety	Calm	
				Bitter	
				Pride	
				Irony	
				Insecure	
				Skepticism	

*All categories which were found in at least two of Osgood's three types of data analyses have been listed.
**All categories which emerged in the analysis of judgments of both stimulus persons have been listed.

Source: Ekman (1972)

anger, an

two categ

in the li

Electrom

Di

the only

expressi

it is po

of facia

Schwartz

that me

tion of

obvious

these s

electri

found

corrug

the su

Friedm

no vis

conclu

were i

Klerma

is sti

current

anger, and contempt-disgust. The validity of the remaining two categories, interest and shame, also has some support in the literature.

Electromyography

Dimensions and category labels have in the past been the only existing method to observe and measure facial expressions. With the advent of electromyography, however, it is possible to measure directly the electrical activity of facial muscles as the expressions themselves occur. Schwartz, perhaps the pioneer in electromyography, believes that methodologies emphasizing observation and categorization of facial expressions lack sensitivity to many less obvious facial changes. The Electromyograph (EMG) measures these small facial movements by recording changes in the electrical potential of certain facial muscles. Schwartz found different electrical potentials in the frontalis and corrugator muscles depending on the emotional content of the subject's imagery (Schwartz, Fair, Greenberg, and Friedman, 1973). Moreover, this effect was present even when no visible facial expression was evident. Schwartz thus concluded that the EMG was sensitive to facial changes which were invisible to observers (Fair, Schwartz, Greenberg, Klerman, and Gardner, 1974). Although the use of the EMG is still in a preliminary stage, it seems possible to circumvent many of the problems inherent in both the dimension and category methods by directly measuring facial electrical activity through this technique.

Conclusion

In this chapter, several procedural aspects of facial expression studies have been reviewed. Certain conclusions can be drawn from each of these sections and these have been considered in planning the present experiment.

It has been demonstrated that since expressions of facial emotion are elicited by a wide range of stimuli, it is necessary to choose an eliciting condition with care so that the intended affect is indeed elicited. Asking subjects to pose facial expressions avoids these considerations, yet there is some evidence to suggest that posed expressions differ systematically from those elicited spontaneously. In this study, spontaneous expressions are generated by asking the subjects to produce their own eliciting circumstances through the use of imagery. In this way it is possible to study spontaneous facial expressions without encountering the problems inherent when the experimenter sets the eliciting circumstances.

The next problem to be confronted is how to present these facial expressions to raters. Although the vast majority of studies have employed still photographs, it has been shown here that films or videotapes are significantly superior to photographs in the accuracy of identification. There is also some suggestion that the speed of facial expre

of ra

expre

norma

invol

Diffe

found

betwe

howev

group

betwe

capac

posse

natio

hand,

human

facia

be he

accur

been

perce

tapes

respon

expres

expressions when viewed on videotape influences the accuracy of ratings. In this study, the same videotape of facial expressions is shown to raters both in slow motion and in normal speed.

The third aspect of these facial expression studies involves the composition of the subject and rater groups. Differences in observers' ability to identify has been found between races, between sexes, between age groups, between personality types and between cultures. Thus far, however, the similarities in the accuracy of these diverse groups are far more striking than the differences that exist between them. This type of data points strongly to a capacity to recognize and identify facial expressions possessed by all human beings which cuts across cultural, national, sexual, and age-related boundaries. On the other hand, it has been shown fairly conclusively that although human beings are capable of accurately identifying some facial expressions, training in this area has also proved to be helpful, particularly for those who are initially less accurate than average. In this study, all raters have been trained and have attained a level of at least 80 percent accuracy for still photographs before viewing videotapes.

The methodology for describing and recording raters' responses is an important part of any study of facial expressions. Many studies have shown that either the use of di

fully

of th

happi

disgu

inclu

Tomki

emplo

enjoy

conte

group

in th

of dimensions or categories enable observers to successfully discriminate between facial expressions. A synthesis of the major studies has emerged with the categories of happiness, surprise, sadness, anger, fear, and contempt-disgust. The categories of interest and shame are also included very successfully in some research. In this study, Tomkins schema of eight affective categories has been employed. The affects studied are: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, contempt-disgust, fear-terror, and shame-humiliation. This group of categories includes all those studied successfully in the cross cultural research.

se

vi

vi

sa

the

ana

st

up

dua

Mic

the

whi

fee

mat

par

sess

revi

CHAPTER III

DESIGN OF THE STUDY

This chapter is divided into the following twelve sections: the subject sample, the primary interview, the videotape apparatus, the recall interview, judging of interview tapes, editing of the interview tapes, the rater sample, training of raters, the post hoc rater questionnaire, the design of the study, the hypotheses, and finally, the analysis of the data. A flow chart of the procedure of the study is presented in Table 3.1.

The Subject Sample

Eighteen volunteer subjects were obtained through sign-up sheets (see Appendix A) from a large class, "The Individual and the School" (ED-200), in the College of Education at Michigan State University. Subjects were informed before they signed up that they would be participating in a study which involved making videotapes of people discussing their feelings and emotions. They were informed of the approximate time commitment involved and told that they would participate in a videotaped interview followed by a recall session where the contents of the interview would be reviewed.

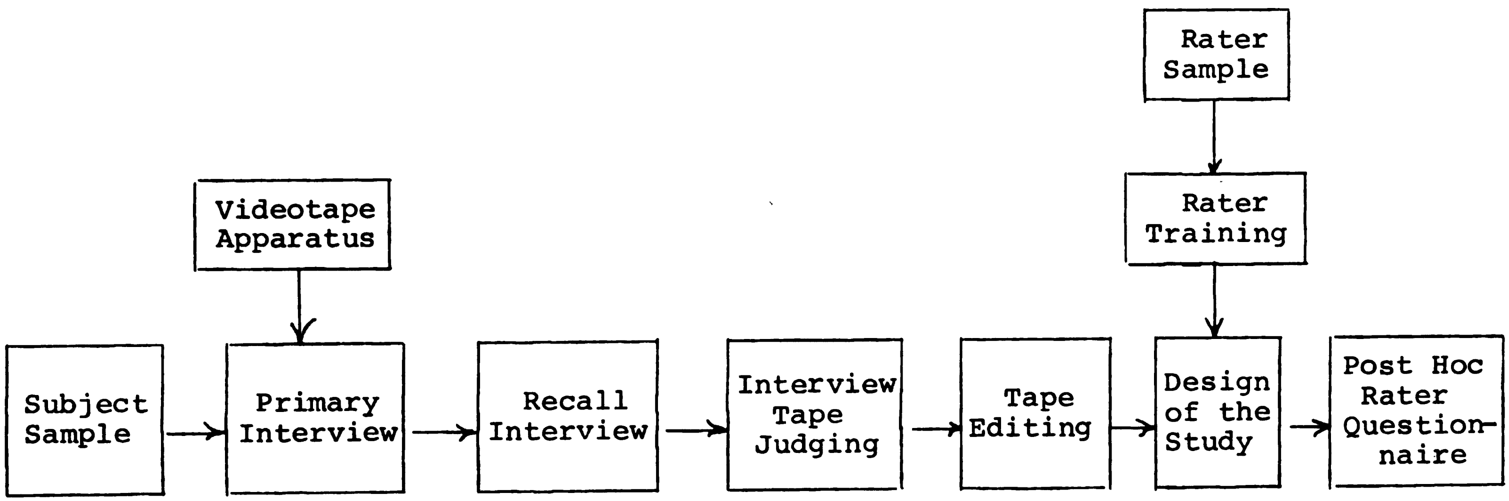


Table 3.1. Flow Chart of Procedure

with

of e

cent

subj

and

stud

tapi

and

C an

the

inte

in t

cons

of t

use

thei

did

or m

aske

thei

sess

the s

candi

Ages of subjects ranged from nineteen to forty-seven with the average age being twenty-seven. The average level of education completed is sophomore in college, and 59 percent of the subjects were female with 41 percent of the subjects being male. Fourteen of the subjects were white and three were black (see Appendix B).

The Primary Interview

When the subject arrived for participation in the study, the experimenter again informed him of the videotaping procedure and asked him to fill out a release form and a short series of informational questions (see Appendices C and D). Although the subject was going to be videotaped, the experimenter explained that the verbal content of the interview was not being recorded. Thus, everything said in the interview remained strictly confidential and was not considered material for the study. Moreover, the identity of the subject was kept completely confidential through the use of a number system. Although subjects were aware that their non-verbal behavior was being recorded, at no time did the experimenters mention the term "facial expression" or make any reference to the focus of the study. If subjects asked the purpose of the study, they were asked to postpone their questions until after the primary interview and recall session were completed. The primary interviewer in both the structured and unstructured interview was a male Ph.D. candidate in the College of Education at Michigan State

Univer

in an

atmos

was r

the s

condi

<u>The S</u>

firs

E).

set

thes

Afte

verb

the

she

for

tha

his

Whe

int

tiv

Car

University. He was instructed to respond to the subjects in an interested, accepting manner in order to create an atmosphere of trust during the interview. The interviewer was naive as to the hypotheses of the study.

The first 9 subjects scheduled were interviewed in the structured condition and the last 8 in the unstructured condition.

The Structured Interview

In the structured interview condition, the interviewer first read the instructions to the subject (see Appendix E). He told the subject that he or she would be shown a set of photographs of facial expressions, and that each of these expressions represented a particular type of emotion.[1] After a photo was shown to the subject, the interviewer verbally identified the emotional category represented in the photo. He then interviewed the subject on how he or she experienced that particular emotion. Questions asked for each category were: how familiar the subject was with that emotion, how he identified it, where he felt it in his body, and finally what situations tended to trigger it. When the subject was finished talking about one emotion, the interviewer presented another photograph and another affective category was discussed with the same topic areas

---

[1]The photographs used were obtained courtesy of Carroll Izard, Vanderbilt University.

revi

of

enj

rag

It

to

The

the

to

stat

to

Appe

the

felt

the

inte

affe

the

vent

unst

Plac

emplo

reviewed. The photographs portrayed expressions of each of these eight affective categories: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, contempt-disgust, fear-terror, and shame-humiliation. It was these eight categories that the subject was asked to discuss or explore in terms of his own experience.

The Unstructured Interview

In the unstructured interview, the basic purpose was the same as the structured condition: the subject was asked to discuss his experience with several different affective states. In this condition, however, the subject was asked to make his own list of emotions and discuss them (see Appendix F). Subjects were asked how familiar they were with the emotions they chose, how they identified them, where they felt them in their bodies, and what situations triggered the particular emotions. The difference here was that the interviewer did not provide photographs or the concurrent affective categories for discussion by the subject. Rather the subject was expected to generate these without intervention by the interviewer.

Videotape Apparatus

While the subject was being interviewed in either the unstructured or structured condition, videotaping was taking place behind a one-way mirror. Two Sony video-cameras were employed; one with a 25-22.5-90mm zoom lens was trained on th

a

re

S

fa

th

co

ac

th

ta

jec

was

cand

Univ

instr

was

the p

tape

encin

were

in th

unabl

gorie

the subject's head and neck region. The other camera with a 16 mm normal lens was trained on a digital timer with a read-out in seconds. Both cameras were fed into a SONY SPECIAL EFFECTS GENERATOR (SEG1) which showed the subject's face on the majority of the screen while the read-out from the digital clock was recorded in the upper right-hand corner. The recording of the digital timer allowed great accuracy in locating the segments of the interview tape for the editing and judging procedures to follow. The video-tape was recorded on an AMPEX 3600 Video-Tape Recorder.

Recall Interview

After the primary interview was concluded, the subject was introduced to the recall interviewer and the tape was rewound. The recall interviewer was also a male Ph.D. candidate in the College of Education at Michigan State University, and was naive as to the hypotheses of the study.

The recall interviewer then read another set of instructions to the subject (see Appendix G). The subject was told that they would be viewing together a videotape of the previous interview. The subject's task was to view the tape and to identify places where he saw himself as experiencing an emotion. All subjects during the recall interview were asked to use the same affective categories as were used in the structured interview condition. If a subject was unable to fit his emotional label into one of the eight categories, the response was not used in the study.

The recall interviewer was instructed to view the videotape along with the subject and to record the points in time on the tape where the subject identified an emotional response. He thus recorded the type of response in one of the eight affective categories and pinpointed its location on the tape by recording the corresponding digital clock read out (see Appendix H).

Before leaving, the subject was informed of the purposes of the study and was given the opportunity to discuss any reactions he had to the procedure.

Judging Interview Tapes

While previous sections of this chapter examined how the facial expressions were elicited and recorded through the interview procedure, this section deals with how the most valid segments were chosen from the raw data of the interview tapes. A rating panel composed of four expert judges was chosen on the basis of the judges' familiarity with Izard's affective states (Izard, 1971), and with research and literature on facial expressions. The interview tapes were played to the judges, and the judges were asked to identify the emotion on the subject's face at those points on the tape chosen by the subjects themselves during the recall interview. An average of 4 seconds was bracketed around the recorded time to allow for errors by the subjects or by the recall interviewer.

An example might be helpful to make this part of the procedure clear. For instance the subject identified a point on the interview tape where he thought he looked happy. The recall interviewer recorded this label and, through the digital readout in the corner of the screen, also recorded the point on the tape at which it occurs. Two seconds of viewing time were added to the segment preceding the time identified by the subject. Another two seconds were added following the identified time. Thus a total of five seconds of videotape were viewed, with the exact second identified by the subject occurring in the middle of the segment. If the readout time then was recorded at 5 minutes and 30 seconds, the judges would have viewed the tape segment from 5 minutes 28 seconds to 5 minutes 33 seconds, and would have recorded which of the 8 affective categories was in their opinion represented on the segment.

For purposes of this research, the cirterion for validity was the agreement of 75 percent of the judges on the affective category of a 5 second segment. Thus if 75 percent of the judges agreed on the emotion depicted in a five second segment, this segment was acceptable for use in the stimulus tapes. Two affective categories (fear-terror and shame-humiliation) were eliminated from the study due to an inadequate number of acceptable segments portraying these two emotions. The materials included in the stimulus tapes then consisted of segments which were identified in the following categories: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage and contempt-disgust. The rationale for the elimination of fear-terror and shame-humiliation will be further discussed in the following chapter.

Tape Editing

One hundred and one segments in the remaining sex categories were randomly edited onto a master tape. A random numbers table (Glass and Stanley, 1971) was employed for this part of the procedure. An AMPEX 3650 Video Editor was employed for all editing. Segments were spaced so that there was a 10-second pause between two segments to allow raters time to record their responses. An AMPEX 5680 Video Editor was employed to make a duplicate tape with the segments slowed to an average of 31 seconds (one-sixth speed) for the slow-motion condition. In the slow-motion tape, an attempt was made to retain the intervals between the segments at an approximate length of 10 seconds; because of taping and editing errors, however, the actual interval was closer to 9 seconds. (For specific composition and speed of the stimulus tapes, see Appendices I, J and K.)

Rater Sample

The procedure thus far has yielded two stimulus tapes (one in slow motion and one at normal speed) on which 101 segments of facial expressions occur with 10 second intervals between them. The next step in the procedure is to select raters who will label facial expressions when they view the segments. The rater group consisted of 29 volunteers from education classes in "Group Leadership" (ED 882) and in "Teacher Interaction Skills" (ED 882) offered by the College of Education at Michigan State University. The average age of the raters was 31 and all raters in the study were graduate students (see Appendix L).

Rater Training

The first part of the training program began after the rater had filled out the information sheet and release form (see Appendices M and N). The program consisted of an introduction to the six affective categories in the study, and the appearance of these emotions in facial expressions. A schematic of facial musculature was presented to acquaint the rater with facial muscle groups (see Appendix O). Each of the six categories of emotions was then explained in detail including synonyms for the affective terms, sensations associated with each state, possible elicitors, the theoretical function of the affect, and finally, the facial appearance of each state (see Appendix P). During the discussion of an affect, a slide was shown depicting the facial expression of that affect.[2] The rater was also introduced to the set of abbreviations which were to be used in place of writing out the names of the emotional categories on the scoring sheet (see Appendix Q).

---

[2]All slides used in this section of training were obtained courtesy of Carroll Izard, Vanderbilt University.

After the discussion of the six categories of emotion, a set of 18 slides[3] were shown to the raters and they were asked to attempt to identify each photo using one of the six emotional categories discussed previously. The raters at this point were allowed to view these slides as long as they wished. After the task was completed, the slides were reshown along with the correct answers, and the raters were encouraged to discuss any confusions or questions they might have had at this time.

The raters were then administered an accuracy test composed of 36 slides of spontaneous expressions.[4] Each of these slides was exposed for only 5 seconds; there was a 10-second interval between the showings of the slides so the raters could record their responses on the answer sheet. Since the timing of this test was identical to the timing of the normal speed videotape, the results of these slides were used to determine the initial accuracy of the rating groups.

During the next training session, the results of the first accuracy test were returned and the raters received feedback on their scores. They were then shown videotaped segments of the posed affects which were presented in the same way as the stimulus tapes (5-second exposures, followed

---

[3]All slides used in this section of training were obtained courtesy of Carroll Izard, Vanderbilt University.

[4]Slides were produced from videotapes obtained courtesy of Bob Wilson, College of Education, Michigan State University.

by 10-second rest). Because of the posed eliciting conditions, however, these responses were not scored for accuracy. The purpose of this section of the procedure was to familiarize the raters with the task of viewing videotapes.

The final part of the training task was a second accuracy test which was identical in form to that mentioned previously.[5] Slides of the spontaneous expressions were again exposed for 5 seconds followed by 10-second rests. Raters were asked to identify the facial expression using the 6 emotional labels. When each rating group member established a criterion level of at least 80 percent accuracy in identification of the slides, then they were ready to rate the stimulus material.

Design

This design was intended to test the effects of tape speed (normal vs. slow) and test-retest procedures on the raters' perception of spontaneous facial expressions. There were two dependent measures employed: the number of facial expressions observed (M1), and the accuracy of observers' identification in each of the six categories (M2).

Each group of observers viewed the same videotape twice (see Table 3.2). Group one saw the normal speed tape

---

[5] Slides were produced from videotapes obtained courtesy of Bob Wilson, College of Education, Michigan State University.

followed by the slow motion speed tape; group three saw slow motion followed by normal; and group four saw slow motion followed by slow motion. A minimum of one week elapsed before a group was presented with the second tape. Observers who viewed the slow motion version of the tape were allowed a rest break of 10 minutes after 45 minutes of viewing time since the slow motion task was found to be a very fatiguing one.

Responses were recorded on forms similar to those used during the training session (see Appendix R). If the raters wished to record more than one affect for a segment, they were instructed to write the "most intense and predominant" affect first, and the other affect(s) second, third, and so on. Thus the order in which the rater recorded the affects was not necessarily the order in which they appeared on the tape.

Table 3.2. Design of the Study.

			P_1						P_2					
T_1	T_2	R	A_1	A_2	A_3	A_4	A_5	A_6	A_1	A_2	A_3	A_4	A_5	A_6
		1	M1 / M2											
		2												
		3												
S_1	S_1	4												
		5												
		6												
		7												
		8												
		9												
		10												
		11												
S_1	S_2	12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
S_2	S_1	20												
		21												
		22												
		23												
		24												
		25												
		26												
S_2	S_2	27												
		28												
		29												

Abbreviations:

S1 = normal speed
S2 = slow motion
T1 = speed at time 1
T2 = speed at time 2
M1 = number of facial expressions per segment
M2 = number of right answers per category
P1 = first presentation
P2 = second presentation
A1 = interest-excitement
A2 = enjoyment-joy
A3 = surprise-startle
A4 = distress-anguish
A5 = anger-rage
A6 = contempt-disgust

Post Hoc Rater Questionnaire

Two months after the stimulus tapes had been viewed by the raters, a summary of the study and a questionnaire was mailed to each person who had rated the tapes (see Appendices S and T). This questionnaire consisted of 12 items in three categories: the rater's state of mind while viewing the stimulus tapes, the quality of the tapes themselves, and the rater's evaluation of the overall study. Each item on the questionnaire consisted of a seven point scale on a continuum such as "interested-bored," or "relaxed-tense." The purpose of this quesionnaire was to determine whether confounding variables were operating as a function of the composition of the rater groups or as a function of the stimulus tapes themselves.

Hypotheses

Six research hypotheses were tested, each postulating a relationship between speed of the videotape and the accuracy of frequency of raters' responses. The six hypotheses are as follows:

Hypothesis 1: Trained observers will record a greater number of facial expressions when viewing the stimulus tape at slow motion than when it is viewed at normal speed.

Hypothesis 2: Trained observers will identify facial expressions more accurately when viewing a stimulus tape in slow motion than when it is viewed at normal speed.

Hypothesis 3: Trained observers will record a greater number of facial expressions when the unstructured interview is played in slow motion than when the structured interview is played in slow motion.

Hypothesis 4: Trained observers will identify facial expressions more accurately when the unstructured interview is played in slow motion than when the structured interview is played in slow motion.

Hypothesis 5: When the slow motion videotape is viewed at time 1, trained observers will record a greater number of facial expressions at presentation 2 than they did at presentation 1.

Hypothesis 6: When a slow motion videotape is viewed at time 1, trained observers will more accurately identify facial expressions at presentation 2 than they did at presentation 1.

For each of these hypotheses, the alpha level is set at p = less than .05.

Analysis of the Data

The analysis of the data took place in several steps. The primary rater response was scored as right or wrong, corresponding to the answer key developed through the responses of the expert judges. Each affective category was considered a separate scale, and the total number of right answers per scale was designated as one of the dependent variables, measure 1 (M1).

The accuracy of raters' judgments was calculated for the primary response and compared to the accuracy expected by chance alone. To determine inter-item reliabilities, coefficient alpha was calculated for each of the affective scales. Spearman Rank Order correlations were also calculated to determine the reliability of the patterns of responses for each scale across the two presentations of the stimulus tapes.

Measure 1, the total number of right answers per affective category was then analyzed in a design across subjects and a design across measures. The design across subjects tested the effects of the speed at time 1 (T1), the speed at time 2 (T2), and the interaction between these speeds. The speeds compared are normal speed (F) and slow motion (S). The design across measures tested the effects of presentation 1 (P1) and presentation 2 (P2) on each of the six affective scales (A1 through A6). Again the dependent variable was the number of right answers on each affective scale.

Measure 2 concerned the number of facial expressions recorded by raters for each segment. It was calculated by dividing the number of segments in which more than one facial expression was seen, by the total number of segments or items on a scale. The dependent variable then was the percent of items in a scale where more than 1 affective facial expression was observed.

The designs utilized for measure 2 were the same as those used for measure 1. The across subjects design tested the effects of speed at time 1, speed at time 2 and the interaction of speeds. The across measures design tested the effects of presentation 1 and presentation 2 on the frequency of responses across the six affective categories.

The results for both measure 1 and measure 2 were analyzed in a multivariate approach to repeated measures analysis of variance incorporating multiple measures taken at each measure point. In this design it was possible to analyze not only the main effects in each of the designs but also the interaction between the designs themselves. The variables studied in the overall design thus includes:

For M1 (accuracy data) and M2 (frequency data):

T1 = speed at time 1
T2 = speed at time 2
T1 x T2 = speed at time 1 x speed at time 2
P1/P2 = test-retest
T1 x P1/P2 = speed at time 1 x test-retest
T2 x P1/P2 = speed at time 2 x test-retest
T1 x T2 x P1/P2 = speed at time 1 x speed at time 2 x test-retest

The significance level for all of the effects studied was set at $p < .05$.

CHAPTER IV

ANALYSIS OF RESULTS

Introduction: Overview of the Design and Analysis

Because of the complexity of the design, the data in the study is reported in several steps. The first area covered is Subject Self Reports: how subjects identified their own facial expressions using each of Tomkins' eight categories. The second section, Expert Judge Agreement, focuses on the agreement of the subject with a panel of expert judges.

The outcome of the Expert Judge Agreement data was twofold: the design was altered to provide a stronger test of the main hypotheses at the expense of two minor hypotheses, and the segments appropriate for the stimulus tapes were chosen along with the "right answer" key for these segments.

The simulus tape was presented to trained raters, and two measures (M1 and M2) were recorded and analyzed. The accuracy of the primary rater responses (M1) was compared with chance levels of accuracy; also Coefficient Alpha and Spearman Rank Order correlations were calculated to determine inter-item and test-retest reliability. Finally, a multivariate approach to analysis of repeated measures designs which incorporates multiple dependent variables at each of the points of repeated measurement was employed for both the accuracy and frequency measures. The design thus tested the effect of the following variables: speed at time 1 (normal vs. slow motion), speed at time 2 (normal vs. slow motion), test-retest, and six affective categories (interest, joy, surprise, distress, anger and contempt-disgust). The dependent measure which was analyzed for each of these effects was the accuracy of the raters' responses.

The second dependent measure analyzed (M2) consisted of the proportion of videotaped segments where the rater recorded seeing more than one emotion. This frequency data was analyzed in the same type of analysis of variance for repeated measures as was performed for the accuracy data.

Finally, the outcomes of these two designs were related to the remaining hypotheses of the study and the statistical decision was made as to whether or not the null hypotheses should be rejected, and the directional alternatives accepted.

Subject Self Report

The dependent measure in the subject self-report data is the total number of responses the subjects gave in each affective category while reviewing the tape of their own primary interview. No mention is made here of the validity of subject responses but merely of the frequency of responses in each category.

From Table 4.1, it is clear that some emotions were labeled more often than others. Interest was the category most often labeled, followed by distress and joy. The categories of anger and contempt were used by subjects less frequently than interest, distress, or joy and the categories of surprise, fear and shame were labeled quite infrequently. Shame-humiliation was the category least utilized by subjects, with a total of only 12 instances of shame labeled by subjects in all of the recall sessions. These data are presented graphically in Figure 4.1.

Table 4.1. Number of facial expressions reported by subjects in each of eight affective categories for the two interview conditions.

Affect	I_1	I_2	Total
Interest	52	50	102
Joy	43	30	73
Surprise	24	3	27
Distress	28	58	86
Anger	33	14	47
Contempt-Disgust	39	7	46
Fear	19	8	27
Shame	10	2	12

Abbreviations: I_1 = structured
I_2 = unstructured

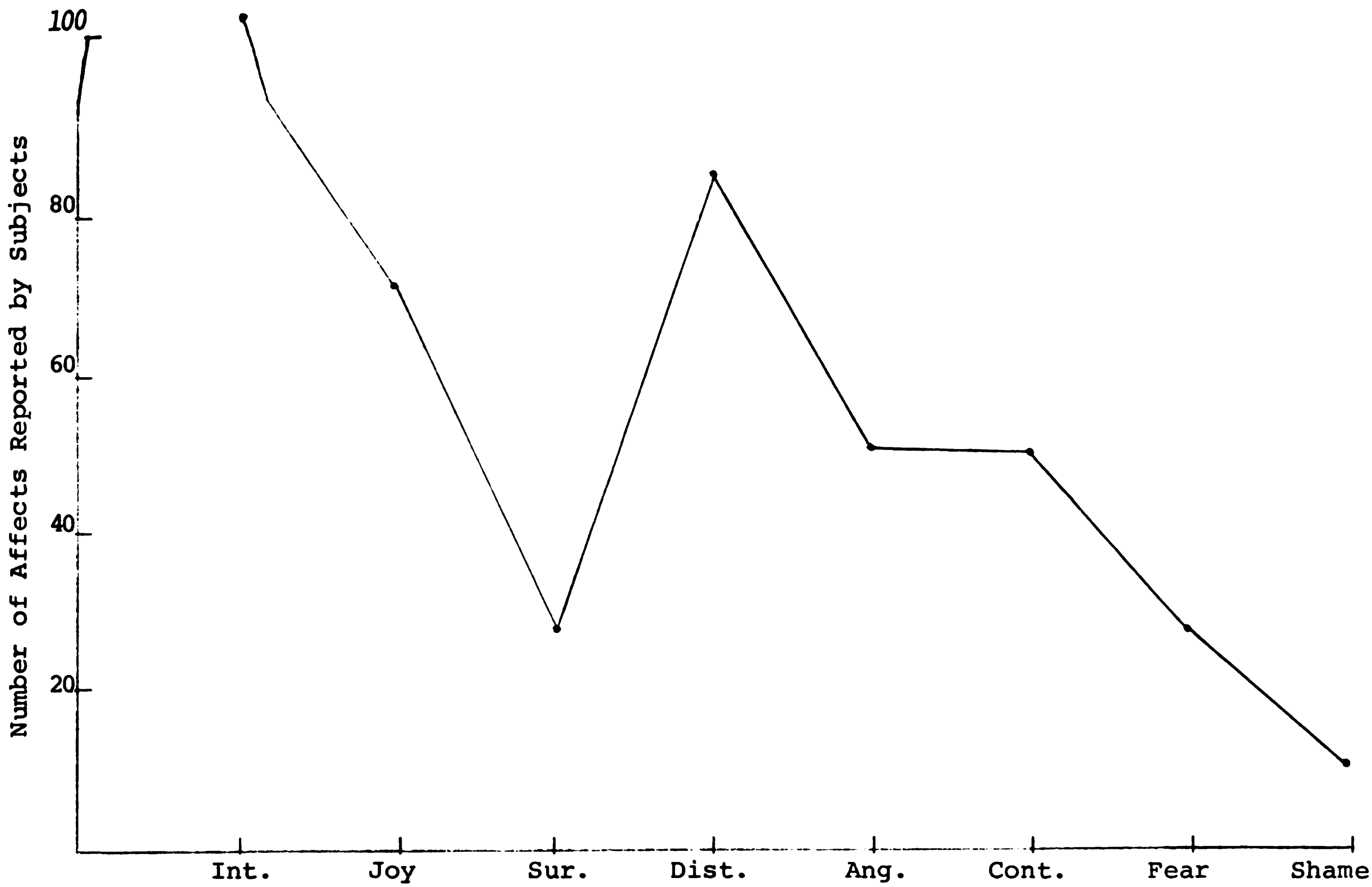


Figure 4.1. Total Subject Emotions Reported in Each of Eight Affective Categories

When subject responses were divided between the two interview conditions, there was a marked contrast in the subject response frequencies (see Figure 4.2). Subjects in the unstructured interview condition made markedly fewer responses in the categories of surprise, anger, contempt, and fear. The only category in which subjects in the unstructured condition made more responses was the category of distress-anguish, and here they made over twice the number of responses than had the subjects in the structured interview condition. In only two categories did subjects in the interview conditions produce comparable response frequencies: interest, the most popular category, and shame, the least popular category.

Expert Judge Agreement

After the subject self report responses were recorded, a panel of expert judges viewed those portions of the tape chosen by subjects and made independent judgments of the affect present. The data compiled here (Table 4.2) are the number of instances in which 75 percent of the judges agreed on the category label regardless of the subject's labeling of the segment. The greatest amount of judge agreement was in the categories of interest, joy, and distress. Surprise, anger and disgust yielded a moderate amount of judge agreement, and fear and shame yielded the fewest number of instances where 75 percent of the judges agreed on the category.

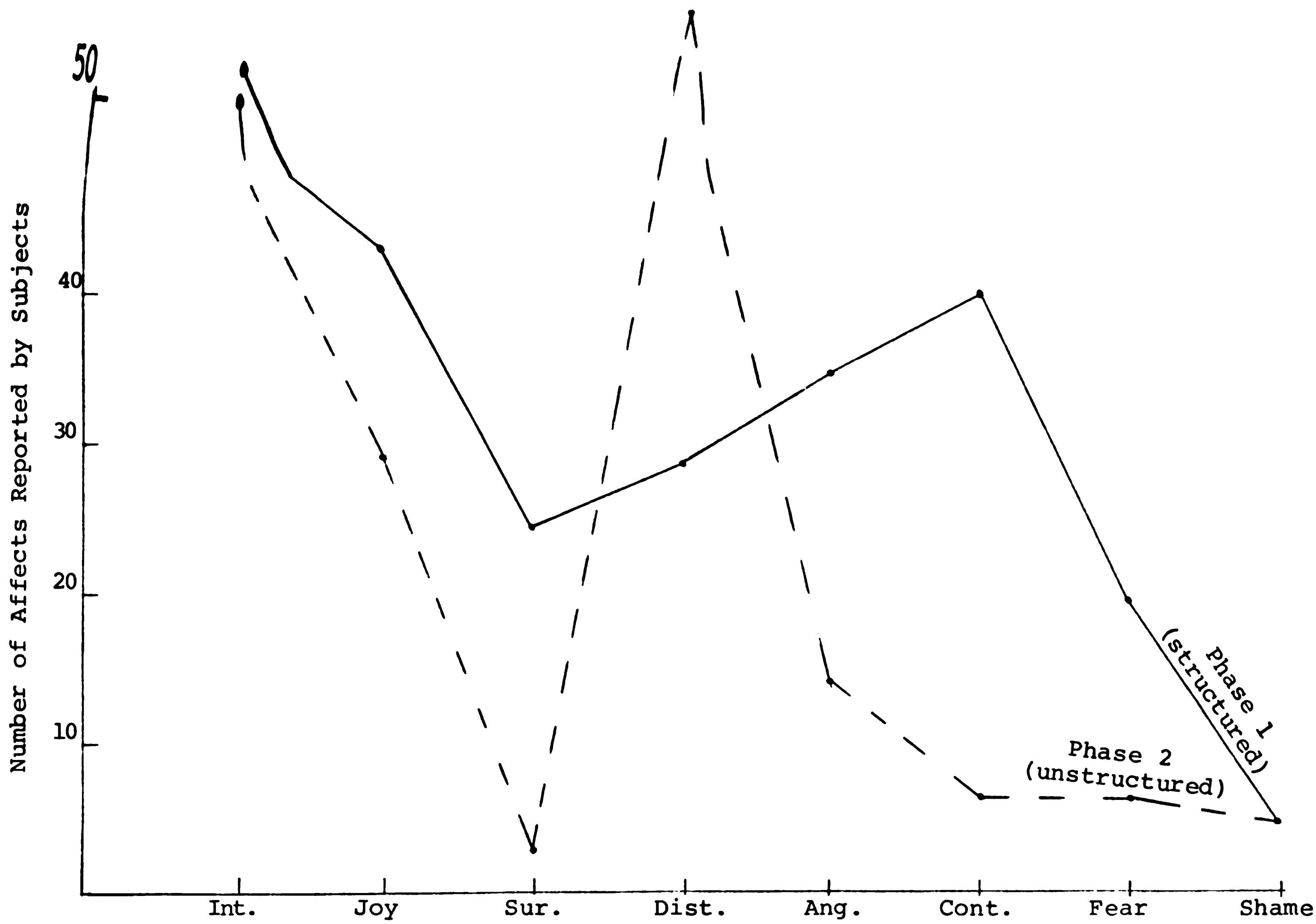


Figure 4.2. Number of Affects Identified by Subjects in Each of Eight Categories in the Two Interview Conditions

Table 4.2. Number of Instances of 75 Percent Agreement in the Two Interview Conditions for Each of the Eight Affective Categories

Affect	I_1	I_2	Total
Interest	19	14	33
Joy	19	13	32
Surprise	7	3	10
Distress	13	19	32
Anger	7	11	18
Disgust	6	6	12
Fear	2	2	4
Shame	4	3	7

I_1 = structured interview

I_2 = unstructured interview

In comparing the two types of interview conditions, he same type of pattern of judge agreement occurred see Figure 4.3). Interest, joy, and distress yielded eatest judge agreement and fear and shame the least. nerally, judges were less in agreement on segments taken om the unstructured interview condition with the excepions of the categories of distress and anger. For these o affects, especially distress, the unstructured interew yielded more agreement among the judges than did the ructured interview.

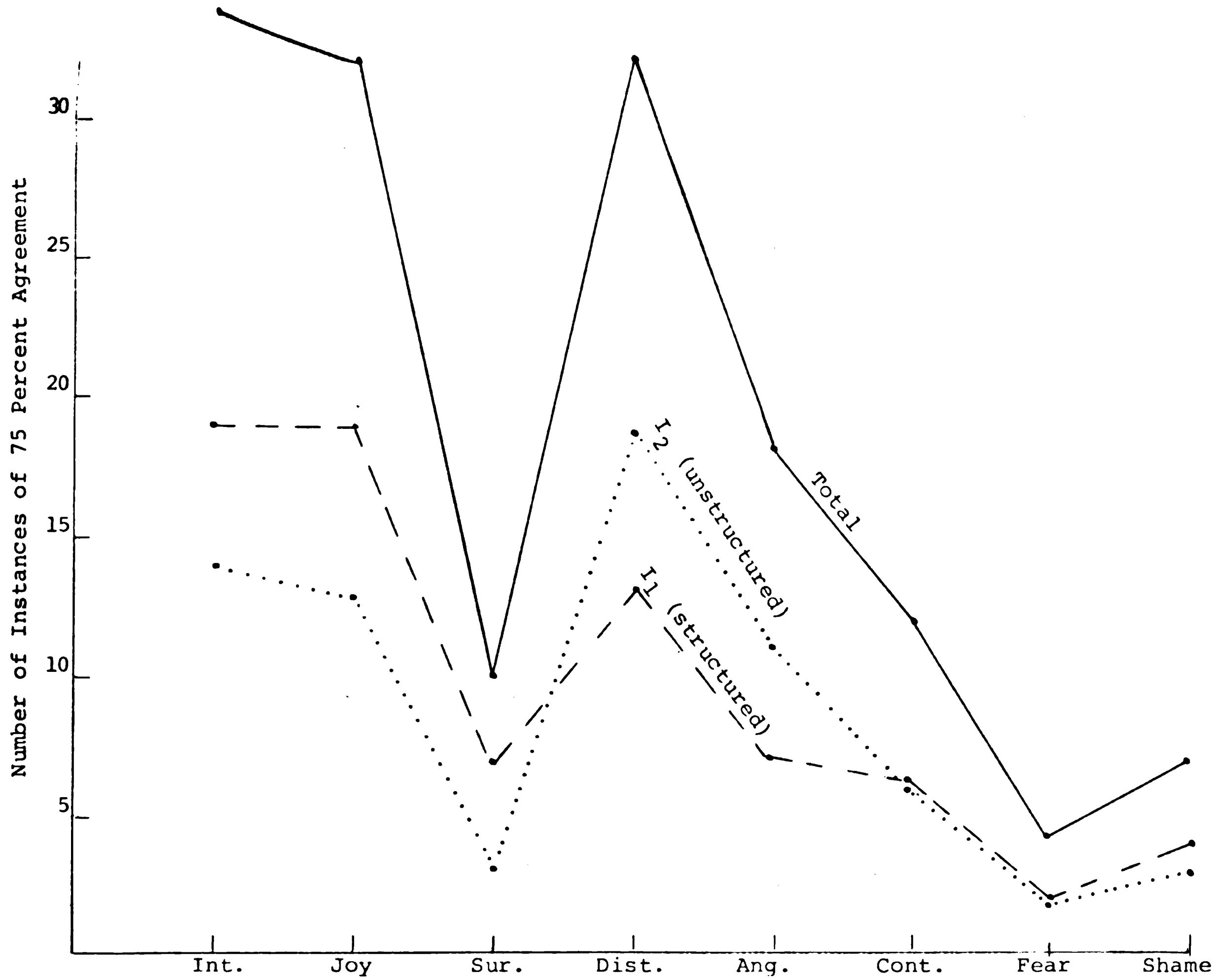


Figure 4.3. Total Number of Instances of 75 Percent Agreement of Expert Judges in Each of Eight Affective Categories

Revision of Design

Because of the low overall number of instances of 75 percent judge agreement, two major revisions in the design were instituted. Because of the small number of subject recall responses and the small number of instances of 75 percent judge agreement in the affective categories of fear-terror and shame-humiliation, these categories were eliminated and the two interview conditions (I1 and I2) were merged. The stimulus tape then contained segments from both the structured and unstructured interview conditions and the data were not analyzed in terms of this variable.

The elimination of the categories of fear-terror and shame-humiliation has no effect on the overall design. All hypotheses can be tested utilizing six categories rather than the original eight. The elimination of the interview condition as a variable does have important effects on the design and the tests of two hypotheses. These hypotheses involved the prediction that there would be differences on each of the measures (accuracy and frequency) owing to the type of interview condition employed for that subject. In this revised design, these hypotheses are untestable.

The strength of the revised design is that it allows the remaining hypotheses to be tested with greater reliability. Because each of the remaining scales has at least nine items (most have 15 or 20) the hypotheses regarding the effect of tape speed and test-retest can be more reliably tested. It is these remaining hypotheses that constitute the core of the study, and thus the elimination of the two hypotheses regarding interview conditions does not alter the main thrust of the research.

Stimulus Tape Composition

The stimulus tape was composed of 101 segments but because of editing errors and distortions in the videotape output due to faulty equipment, the number of useable segments was reduced to 88. Of these, 65 percent involved female subjects and 35 percent involved males. Fifty-two percent were drawn from the structured interviews and 48 percent from the unstructured interviews. Segments were edited in a random order onto the master tape through the use of a random numbers table (Glass and Stanley, 1970). For an item by item breakdown of the segments on the master tape, see Appendix I and J.

Two criteria are used to develop the right answer key for the segments on the master tape: 75 percent agreement of judges, and the better than chance agreement of subjects with judges. Segments were chosen on the basis of 75 percent of agreement of expert judges, regardless of the subject's label. Moreover, in 60 percent of the chosen segments, the subjects also agreed with the label assigned by the judges. The percent of agreement expected by chance alone is 12.5 percent. Thus the subject's agreement with the judges for the segments used in the stimulus tape is almost five times the level expected by chance. The high judge agreement coupled with better than chance agreement between subjects and judges makes a strong case for the validity of the segments employed.

Analysis of Dependent Measures

The stimulus tapes were viewed by a sample of 29 trained raters. For this task, an answer form was developed which recorded two measures: first, the raters' judgments of the primary affect in the segment, and second, the number of facial expressions seen in that segment. It is these two measures that form the core of the data in the study.

Accuracy of Rater Responses

Measure 1 concerns the accuracy of rater identifications of facial expressions on the master tape. To calculate this measure, the number of right answers in each affective category was computed for each subject.

It was of interest to find out not only with what frequency people answered correctly on segments keyed for each of the affective scales, but also to find out in what way errors were committed. Table 4.3 and Figure 4.4 illustrate the frequency distribution of responses given to items on each of the affective scales. Each chart in Figure 4.4 represents all items keyed to the correct response--one of the six affective categories.

Table 4.3. Number of Answers and Standard Deviations in Each Affective Category for Each Scale at Time 1 and at Time 2

			Int.	Joy	Sur.	Dist.	Ang.	Con.
Interest	T1	$\bar{X}$	9.586	.759	.488	3.75	1.38	.86
		SD	2.57	1.09	7.36	1.70	1.29	1.06
	T2	$\bar{X}$	10.48	.828	.483	3.06	.97	.69
		SD	2.49	1.04	.74	1.80	1.15	1.07
Joy	T1	$\bar{X}$	3.10	13.35	.62	.31	.35	.17
		SD	2.21	2.72	1.18	.54	.55	.47
	T2	$\bar{X}$	2.80	13.52	6.21	3.79	.14	.10
		SD	2.14	2.65	.98	6.8	.36	.56
Surprise	T1	$\bar{X}$	1.55	.276	4.72	.17	.14	.10
		SD	1.21	.46	1.36	.38	.35	.41
	T2	$\bar{X}$	1.69	.138	4.59	.27	.17	.10
		SD	1.56	.44	1.72	.59	.47	.56
Distress	T1	$\bar{X}$	3.86	.55	.24	7.52	2.03	2.72
		SD	2.42	.73	.56	3.35	2.71	2.16
	T2	$\bar{X}$	4.31	.244	.345	7.48	2.20	1.89
		SD	2.58	.497	.614	3.08	2.23	1.86
Anger	T1	$\bar{X}$	3.59	.55	.24	2.28	6.31	2.79
		SD	2.16	.69	.51	1.56	2.88	1.89
	T2	$\bar{X}$	3.86	.48	.41	2.0	6.79	2.28
		SD	2.60	.69	.87	1.73	3.22	2.03
Contempt	T1	$\bar{X}$	3.97	.76	.17	2.24	1.24	4.72
		SD	1.89	.64	.38	1.21	1.24	1.73
	T2	$\bar{X}$	4.35	.72	.17	1.80	1.17	4.52
		SD	1.91	.53	.47	1.29	1.22	2.03

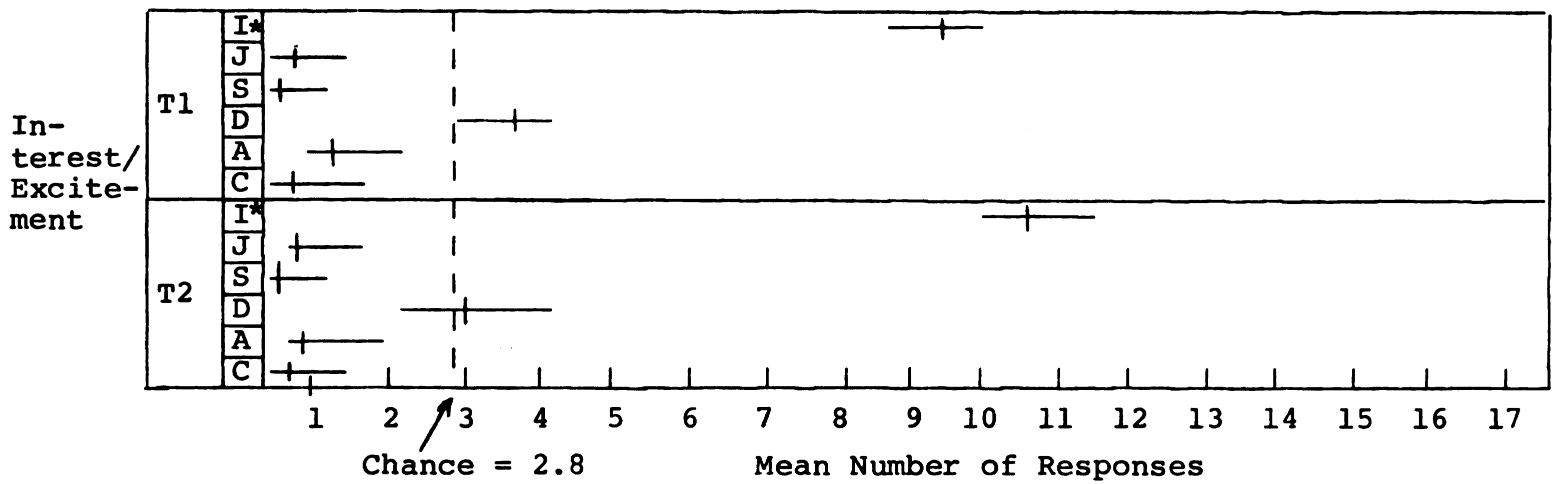


Figure 4.4. Mean Number of Answers and 95 Percent Confidence Interval in Each of Six Affective Categories for All Scales at Time 1 and Time 2 as Compared to Level of Accuracy Expected by Chance

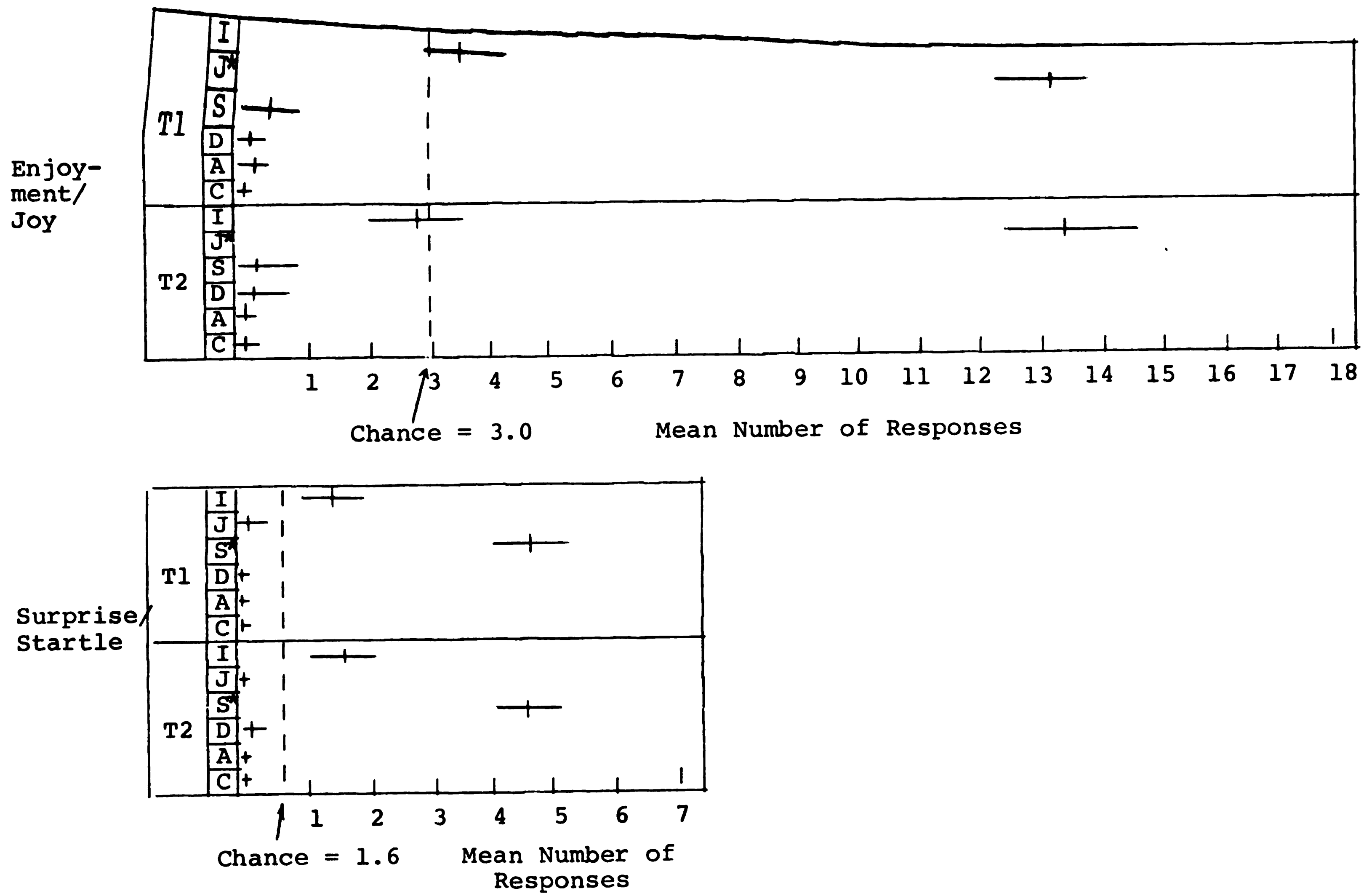
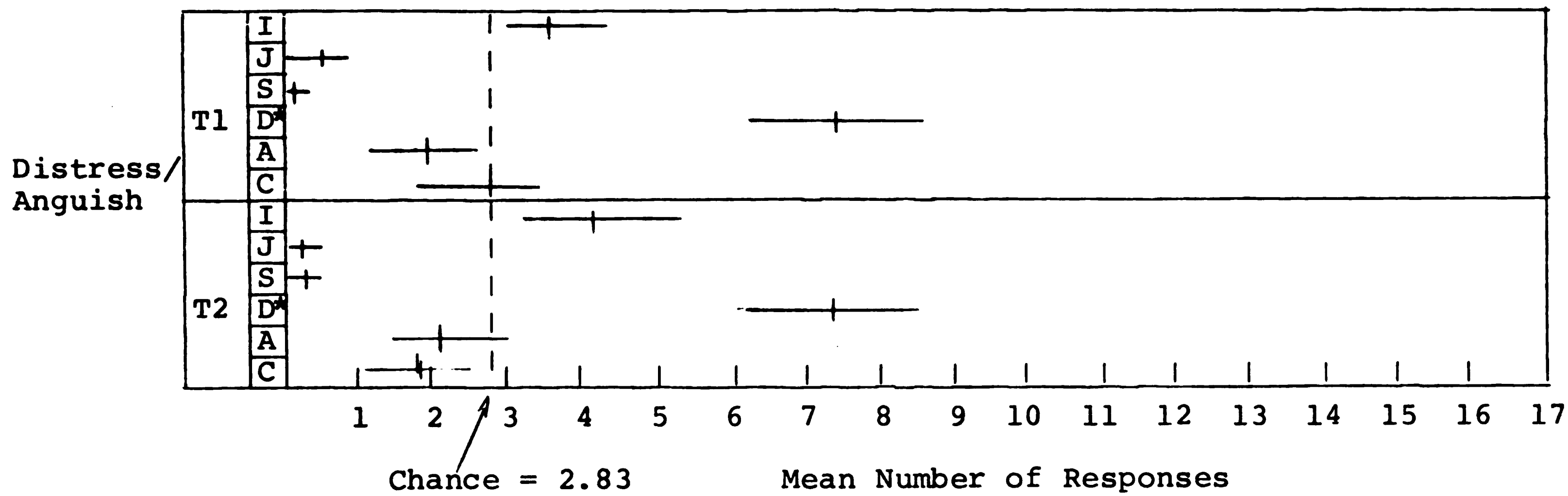


Figure 4.4. Continued



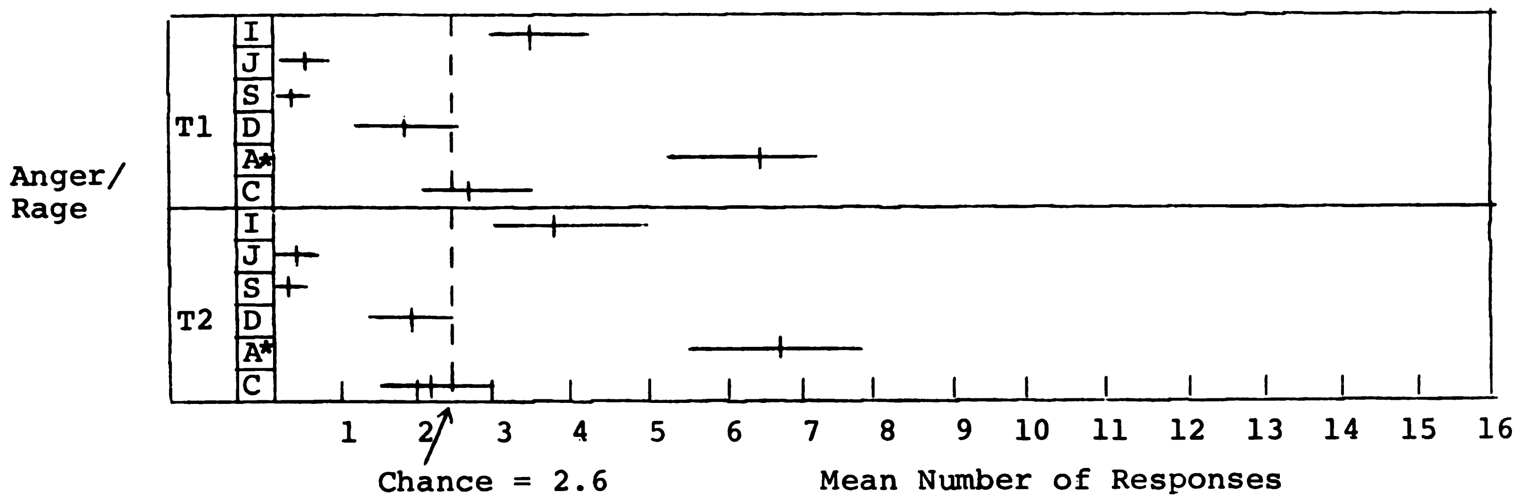
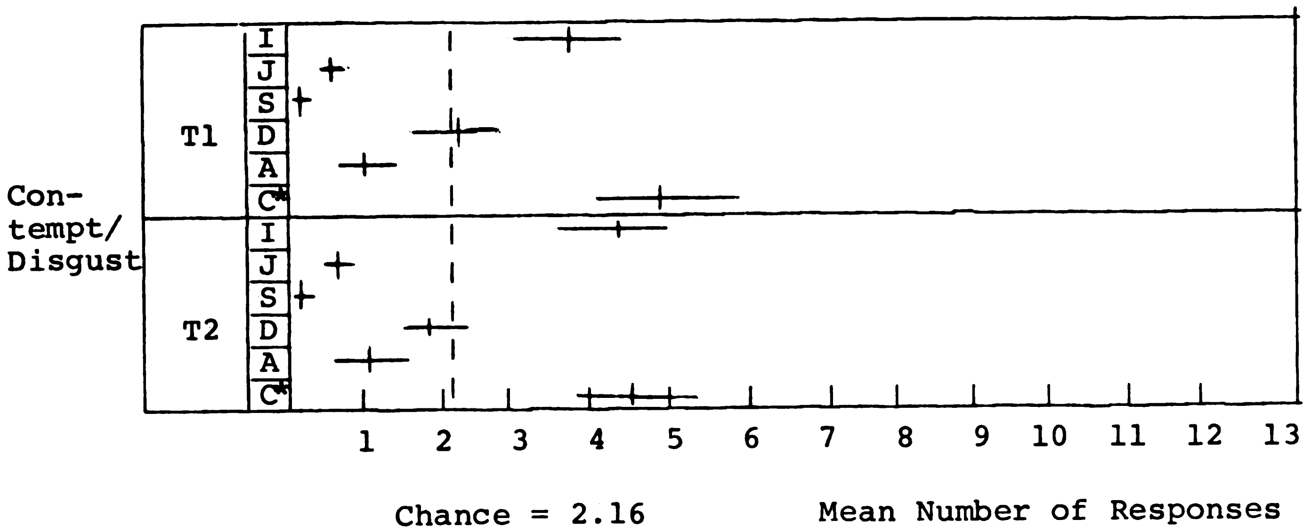


Figure 4.4. Continued



Abbreviations:

T1 = time 1
T2 = time 2
I = interest-excitement
J = enjoyment-joy
S = surprise-startle
D = distress-anguish
A = anger-rage
C = contempt-disgust
* = category designated as correct answer
—+— = mean and 95 percent confidence interval

Figure 4.4. Continued

Thus it becomes evident not only how often subjects answered correctly (identifying interest on an "interest" item for example) but also how often subjects answered in each of the incorrect categories (for example answering "joy" for an "interest" item).

The first and most important aspect of this data is that raters identified the segments with an accuracy which was much greater than chance would predict. Although many times the average levels of accuracy were low, in each category they were significantly different from chance ($p < .05$). Joy was the most accurately identified emotion, followed by interest, surprise, distress, anger, and finally, contempt. For five of these six categories, the second highest score was consistently in the category of interest-excitement. For the scale in which interest was the right answer, the second highest score is that of distress-anguish. In three of the six categories, the second highest score was significantly different from chance. However, in only one category (contempt-disgust) did the second highest score (interest) approach the accuracy level of the "right answer" score. Figure 4.5 summarizes the results of the accuracy data for both the correct answers in each category and the highest frequency of wrong answers in each category.

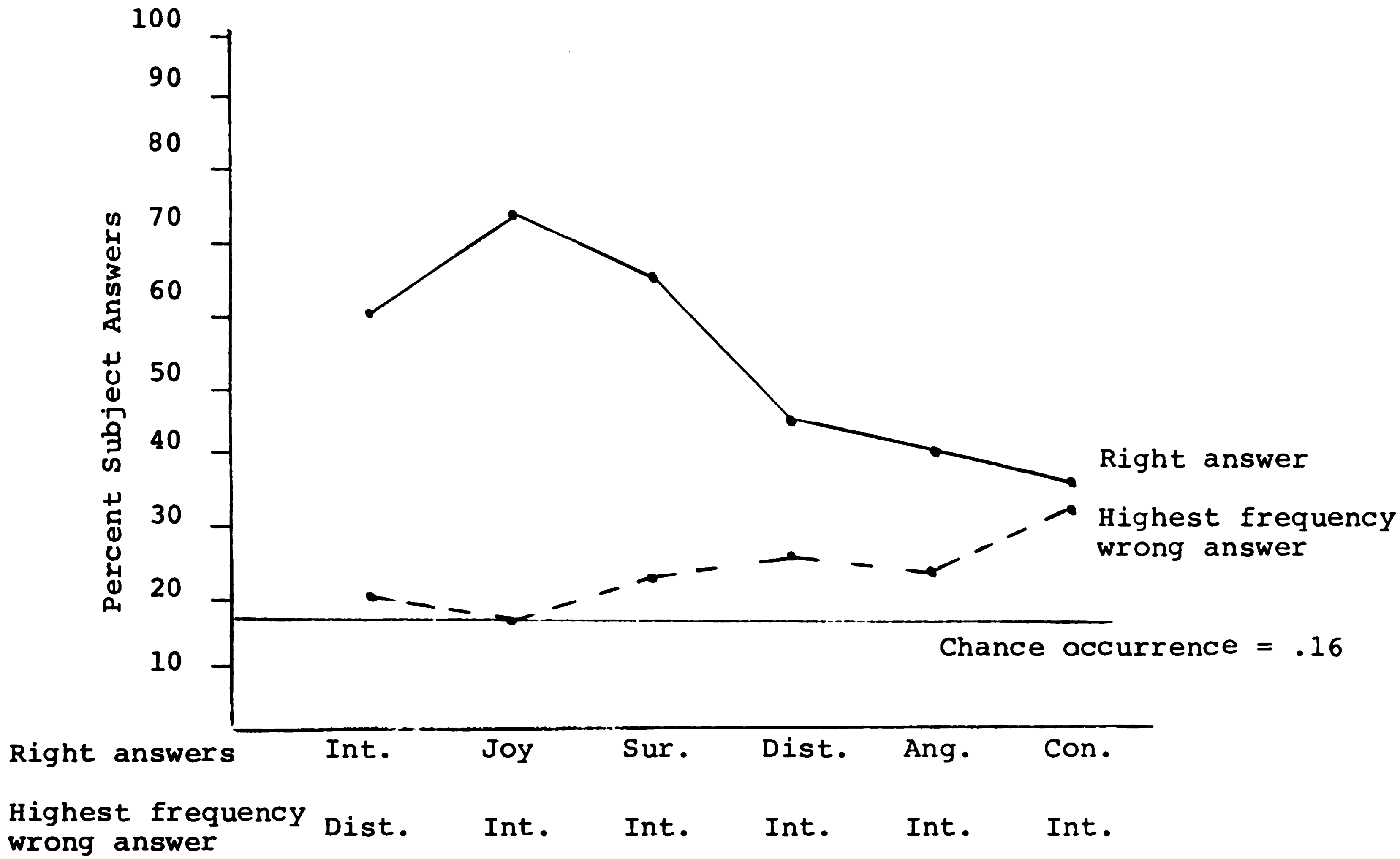


Figure 4.5. Summary of Accuracy Data: Percent of Correct Answers in Each Category and Highest Frequency Wrong Answer in Each Category

Reliability of the Scales

Two types of reliability were calculated for each of the six affective scales. Coefficient Alpha was calculated to determine the inter-item correlations between the items in the scales. Spearman Rank Order Correlations were computed for the relative frequency of each possible response in each of the scales across the two testings. Thus the overall pattern of right and wrong answers for each scale was compared over two presentations.

The inter-item correlations between items in each scale is presented in Table 4.4. From this data it is clear that the inter-item reliability within each scale was quite variable. The highest reliability was in the distress-anguish scale, followed by enjoyment-joy, anger-rage, and interest-excitement. Two scales which had markedly lower reliabilities were contempt-disgust, and surprise-startle. It is possible that the low reliability of the surprise scale was due to the small number of items (n = 7) which were included.

The Spearman Rank Order Correlations (see Table 4.5) for the two presentations of the stimulus tapes were much higher than the coefficient alphas. To obtain these correlations, the mean number of responses in each category were calculated and ranked from highest to lowest. These rankings are compared at the two presentations of the tape. Thus, the Spearman correlations provide information as to

Table 4.4. Coefficient Alpha for Inter-item Reliability of Each of the Six Affective Scales

Affect	Reliability
Interest	.53
Joy	.70
Surprise	.28
Distress	.71
Anger	.62
Contempt	.32

Table 4.5. Spearman Rank Order Correlations for the Relative Frequency of Identifications on Each Affective Category for the Two Presentations of the Stimulus

Affect	Spearman Rank Order Correlations
Interest	1.00
Joy	.74
Surprise	.81
Distress	.54
Anger	1.00
Contempt	1.00

the consistency of the overall pattern of responses on each scale over time. The correlations for the scales of interest, anger, and contempt are very high (1.00), and the correlations for joy and surprise are moderately high (.74 and .81). Distress was the only category with a relatively low correlation between the rankings at the two presentations (.54).

Design I: Accuracy Data

Design Over Subjects

The design over subjects tests overall performance of raters by employing the sum of the number of right answers in both presentations of the stimulus materials (see Table 4.6). Each rater is scored for the number of right answers and the total right/wrong score is computed for each scale. The effects tested in this design are the time 1 effect (T1), the time 2 effect (T2) and the interaction effects between time 1 and time 2 (T1 x T2) for each of the six affective categories (A1 - A6). The analysis of variance for the design over subjects is presented in Table 4.7 (see Appendix U for cell means). In this design, neither the T1 effect, the T2 effect nor the T1 x T2 effect were significant at the .05 alpha level. The cell means obtained for design 1 are presented in Appendix U.

Table 4.6. Design I: Accuracy Data

T1	T2	R	P1 A1	P1 A2	P1 A3	P1 A4	P1 A5	P1 A6	P2 A1	P2 A2	P2 A3	P2 A4	P2 A5	P2 A6
F	F	n=8												
	S	n=8												
S	F	n=8												
	S	n=8												

T1 = speed at time 1
T2 = speed at time 2
F = normal speed
S = slow motion

P1 = first presentation
P2 = second presentation
A1-A6 = affective scales
R = raters

Effects Tested in Table 4.6.

T1 - Time 1 Effect. The overall performance of raters is influenced by the speed of the videotape they view first regardless of the speed of the second videotape.

T2 - Time 2 Effect. The overall performance of raters will be influenced by the speed of the videotape they view second, regardless of the speed of the first videotape.

T1*T2 - Time 1 Time 2 Interaction. That the overall performance of raters will be influenced both by the speed of the videotape they view at time 1 and the speed of the videotape they view at time 2.

T1*P1P2 - Time 1 x Test-Retest Interaction. That the change in raters' performance will be influenced by the speed of the videotape which they view at time 1.

T2*P1P2 - Time 2 x Test-Retest Interaction. That the change in raters' performance will be influenced by the speed of the videotape which they view at time 2.

T1*T2*P1P2 - Time 1 x Time 2 x Test-Retest Interaction. That the change in raters' performance will be influenced both by the speed of videotape they view at time 1 and the speed of videotape which they view at time 2.

Table 4.7. Anova for Design Over Subjects, Accuracy Data

Source	df	F	p	Sig
Grand Mean	6	303.39		
T1	6	.545	.7674	ns
T2	6	1.232	.3317	ns
T1 x T2	6	1.157	.3673	ns

Design Over Measures

The design over measures tests the change in performance between the two presentations of the stimulus materials, P1 and P2 across the six affective categories (A1 - A6). The dependent measure is the number of right answers per affective scale at either P1 or P2. The effect tested in this design is the PLP2 or test-retest effect. Presented along with the design over measures is the interaction between this design with the design over subjects. Thus the effects tested in this analysis include the test-retest effect (P1P2), the interaction between the time 1 effect and test-retest (T1 x P1P2), interaction between the time 2 effect and test-retest (T2 x P1P2), and the interaction between time 1, time 2 and test-retest (T1 x T2 x test-retest). The analysis of variance for the design over measures and the interaction between designs is presented in Table 4.8.

Table 4.8. Anova for Interaction of Design Over Measures with Design Over Subjects: Accuracy Data

Source	df	F	p	Sig
P1P2	6	1.07	.447	ns
T1 x P1P2	6	3.01	.029	$p < .05$
T2 x P.P2	6	1.16	.363	ns
T1 x T2 x P.P2	6	.82	.567	ns

In this analysis, the test-retest effect, the T2 x test-retest effect and the T1 x T2 x test-retest effect fail to reach significance at the .05 alpha level. The T1 x test-restest effect however was significant at alpha < .05. In Table 4.9, this effect is analyzed for each of the affective scales.

Table 4.9. T1 x P1P2 Effect: Anova for Six Affective Categories

Affect	Mean Squared	F	p	Sig
Interest	21.25	3.89	.05	p < .05
Joy	22.69	2.59	.11	ns
Surprise	3.78	.99	.32	ns
Distress	.83	.11	.74	ns
Anger	54.24	3.98	.05	p < .05
Contempt	1.008	.35	.55	ns

Frequency of Rater Responses (M2)

Measure 2 involves the number of rater responses to segments of the stimulus materials. Raters were allowed to record as many answers as they saw expressions. While the first measure concerned the accuracy of the primary answer, measure 2 concerns only the number of answers recorded for segments, regardless of the accuracy of later answers.

Each item was scored "0" if one answer was recorded and "1" if more than one answer was recorded per segment. The number of items with more than 1 answer was counted for each scale and divided by the total number of items in the scale. This dependent measure (recorded for each scale) is, then, the proportion of items for which a rater recorded more than 1 answer per item.

Design II: Frequency Data

Design Over Subjects

The design over subjects for the frequency data is identical to the design over subjects for the accuracy data (see Table 4.10). The dependent variable, however, is measure 2, the overall proportion of items where raters recorded more than one answer, computed for each of the six affective scales and summed over the two presentations. The effects tested in this design are the time 1 effect (T1), the time 2 effect (T2) and the interaction effect between time 1 and time 2 (T1 x T2) for each of the six affects (A1 - A6). The analysis of variance for the design over subjects is presented in Table 4.11. The cell means obtained for design 2 are presented in Appendix V.

Table 4.10. Design II. Frequency Data

T1	T2	R	P1						P2					
			A1	A2	A3	A4	A5	A6	A1	A2	A3	A4	A5	A6
F	F	n=8												
	S	n=8												
S	F	n=8												
	S	n=8												

T1 = speed at time 1
T2 = speed at time 2
R = normal speed
S = slow motion

P1 = first presentation
P2 = second presentation
A1-A6 = affective scales
R = raters

Effects Tested in Table 4.10.

T1 - Time 1 Effect. The overall performance of raters is influenced by the speed of the videotape they view first, regardless of the speed of the second videotape.

T2 - Time 2 Effect. The overall performance of raters will be influenced by the speed of the videotape they view second, regardless of the speed of the first videotape.

T1*T2 - Time 1 Time 2 Interaction. That the overall performance of raters will be influenced both by the speed of the videotape they view at time 1 and the speed of the videotape they view at time 2.

P1P2 - Test-Retest Effect. That the performance of the raters will change with a second exposure to the stimulus tape.

T1*P1P2 - Time 1 x Test-Retest Interaction. That the change in raters' performance will be influenced by the speed of the videotape which they view at time 1.

T2*P1P2 - Time 2 x Test-Retest Interaction. That the change in raters' performance will be influenced by the speed of the videotape which they view at time 2.

T1*T2*P1P2 - Time 1 x Time 2 x Test-Retest Interaction. That the change in raters' performance will be influenced both by the speed of videotape they view at time 1 and the speed of videotape which they view at time 2.

Table 4.11 Anova for Design Over Subjects: Frequency Data

Source	df	F	p	Sig.
Grand Mean	6	17.96		
T1	6	.34	.9034	ns
T2	6	2.70	.0436	$p < .05$
T1 x T2	6	3.12	.0251	$p < .05$

In this analysis the T1 effect was not significant. However, the T2 effect and the interaction effect between T1 and T2 were both significant at alpha $< .05$. In Tables 4.12 and 4.13 these significant effects are analyzed for each of the six affective scales. The interaction effect (T1 x T2) is graphically depicted in Figure 4.6.

Table 4.12. T2 Effect: Anova for the Six Affective Scales

Source	Mean Squared	F	p	
Interest	.01	.30	.58	ns
Joy	.07	1.40	.24	ns
Surprise	1.49	8.44	.007	$p < .05$
Distress	.30	.41	.52	ns
Anger	.15	1.55	.22	ns
Contempt	.01	.19	.66	ns

Table 4.13. T1 x T2 Effect: Anova for the Six Affective Scales

Source	Mean Squares	F	p	
Interest	.39	6.60	.01	$p < .05$
Joy	.71	14.34	.0009	$p < .05$
Surprise	2.50	14.1	.001	$p < .05$
Distress	1.22	14.8	.0008	$p < .05$
Anger	1.01	10.1	.004	$p < .05$
Contempt	.10	12.07	.001	$p < .05$

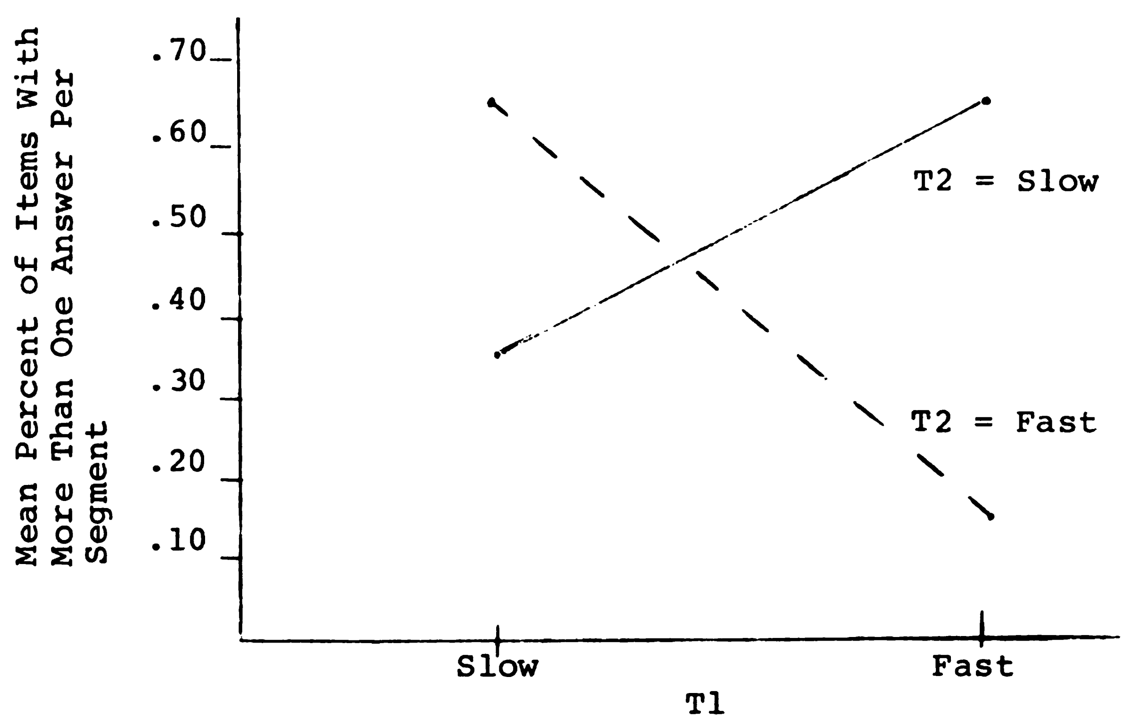


Figure 4.6. T1 x T2 Interaction Effect, Design Across Measures, Frequency Data: Mean percent of Items With More Than One Answer Per Segment at T1 and T2 for Normal Speed and Slow Motion

Design Over Measures

The design over measures for the frequency data is identical to the design over measures employed for the accuracy data. In this design, the change in performance between the two presentations of the stimulus materials (P1 and P2) is tested for each of the six affective scales (A1 - A6). The dependent variable is the proportion of items in a scale where the rater recorded more than one answer during the first presentation (P1) and during the second presentation (P2). In analysis (see Table 4.14), only the T1 x test-retest effect was significant at the .05 alpha level. In Table 4.15 this effect was analyzed across the six affective scales

Table 4.14. Anova for Design Over Measures x Design Over Subject

Source	df	F	p	Sig
P1P2	6	1.33	.28	ns
T1 x P1P2	6	4.73	.003	$p < .05$
T2 x P1P2	6	2.23	.082	ns
T1 x T2 x P1P2	6	1.34	.287	ns

Table 4.15. T1 Effect: Anova for the Six Affective Scales

Variable	Mean Square	F	P	Sig
Interest	.10	3.33	.08	ns
Joy	.25	15.84	.00006	$p < .05$
Surprise	1.5	24.22	.0001	$p < .05$
Distress	.13	5.18	.0317	$p < .05$
Anger	.67	12.00	.002	$p < .05$
Contempt	.12	3.3	.08	ns

Post Hoc Questionnaire

The results of the post hoc rater questionnaire (see Table 4.16) were analyzed on 3 dimensions: 1) rater state of mind (R), 2) tape quality (T) and 3) overall value of the study (S). A multivariate analysis of variance for repeated measures was performend to test each of these three effects (for design outline and cell means, see Appendix W). Employing the .10 alpha level as the criterion for significance, significant effects are found in the "rater state of mind," the "tape quality" and the overall "value of the study" (see Tables 4.17, 4.18, 4.19). T2 effects were found in both the "rater state of mind" and the "value of the study" data. T1 x T2 interaction effects were found for the "quality of the tapes" and the "value of the study" data. A T1 effect was found in the "quality of the tapes" data.

Table 4.16. Post Hoc Questionnaire

T1	T2	r	R	T	S
F	F	n=7			
	S	n=7			
S	F	n=6			
	S	n=5			

T1 = speed at time 1
T2 = speed at time 2
F = normal
S = slow motion
r = raters
R = rater state of mind
T = tape quality
S = value of the study

Effects Tested in Table 4.16

T1 - T1 Effect. That the speed of the tape at time 1 influenced the rater's scores.
T2 - T2 Effect. That the speed of the tape at time 2 influenced raters' scores.
T1*T2 - Time 1 x Time 2 Interaction. That both the speed of the tape at time 1 and the speed of the tape at time 2 influenced raters' scores.

Table 4.17. Anova For Post Hoc Rater Questionnaire Rater State of Mind

Source	df	F	p	Sig
Grand Mean	6	168.39		
T1	6	.7794	.5980	ns
T2	6	2.51	.06	$p < .10$
T1 x T2	6	.4868	.81	ns

T1 = Time 1; T2 = Time 2

Table 4.18. Anova For Post Hoc Rater Questionnaire: Quality of Tapes

Source	df	F	p	Sig
Grand Mean	4	170.22		
T1	4	2.41	.087	$p < .10$
T2	4	1.76	.18	ns
T1 x T2	4	2.50	.07	$p < .10$

T1 = Time 1; T2 = Time 2

Table 4.19. Anova For Post Hoc Rater Questionnaire: Value of the Study

Source	df	F	p	Sig
Grand Mean	2	374.9		
T1	2	.0312	.9694	ns
T2	2	3.96	.036	$p < .10$
T1 x T2	2	3.80	.039	$p < .10$

T1 = Time 1; T2 = Time 2

Plotting the results from the Post Hoc Rater Questionnaire (see Figures 4.7, 4.8, 4.9), groups who saw the slow motion videotape at time 2 in general scored lower on all three dimensions than groups who saw normal speed at time 2. Moreover, raters in the slow-slow group usually rated the study lower than either of the other three groups. Thus the tendency of raters was to rate their state of mind, the tape quality, and the value of the study as poorer if the slow motion condition was viewed at time 2 than if normal speed was viewed at time 2. Moreover, on each of these dimensions, the group who viewed slow motion both at time 1 and time 2 rated the study lower than the other three rater groups.

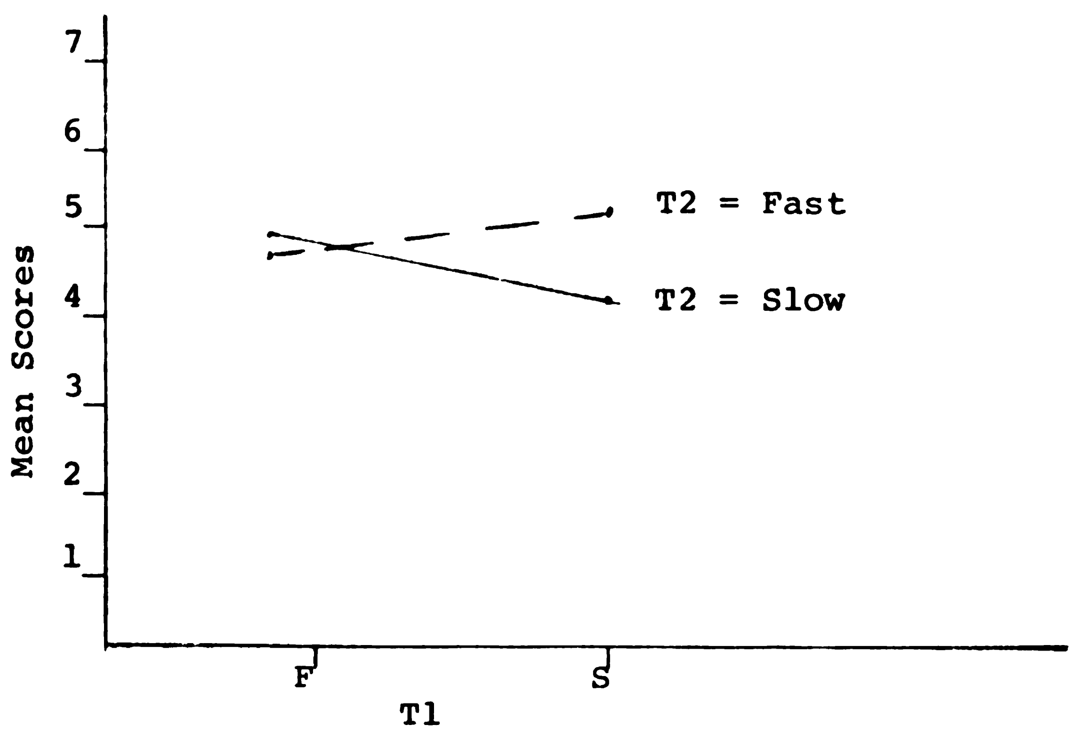


Figure 4.7. Plot of Mean Scores for Rater "State of Mind" for Speeds at Time 1 and Time 2

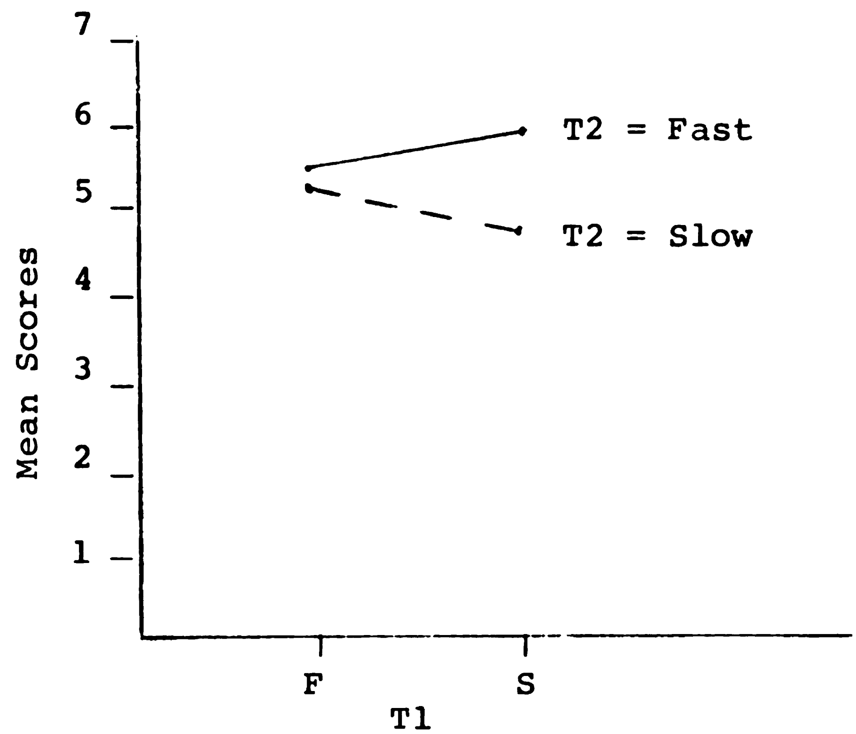


Figure 4.8. Plot of Mean Scores for Overall Value of the Study for Speeds at Time 1 and Time 2

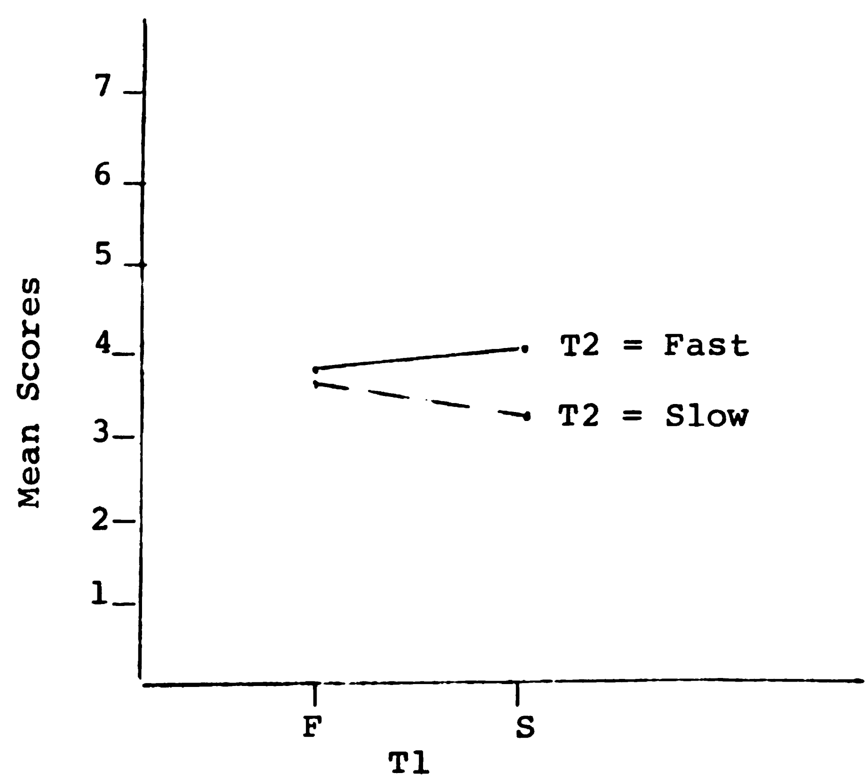


Figure 4.9. Plot of Mean Scores for Quality of the Videotapes for Speeds at Time 1 and Time 2

Hypotheses

Hypothesis 1. Null Hypothesis: Trained observers will record the same number of facial expressions when viewing a stimulus tape in slow motion as when it is viewed in normal speed.

Alternative Hypothesis: Trained observers will record a greater number of facial expressions when viewing a stimulus tape in slow motion than when it is viewed in normal speed.

Examining the design over subjects, for the frequency data (measure 2) we find the multivariate F value of the T1 x T2 interaction effect was 3.12 (see Table 4.11). This value was significant at the .05 alpha level. Therefore the null hypothesis for the tape speed effect on the frequency of rater responses was rejected.

Examining the interaction effect more closely, it would be expected that if slow motion viewing of the videotape renders a greater number of affects observable, then the slow-slow group would rank highest in number of affects seen; the slow-fast and fast-slow groups would be next, and finally the fast-fast group would be lowest. The actual ranking was slow-fast, fast-slow (nearly equal) followed by slow-slow and finally fast-fast (see Figure 4.6). The Spearman Rank Order correlation between the expected and actual order of the groups is .4. In addition, in this same analysis, the T2 effect was significant at the .05 alpha level. This effect expands upon the information available from the interaction effect and the rank orderings. If the slow motion tape was shown to raters at time 2, then raters recorded a greater number of affects in terms of their overall scores than if the normal speed tape was shown at time 2. The slow-slow and the fast-slow groups, therefore, viewed a greater number of affects than did the fast-fast or slow-fast groups. This is additional evidence that there were substantial differences in the number of affects recorded by raters owing to the speed at which the videotape was viewed. Thus, moderate evidence exists for the rejection of the null hypothesis and acceptance of the directional alternative.

<u>Hypotheses 2</u>. <u>Null Hypothesis</u>: Trained observers will identify facial expressions with the same accuracy when viewing a stimulus tape in slow motion as when it is viewed in normal speed.

<u>Alternative Hypothesis</u>: Trained observers will identify facial expressions more accurately when viewing a stimulus tape in slow motion than when it is viewed in normal speed.

The multivariate F value for the T1 x T2 interaction in the design over subjects for the accuracy data was 1.157. This value was not significant at the .05 alpha level (see

Table 4.7). The null hypothesis for the tape speed effect on the accuracy of rater responses was therefore not rejected.

Hypothesis 3. Null Hypothesis: Trained observers will record the same number of facial expressions when the unstructured interview is played in slow motion as when the structured interview is played in slow motion.

Alternative Hypothesis: Trained observers will record a greater number of facial expressions when the unstructured interview is played in slow motion than when the structured interview is played in slow motion.

In the revised design, the variable of interview condition (I1 and I2) was eliminated. This design therefore provided no test of the hypothesis of the effect of interview condition on the number of rater responses.

Hypothesis 4. Null hypohesis: Trained observers will identify facial expressions with the same accuracy when the unstructured interview is played in slow motion as when the structured interview is played in slow motion.

Alternative Hypothesis: Trained observers will identify facial expressions more accurately when the unstructured interview is played in slow motion than when the structured interview is played in slow motion.

In the revised design, again the variable of interview condition (I1 and I2) was eliminated. This design therefore provided no test of the hypothesis of the effect of interview conditions on the frequency of rater responses.

Hypothesis 5. Null hypothesis: When the slow motion stimulus tape is viewed at time 1, trained observers will record the same number of facial expression at presentation 2 as they had at presentation 1.

Alternative hypothesis: When a slow motion stimulus tape is viewed at time 1, trained observers will record a greater number of facial expressions at presentation 2 than they had at presentation 1.

Examining the interaction between the design over measures and the design over subjects for the frequency data (see Table 4.18), the F value for the T1 x P1P2 interaction is 4.73. This value was significant at the .05 alpha level. However, the effect found was in the opposite of the direction predicted. In other words, raters who viewed the normal speed tape at time 1 showed a greater amount of improvement at time 2 than those who saw slow motion at time 1.

Hypothesis 6. Null hypothesis: When a slow motion stimulus tape is viewed at time 1, trained observers will identify facial expressions with the same accuracy at presentation 2 as they had at presentation 1.

Alternative hypothesis: When a slow motion stimulus tape is viewed at time 1, trained observers will identify facial expressions more accurately at presentation 2 than they had at presentation 1.

Examining the interaction between the design over subjects and the design over measures for the accuracy data (see Table 4.8) the multivariate F value for the T1 x P1P2 interaction is 2.01. This value was significant at the .05 alpha level. Therefore the null hypothesis for the interaction between the time 1 effect and the test-retest effect on the accuracy of rater responses was rejected and the alternative hypothesis was supported.

Additional Findings

The effects tested by the hypotheses in this study were a core subset of all effects in the overall design. Along with the tested hypotheses, this design explored several effects which contribute to the body of knowledge concerning tape speed and its effect on the accuracy and number of facial expression identification.

<u>T1 Effect: The effect of the speed of the videotape at time 1 on the overall performance of the raters</u>. For neither the accuracy nor the frequency data did this effect reach significance. Thus the speed of the videotape at time 1 does not affect overall performance of the raters on eight of the dependent measures.

<u>T2 Effect: The effect of the speed of the videotape at time 2 on the overall performance of the raters</u>. This effect was significant in terms of the number of emotions observed, but did not reach significance in the accuracy of the identification. Thus although the speed of the videotape at time 2 improves the overall number of affects observed, it does not influence the accuracy of the identification.

<u>P1P2 Effect: The Test-Retest Effect</u>. On both the accuracy and frequency measures, this effect failed to reach significance. Thus, regardless of speed of the videotape, a second viewing of the same stimulus does not improve scores in either of the two measures.

<u>T2*P1P2 Effect: Time 2 x Test-Retest Interaction</u>. The change in raters' performance in two viewings of the stimulus tape was not significantly influenced by the speed of the videotape at time 2.

<u>T1*T2*P1P2 Effect: Time 1 x Time 2 x Test-Retest</u>. The change in raters' performance in two viewings of the stimulus tape was not significantly influenced by the

interaction between the speed of the videotape at time 1 and the speed of the videotape at time 2.

Summary

Hypotheses were tested regarding 1) effect of tape speed on overall performance and 2) the effect of tape speed at time 1 on change in performance at time 2. The dependent variables included the accuracy of the primary rater responses and the number of rater responses per segment. Multivariate analyses of variance were performed for these two types of data and in two of the four cases, the null hypothesis was rejected at the .05 alpha level.

It was found that raters saw a significantly greater number of facial expressions when viewing the tape in slow motion ($p < .05$). However the accuracy of their ratings of the slow motion tape was not significantly different from their ratings of normal speed tape. If raters viewed the videotape in slow motion first, their scores on the second viewing showed significant improvement in the accuracy of their primary response ($p < .05$). In terms of the number of facial expressions recorded however, viewing the slow motion videotape first was not associated with improvement on the second trial. Because of the revision of the design, the hypotheses regarding the effect of interview condition on ratings was not tested. Several additional findings which were tested in the design but which were not included in the hypotheses were also presented.

A summary of the study, the conclusions drawn and a discussion of the results is presented in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS AND DISCUSSION

In this chapter, a summary of the study is presented and the conclusions of the data analysis are examined. Various aspects of the study are discussed including: subject self report data, accuracy of rater judgments, rater fatigue, test ceiling, limits of the study, and finally, implications of the research.

Summary

This study investigated the ability of trained raters to perceive spontaneous facial expressions on videotape and to label them accurately in six affective categories. The categories employed were: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage and contempt-disgust. Also investigated were the number of spontaneous facial expressions which raters perceived in the stimulus materials.

Although facial expressions have been judged in many studies, most of these have not employed videotape to record spontaneous expression. Moreover, the effect of viewing facial expressions in slow motion has not as yet been extensively researched by most authors. The purpose of the present study then is to test the effect of 1) tape speed and 2) test-retest procedures on both the number of facial expressions observed and the accuracy of the perception of the primary affect in each of six emotional categories.

A stimulus tape composed of a series of 5 second videotaped segments was produced with each segment portraying a recognizable type of facial expression.

A second stimulus tape was produced which was identical to the first except that each segment was slowed to approximately one-sixth normal speed. The validity of the emotion in each of the segments was determined by a panel of expert judges.

Twenty-nine graduate students enrolled in courses in the College of Education at Michigan State University were trained to identify facial expressions for each of the six affective categories. Raters participating in the study attained a level of 80 percent accuracy in identifying emotions from still photographs of facial expressions before viewing the stimulus tapes.

Each group of raters viewed the stimulus tapes two times. The speed of the tape (normal or slow motion) and the order in which the speeds were presented was varied among groups. Group one viewed the normal speed tape at both time 1 and time 2. Group two viewed the normal speed tape at time 1 and the slow motion tape at time 2. Group three viewed the slow motion tape at time 1 and the normal speed tape at time 2. Finally, group four viewed the slow motion tape both at time 1 and time 2.

There were two dependent variables employed in the study: accuracy of identification of emotions from facial expressions, and the number of affects recorded for each segment. A multivariate approach to analysis of variance for repeated measures was employed to test several effects on both the accuracy and frequency data for raters' overall performance and their change in performance over time. The effects tested were 1) speed at time 1, 2) speed at time 2, and 3) interaction between speeds time 1 and time 2. Also tested was the effect of the test-retest procedure on the accuracy of identification and the number of responses.

A Post Hoc Questionnaire was mailed to raters two months after their participation in the study. The quesionnaire explored three areas: the rater's state of mind while viewing the tapes, the quality of the tapes themselves, and the rater's evaluation of the overall study. The results of the questionnaire were analyzed in the same type of a multivariate analysis employed for both the accuracy and number data mentioned previously.

Conclusions

Effect of Tape Speed on Identification of Emotion

The multivariate analysis of repeated measures for the design over subjects led to the conclusion that there was no significant difference between accuracy of raters' judgments at normal speed and accuracy of judgments at the slow motion speed, at the .05 alpha level. Raters therefore did not perceive and label facial expressions of emotion more accurately when they viewed the slow motion videotape.

Effect of Tape Speed on the Number of Facial Expressions Observed

The multivariate analysis of repeated measures for the design over subjects led to the conclusion that there was a significant difference between number of facial expressions seen at normal speed and number of facial expressions seen in slow motion. This effect was significant at the .05 alpha level. The group who viewed the normal speed tape twice saw the fewest number of affects. The next fewest number was seen by the slow-slow group, and the greatest number seen by both the slow-fast and the fast-slow groups. This rank ordering is as predicted by the hypothesis with the exception of the poor performance by the slow-slow group.

The performance of the slow-slow group may be due to the effect of rater fatigue. It is possible that viewing the slow-motion tape two consecutive times had an effect on the rater's willingness to record more than one response per segment of the tape. This hypothesized effect in the slow-slow group may have caused them to see fewer affects at time 2 than they had at time 1.

Moreover, the results of the post-hoc questionnaire indicate the tendency of all raters who saw the slow motion tape at time 2 to rate the value of the study and the quality of the tapes lower than other groups ($p < .10$). This effect was especially apparent for the slow-slow group who were generally more critical of the quality of the tapes themselves and the value of the overall study.

The negative attitude of the slow-slow group may have affected the motivation of the raters and thus explain their relatively poor performance in the number of expressions they observed in slow motion during the second viewing.

The Effect of Tape Speed on the Change in the Accuracy of Rater Performance Over Time

The multivariate analysis for the interaction between the design over subjects and the design over measures led to the conclusion that if the slow motion tape was viewed first, there was a significant improvement in the accuracy of later ratings. This difference was significant at the .05 alpha level. Thus if raters were shown a slow motion tape at time 1, the accuracy of their identifications of facial expressions at time 2 would be significantly better than if they had first viewed the normal speed tape.

The Effect of Tape Speed on the Change in the Number of Affects Over Time

The multivariate analysis for the interaction between the design over subjects and the design over measures led to the conclusion that if subjects viewed the slow motion tape first, there was not a significant improvement in the number of affects observed at a later viewing.

Subjects who viewed the slow motion tape failed to see a greater number of affects during the second viewing of the tape, regardless of the speed of the second viewing. As with the others, the alpha level for the test of this effect was p = less than .05.

It is possible that a ceiling effect may have influenced the test of this hypothesis. It has already been shown that raters observed more affects in a slow motion videotape regardless of whether it is seen first or second. If raters observe the maximum number of affects possible in slow motion at time 1, further improvement would therefore be impossible at time 2 even if the second tape was also observed in slow motion. On the other hand, if the normal speed is viewed first, then improvement at time 2 is possible, especially if the slow motion tape is played. The speed at which the tape is played at time 1 then dictates the amount of improvement possible at time 2. Thus the tendency for raters to reach a ceiling when rating slow motion may have undermined the test of this hypothesis.

Discussion

Validity of Stimulus Segments

The type of emotion portrayed in each of the stimulus segments was decided by a panel of expert judges. The subject self-report data was not taken into account to determine the emotion portrayed in each segment.

The decision to determine the validity of the segments through the ratings of expert judges was made on the basis of two arguments. First, subjects were not trained in the use of the categories or in the identification of facial expressions, even their own. A greater number of inaccuracies could then be expected had the self report data alone been employed to determine the validity of the stimulus segments.

The second argument for use of segments agreed upon by expert judges was that subjects may be motivated to consciously or unconsciously defend against unacceptable affect in their self reports. Identifying certain unpleasant emotional states in their own tapes during the recall session would not only disclose these emotions to the experimenter, but also insure a permanent record of their own display of these emotions on videotape. Studies of perceptual defense (Forrest and Lee, 1962; McGinnies, 1949; Erikson, 1951; Postman, Bruner and McGinnies, 1948) suggest that emotionally unacceptable stimuli is less likely to be reported as perceived than other stimuli. Moreover, even if an unacceptable emotional state were perceived, the subject may be consciously resistant to disclosing this emotion to the interviewer, who is a relative stranger. Thus, because of the subjects' lack of training in identifying emotions, and possible motivation to either conceal or repress unacceptable affective states, the validity of the emotion in the stimulus segments was determined by a panel of expert judges and not by subject's self report.

Subject Self Report

The three affects that the videotaped subjects were willing to identify most often in themselves during the recall interviews were interest, joy, and distress. Anger and contempt were labeled less often, and surprise, fear, and shame were rarely labeled by subjects. These results broadly correspond to Izard's cross cultural research on affects (Izard, 1971). For the American culture, interest and joy were most often cited as emotions people believed they "understand the best." Moreover, distress was cited as the negative emotion that people in America experience most frequently. Fear and shame were the two emotions least frequently reported by American subjects (Izard, 1971). Thus the emotions elicited by the interviews reflected the general cultural norms for experiencing and expressing emotions in the American culture.

Striking differences were found between the emotions that subjects recognized in themselves in the two interview conditions. Subjects in the structured interview, who were shown photographs and given labels by the experimenter, reported a greater number of emotional states in 6 out of 8 affective categories. The only category in which subjects in the unstructured interview reported a greater number of affects was that of distress. It is possible that introducing the subjects to categories and labels during the structured interview training had the effect of training them to label more specifically their affective states during the recall interview (especially in the negative categories). Subjects who did not have this information may have made poorer discriminations between the negative emotional states and many have placed more emotions which they experienced as unpleasant into the general category of "distress." Thus the structured interview may have involved a covert training effect which allowed subjects to more accurately label their emotional states during the later recall interview.

Accuracy of Rater Judgments

Upon reviewing the accuracy with which raters identified emotions from subjects' facial expressions, one clear fact emerges: that raters were able to identify spontaneous facial expressions of emotions at levels of accuracy which were significantly above chance. This accuracy of identification was consistent both for normal speed and slow motion videotapes. Moreover, although there were differences in the levels of accuracy with which various emotions were identified, all emotions studied were identified by raters at levels well above chance.

Raters were able to most accurately identify the emotion of enjoyment-joy while the emotions of contempt-disgust and anger-rage were identified least accurately of the group. These findings generally correspond with results of various cross-cultural studies in that enjoyment-joy is the most accurately identified of all emotions (Ekman, 1972; Izard, 1971; Dickey and Knower, 1941). The negative affects--distress-anguish, anger-rage, and contempt-disgust--are generally found to be less accurately identified by observing in many cultures (Ekman, 1972; Izard, 1971). It is significant here that the studies mentioned have employed still photographs of posed subjects for identification by raters. The present study examines videotaped expressions which are elicited spontaneously and this procedure has produced results similar to the earlier studies.

Although raters were able to identify facial expressions at accuracy levels which differed from chance, the actual mean accuracy levels obtained for most emotions was relatively low (interest = 59 percent, joy = 74 percent, surprise = 66 percent, distress = 44 percent, anger = 41 percent and contempt = 35 percent). This low level of overall accuracy may be a product of the difficulty of the rating task itself. Raters were allowed to view only a brief segment of the videotape and the stimulus during this time was an animated, complex series of muscular movements. Identifying emotion from this type of stimulus is a more difficult task than when still photographs freeze the face in one position and allow the rater to closely study the muscular configuration. Thus the complexity of the videotaped stimulus is a possible explanation for the relatively low levels of rater accuracy obtained in the present study.

Confusions In Identification

Tomkins (1965) discusses the concept of common confusions in rater accuracy which are caused by underlying personality variables altering the perceptual and decision-making processes of the rater. Although this type of notion is difficult to verify, the data in this study do not support the idea of common confusions occurring across raters. In three cases (distress, anger, and contempt) a second affect (interest-excitement) was identified at levels higher than chance. Only in one case (contempt-disgust) was the affect of interest cited nearly as often as the correct answer.

The fact that interest-excitement was the most frequently cited "wrong answer" in five of the six emotional categories points to the possibility that the interest category was often employed by raters as the equivalent of a "neutral" or "don't know" response. The relatively low level of facial activity in the expression of interst-excitement and their relatively neutral connotations of the emotional state may have disposed raters to employ this category as an answer when they became confused or unsure. These results suggest that rather than systematically confusing certain affective states, raters tended to employ the category of interest-excitement when they became confused or unclear as to the emotion portrayed.

The Effect of Rater Fatigue

The overall difficulty of the rating task was reflected in the low overall accuracy of ratings and in the inflated use of the interest-excitement category. This difficulty may have also been reflected in a state of fatigue which developed in raters who were asked to view the slow motion tape. Although the complexity of the rating task itself may have been eased through the use of slow motion, the increased rating time necessitated by this condition may have produced a state of fatigue which caused raters' performance to deteriorate. The effect of rater fatigue was evident in the slow-slow group where raters recorded fewer affects at time 2 then they had at time 1. One rater in this group stated, "I think there were people who just gave up. After a while, we just started taking a stab in the dark."

Not only did the length of the slow motion rating task seem to affect raters, but the quality of the tapes themselves appeared to be a factor. Because of the age of the tapes and the poor quality of the slow motion reproduction process, a noticable flicker was apparent on the slow motion tape and this appeared to disturb many raters. In fact, several raters who viewed the tape in slow motion at time 1 did not return for the second viewing.

It is not surprising then that on the Post Hoc Rater Questionnaire, those individuals viewing the slow motion tape at time 2 tended to rate the quality of the tapes, and the value of the overall study lower then the other groups.

It is felt that this lower evaluation of the study reflects a generally more negative attitude experienced by raters in these groups, and that this attitude was induced primarily by the experience of rating the slow motion videotape. It is felt that this negative attitude may have affected the performance of these groups in rating the facial expressions, especially on the number of responses recorded in the slow-slow group.

Test Ceiling Effect

Another facet of the slow motion results was that in terms of the number of expressions observed, raters' responses quickly reached a ceiling which dramatically affected the data in this condition. For example, if a finite number of affects are observable in a segment, and if the rater watches this segment in slow motion at time 1, then it is likely that the rater will observe all possible affects in the segment. Then if at time 2, slow motion is again observed, the fatigue effect would predict that scores would deteriorate somewhat. If on the other hand, the normal speed tape is observed at time 1 then improvement is possible at time 2, especially if the slow motion tape is played. The test ceiling would thus predict that if a rater sees slow motion at time 1, he will either stay the same or do less well (due to fatigue) at time 2; if normal speed is shown at time 1, then the rater should stay the same or improve at time 2. Indeed, reviewing the data for these groups, the test ceiling effect and the fatigue effect adequately explain the data.

The present research questions the notion that exposure to facial expressions in slow motion facilitates later recognition of minute rapidly-occurring facial changes at normal speed. Were this the case, then the slow-fast group would see nearly the same number of facial expression in normal speed at time 2 as they did in slow motion at time 1. This was not the case in the present study. The lack of a training effect across speeds along with the test ceiling in the slow motion condition may thus have interacted to produce a significant effect for hypothesis five which was in the opposite of the predicted direction.

Limits of the Study

Eliciting Circumstances

In order to produce the stimulus materials, it was necessary to videotape subjects in situations where they experienced a variety of affects. The interview conditions were developed so that it would be possible to elicit the eight emotions to be examined in the research. The purpose of the interviews was to elicit through the use of individual imagery the subjects' experience of each of these emotions, thus allowing the subject to talk about the emotion, its attributes and the situations which have elicited the affect in his life.

The eliciting circumstances employed in this study seemed to produce facial expressions which were recognizable to both subjects and raters as displays of most of the emotions studied. It was found however, that positive emotions or mild negative emotions were elicited in greater numbers than the extremely negative emotions such as fear-terror or shame-humiliation. The inability of the interview conditions to elicit very unpleasant affects is believed to be related to the level of trust between the subject and the interviewer. Because of the nature of the experimental situation, a low level of self disclosure, (especially on the topic of unpleasant emotional states) may have caused the low number of responses in the categories of fear-terror and shame-humiliation.

The interview conditions were therefore found to be effective in producing facial expressions by allowing the subjects to produce eliciting circumstances which were relevant to their own individual experiences. For very unpleasant emotional states such as fear and shame, however, the low level of trust produced by the experimental situation tended to inhibit the subjects' responses in these two categories.

Subject Sample

The subject sample involved in the interview conditions consisted primarily of undergraduates in the College of Education at Michigan State University. Subjects were primarily white, and although the male-female ratio was almost even (8 males and 7 females) the majority of segments chosen for viewing on the stimulus tape involved female subjects (65 percent). The predominance of segments with female subjects was especially evident in the categories of surprise-startle and contempt-disgust. The higher number of female segments chosen may reflect recent findings that females portray emotions more accurately and have a higher level of facial activity than males (Buck, Miller and Caul, 1974).

All subjects participating in the study were also aware of the videotape procedure and volunteered to participate in the study. This willingness to participate may have indicated a greater interest in emotions and a greater willingness to disclose their emotions than would have been found in a more normal population. Thus many aspects of the subject sample in this research render it systematically nonrepresentative of population in general.

Although the selectivity of the subject sample is a shortcoming of the procedure, it is not a major concern in view of the exploratory nature of the overall study. The purpose of the present study is not to discover how <u>widely</u> the phenomena tested exist in the world; the purpose is to discover whether these phenomena in fact <u>exist at all</u>. It is therefore important to test the hypotheses under optimal conditions, and thus, segments were chosen which provided the best material for the rating task. A high level of judge agreement was therefore the sole criterion for the

Although the subject sample was highly selective, it has been mentioned that there is strong evidence to suggest that emotions are posed and judged in much the same manner across cultures, across races, and across sexes (Ekman, 1972; Izard, 1971; Black, 1969; Gitter, Black and Mostofsky, 1972). Thus assuming that the proper facial stimulus is displayed by the subject, it is likely to be judged accurately regardless of these intervening variables. The highly selective subject sample then need not exclude the possibility that similar results would be obtained if a broader sample was employed.

Rater Sample

All raters involved in this study were participating in graduate courses in the College of Education at Michigan State University. Within this sample, however, several distinct subgroups existed, the characteristics of which may have altered the judgments made. Both the fast-fast group and the slow-slow group were Elementary Education teachers participating in Michigan State Extension Courses at Jackson Community College. The fast-slow group consisted of Masters candidates in Counseling at Michigan State, and the slow-fast group consisted of Doctoral candidates in College Counseling at Michigan State University. Thus the level of previous training in the area of affect and the motivation for learning about affective phenomena may have differed among these three groups.

It is important to remember, however, that no matter what the level of previous training, each group was trained to identify affective facial expressions from still photographs at an average of 80 percent accuracy. This training is the common denominator which overrides any differences in previous level of training in the rater groups.

A measure on which the different characteristics of the groups may have confounded the results is the frequency of rater responses. Raters who were pursuing graduate studies in counseling may have been more motivated to recognize a larger number of emotions and thus may have recorded a greater number of responses for each segment. Since prior training was performed only on accuracy of primary identification and not on recording the frequency of facial expressions, the differences in rating groups may have had an effect on the number of rater responses recorded but not on the accuracy of the primary response.

Dependent Measures

Two dependent measures, accuracy and frequency, were employed in this study, and these measures may have been influenced differently by the motivation of raters. The accuracy measure was primarily emphasized in the training procedure, and thus raters were not specifically trained to record more than one affect. Recording the type of primary affect was the rater's first task, while the inclusion of more than one category was optional. More motivated raters may have recorded a substantially greater number of affects than other less motivated raters, while the accuracy of their primary responses might not have differed from those of the less motivated group. The difference in the way these two measures were presented to raters may thus have caused the study to be affected by differing motivation in rating groups.

Implications of the Study

Theoretical Implications

The primary importance of the present study is in the fact that trained observers have been able to identify spontaneous facial expressions recorded on videotape by employing six emotional labels. The affects of interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, and contempt-disgust are all consistantly associated with specific facial patterns which can be recorded on videotape and recognized by observers. The findings lend further credence to the notion that facial behavior is closely related to internal affective states (Ekman, 1972, Izard, 1971). However, the relatively low levels of accuracy obtained in the present study suggest that identifying spontaneous facial expressions from videotape is a more difficult task than identifying still photographs in the categories mentioned.

Although other studies (Frijda, 1953; Dusenburg and Knawer, 1938) have shown films to be a superior presentation mode, the dependent measure employed in these studies did not involve the assignment of emotional labels to the facial expressions. It is suggested here that the complex muscular structure of the face facilitates subtle movements and nuances of expression which are often idiosyncratic to the subject and which have the effect of misleading or confusing raters. The medium of videotape is more susceptible to the inclusion of these nuances, while still photographs can screen out this extraneous information by freezing a fraction of facial behavior. Thus although facial expressions can be categorized accurately from videotapes, the task may be more complex than with still photographs due to the inclusion of information which may be confusing or misleading to raters.

The second finding--that observers record a greater number of emotions when viewing slow motion--is subject to several interpretations. According to Haggard and Issacs (1966), this effect might be due to the presence of new facial expressions in slow motion which occur too rapidly to be observed in normal speed. In other words the use of slow motion changes certain aspects of the stimulus, and this change is reflected in raters' observations. On the other hand, it may be argued that the slow motion condition, rather than disclosing a new set of facial expressions, merely allows raters a longer time in which to carefully identify the contents of the segments. In other words, attributes of the tapes themselves are not altered, but the drastically increased exposure time improves the quality of raters' observations and discriminations. Unfortunately it is impossible to separate lengthened exposure time from the slow-motion condition while holding constant the visual content of the stimulus.

A similar problem was encountered in studies of perceptual defense and perceptual vigilance (Postman, Bruner and McGinnies, 1949; Eriksen, 1951; McGinnies, 1949). When an individual is exposed to value-laden stimuli at drastically reduced exposure times, different recognition thresholds are found. Thus the relative length of exposure to a stimulus affects the recognition of the stimulus by observers. Does the length of exposure influence the actual perception of the event, or does it merely affect the recall and response processes in the observer? Perhaps deciding on what level the effect occurs--in the stimulus or in the observer--is a moot point as long as the effect is in fact apparent, and observers do in fact alter their ratings when the stimulus is presented at different speeds.

The last finding of the study is interesting in light of its theoretical implications. Observers who have already viewed a videotape in slow motion do not record more emotions when the tape is later replayed but do identify facial expressions more accurately on the later tape. It seems that merely one exposure to slow motion facial expression does not sensitize observers to seeing a greater number of expressions in normal speed. Perhaps as Guilford (1929) found in overall levels of accuracy, more numerous training trials (in this case slow motion trials) would gradually increase the number of affects observed in normal speed. In other words, one exposure to a slow motion videotape may not be sufficient to sensitize raters to a greater number of expressions in normal speed. However, a greater amount of exposure to slow motion would gradually sensitize observers to a greater number of expressions.

Although observers who have viewed slow motion tapes on the first trial do not later observe a greater number of expressions, they do later identify facial expressions more accurately. Thus, it is possible that the slow motion conditions sensitize raters to the meanings of <u>nuances</u> of facial expressions thus allowing them to identify these expressions more accurately later on. Since the smaller facial muscles move more quickly than larger facial muscles (Landis and Hunt, 1939) exposure to slow motion may sensitize raters to these more subtle muscular movements. Thus the effect of slow motion may be not to sensitize raters to a greater <u>number</u> of facial expressions, but by accentuating minute muscular responses, make it possible for raters to more clearly interpret subtle facial movement, thus improving the <u>accuracy</u> of their later perceptions. The training effect which occurs if slow motion is seen first is especially striking when one considers the negative attitudes of the same rating groups and the rater fatigue effect. Although some raters were critical of the study and tired of watching the tapes, the accuracy of their responses nonetheless improved at later viewings. Raters who did not see slow motion first may have been less fatigued and had more positive feelings about the study, yet experienced no training effect.

Clinical Implications

Many of the ideas that follow are not conclusions which have been definitively confirmed by the data in this study but rather have been gleaned from clinical observations during the study and perceptions of the possible clinical utility of this research.

The affects studied in this research seemed to be imbued with distinctive characteristics and qualities which emerged when trying to elicit facial expressions during the interviews. Interest and joy, of all of the emotions studied, were the easiest for people to experience. The relative pleasantness and social acceptability of these emotions doubtless contribute to their popularity. Surprise, although it was not viewed as an unpleasant emotion, in itself is of such intensity that it may be associated with fearful stimuli and loss of control on the part of the individual. Thus it is a relatively rare emotion, but has a distinctive facial response when elicited.

In the area of negative emotions, distress was by far the one most frequently identified by both subjects and raters. The relatively less intense nature of this emotion coupled with a rather high level of social acceptability, are both factors contributing to its popularity.

The emotions of anger and disgust are neither as easily owned by individuals nor as easily identified through facial expressions. Unlike distress, however, they are intense emotions and the force of intensity is usually directed toward the environment in some way. Thus both of these emotions carry with them an aura of potency and strength which to some extent offsets the effects of their social undesireability.

The emotions of fear and shame have neither of the advantages of pleasantness nor potency. Neither of these affects are owned readily by subjects or identified easily on the face. One possible consequence of the emotion of fear (when experienced in a mild form) is to freeze the facial expressions so that nothing is observable on the face except a slight widening of the eyes and a fixation of the gaze on the feared object. Similarly when the affect of shame is experienced, recognition is often inhibited because the person looks away, looks down, or physically moves away. These effects--because of their intense, unpleasant nature, and the implicit admission of vulnerability associated with them--are kept secret both from observers and, many times, even from the one experiencing the emotional state.

The second type of clinical implication derived from this research involves the way in which affects are communicated to the world at large. Because of the complexity of the facial structure, emotions can both be easily communicated and readily concealed. This research suggests that emotions are in fact communicated spontaneously through the face, and that people have some recognition of this phenomenon as it occurs. Moreover, people can heighten their ability to identify spontaneous emotions with some training and exposure to the face in slow motion.

Although the face has the ability to communicate emotions effectively, this communication is often under conscious control and is therefore subject to alteration and concealment. The realtively low incidence of recognizable facial expressions in many hours of videotaped interviewing suggests that although the face can communicate effectively, these communications occur infrequently.

When emotions do occur, their facial displays are sometimes shortened, masked or blurred by extraneous muscular movements. Thus, judging spontaneous emotions under live conditions from the human face is possible under certain conditions, but it usually is a subtle and difficult task. This task can be facilitated by providing training in the use of emotional labels and exposing the face in slow motion to clearly uncover more subtle nuances of facial movement.

Implications for Future Research

The conclusions of this research are subject to several limitations because of the selectivity of the subject and rater groups. The limits of the generalizability of the study are especially apparent when the large number of female segments is taken into account. A more balanced male-female ratio for segments employed would enhance future research efforts. It sould also be useful to compare the responses of trained and untrained raters to determine whether videotapes of spontaneous facial expressions can be recognized by individuals without prior learning.

The eliciting circumstances (the interview conditions) could be improved in future research. Providing a more emotion-arousing series of eliciting circumstances would improve both the number and quality of facial expressions elicited. This is especially important for the affects of fear and shame, which were seldom elicited from the interview procedure. The continued use of expert raters to validate segments will also maximize the number of useable segments.

The presentation of slow motion videotape of facial expressions should be shortened to lessen the effect of rater fatigue. This could be accomplished by speeding up the segments slightly, using fewer segments in slow motion, or presenting the slow motion condition in several administrations.

An alteration in the dependent measure would also be useful in future research. Type of primary emotions and number of emotions should be recorded separately so that the motivational factors will be approximately equal for each of the two measures. Rather than simple listing, a format in which the number of affects seen would be recorded in one column and the type of primary affect in another column should be used. This would clearly separate the two types of responses and this would eliminate many of the problems in the area of dependent measures.

Many other research topics would neatly contribute to findings of the present study. A comparison of verbal and nonverbal affect recognition utilizing the category approach presented here and employing videotapes with and without sound, would be an extremely useful contribution. Moreover, the relationship between subject and rater personality variables in posing and judging it both slow motion and normal speed would answer many intriguing questions.

The comparison of posed and spontaneous expressions in slow motion and normal speed would partially answer the question of whether posed expressions are different in recognizable ways from expressions which are spontaneously elicited. Also it is possible that some affects are recognized more accurately in slow motion while others are more identifiable in normal speed. This area has yet to

be explored in any systematic way.

A possible clinical use for the findings of the present study is to develop a training program for professional and paraprofessional counselors which would utilize slow motion videotapes to teach them to accurately recognize emotions from facial expressions. The present results suggest that if counselors are exposed to facial expressions in slow motion they will later be able to identify emotions in their clients with greater accuracy.

REFERENCES

REFERENCES

Abelson, R.P., and Sermat U. Multidimensional scaling of facial expressions. Journal of Experimental Psychology, 63, 1962, pp. 546-554.

Arnold, M.B. Emotion and Personality. New York: Columbia University Press, 1960.

Bartlett, E.S. A Dimensional and Typological Investigation of the Subjective Experience of Emotion. Ph.D. Dissertation, Vanderbilt University, 1971.

Birdwhistle, R.C. The Kinesic Level in the investigation of the emotions. In P.H. Knapp (Ed.) The Expressions of Emotions in Man, Part II, Ch. 7. New York: International University Press, 1963.

Black, H. "Face and Sex Factors Influencing the Correct and Erroneous Perception of Emotion." Proceedings of the 77th annual APA convention, 1969, pp. 363-364.

Black, Perry. Physiological Correlates of Emotion. New York: Academic Press, 1970.

Boring, E.G., and Titchner, E.B. A model for the demonstration of facial expression. American Journal of Psychology, 34 (4), 1923, pp. 471-489.

Boucher, J.D. Facial displays of fear, sadness, and pain. Percept. and Mot. Skills, 28, 1969, 239-242.

Bruner, J.S., and Tagiuri, R. The perception of people. In G. Lindsey (Ed.), Handbook of Social Psychology, Vol. 2. Reading Mass, 1954, pp. 634-654.

Buck, Ross; Miller, Robert E.; and Caul, William F. Sex, personality and physiological variables in the communication of affect via facial expression. J. Pers. Soc. Psy. 30 (4), October 1974, pp. 587-96.

Buck, R.; Savin, V.J.; Miller, R.E.; Caul W.F. "Non-Verbal Communication of Affect in Humans. Proceedings, 77th Annual APA convention, 1969, pp. 367-368.

Buck, R; Savin, V.J.; Miller, R.E.; Caul, W.F. Communication of affect through facial expression in humans. J. Pers. Soc. Psy., (23), 1972, pp. 362-371.

Buhler, C., and Hetzer, H. Das erste Verständnis für Ausdruck in ersten Lebensjahr. Zeitschrift fur Psychologie, 107, 1928, 50-61.

Burns, K.L., and Beier, E.G. Significance of vocal and visual channels in the decoding of emotional meaning. J. Commun. 23 (1), March 1973, pp. 118-30.

Buzby, P. Interpretation of facial expressions. Am. J. of Psy. 35, 1924, pp. 602-604.

Cannon, W.B. Bodily Changes in Pain, Hunger, Fear and Rage. New York: Appleton, 1929.

Carlson, Rae, and Levy, Nissim. Studies of Jungian typology: I. memory, social perception, and social action. Journ. of Personality 41(4):559-576, 1973.

Chambers, J.L. Trait judgment of photographs and adjustment of college students. J. Consult. Psy. 25 (5), 1961, pp. 433-35.

Cohen, Bertram D., and Rau, John H. The non-verbal affect measure. Nonverbal technique for measuring affect using facial expression photographs as stimuli. Journ. of Consulting and Clinical Psychology 38(3); 449-451, 1972.

Coleman, J.C. Facial expressions of emotion. Psych. Monograph, 63, 1949 (1, whole, No. 296).

Cuceloglu, Dogan. Facial Code in Affective Communication Comparative Group Studies (Small Group Behavior), Vol 3(4), 1972, 395-408.

Darwin, Charles. The Expression of the Emotions in Man and Animals. University of Chicago Press, Chicago and London.

Davis, R.C. The specifity of facial expressions. Journal of General Psychology, 10, 1934 42-58.

Davitz, Joel, R. The Language of Emotion. New York: Academic Press, 1969.

Dickey, E.C., and Knower, F.H. A note on some ethnological differences in recognition of simulated expression of emotion. Am. J. of Sociology, 47, 1941, 190-193.

Dougherty, F.E.; Bartlett, E.S.; Izard, C.E. Responses of schizophrenics to expressions of the fundamental emotions. J. Clin. Psy. 30(3), 243-6.

Drag, R.M., and Shaw, M.E. Factors influencing the communication of emotional intent by facial expression. Psychometric Sci. 8, 1967, 137-8.

Duchenne, G.B. Physiology of Motion Demonstrated by Means of Electrical Stimulation and Clinical Observation and Applied to the Study of Paralysis and Deformities. Translated and edited by Emanual Kaplan, M.D., J.B. Lippincott, and Co., 1949.

Duchenne, Mechanisme de la physionomie humaine ou Anaylse electro-physiologique de la expressiones des passiones, 1862.

Duffy, E. An explanation of "emotional" phenomena without the use of the concept "emotion." J. General Psy. 25, 1941, 283-93.

Dunlap, K. The role of eye-muscles and mouth muscles in the expression of the emotions. Genetic Psy. Monograph 3, 1927, 424-435.

Dusenbury, P., and Knower, F.H. Experimental studies in the symbolism of action and voice, I. A study of the specifity of meaning in facial expression. Quarterly J. of Speech 24, 1938, 424-435.

Eibl-Eibesfeldt, K. Love and Hate: A Natural History of Behavior Patterns. Verlag, Munich: R. Piper and Co., 1970.

Ekman, P. Body position, facial expression and nonverbal behavior during interviews. J. Abn. and Soc. Psy. 68, 1964, 295-301.

Ekman, P. Differential communication of affect by head and body cues. J. Pers. and Soc. Psy. 2 (5), 1965, 725-735.

Ekman, P. "Universals and Cultural Differences in Facial Expressions of Emotion." Nebraska Symposium on Motivation, Vol. 19, 1971, 207-283.

Ekman, P. "Universals and Cultural Differences in Facial Expression." In J.K. Cole (Ed.) Nebraska Symposium on Motivation, 1971. Lincoln Nebraska: University of Nebraska Press, 1972.

Ekman, P. Universal facial expressions in emotion. Studia Psychologica, 15 (2), 1973, 140-147.

Ekman, P., and Friesen W.V. Head and body cues in the judgment of emotion: A reformulation. Percept. and Mot. Skills 24, 1967, 711-724 (a).

Ekman, P., and Friesen, W.V. Nonverbal leakage and clues to deception. Psychiatry 32, 1969,88-106.

Ekman P., and Friesen, W.V. The repetition of nonverbal behavior--categories, origins, usage and coding. Semiotica, 1, 1969, 49-98.

Ekman, P., and Friesen, W.V. Constants across cultures in the face and emotion. J. Pers. and Soc. Psy. 17 (2), 1971, 124-129.

Ekman, P., and Friesen, W. Detecting deception from the body or face. J. Pers. and Soc. Psy. 29 (3), 1974 288-298.

Ekman P., and Friesen, W.V. Unmasking the Face: A Guide to Recognizing Emotions from Facial Expressions. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1975.

Ekman, P.; Friesen, W.; and Ellsworth, Pheobe. Emotion in the Human Face. Pergamon Press, 1972.

Ekman, P.; Friesen, W.; and Tomkins. Facial affect scoring technique (FAST): A first validity study. Semiotica 3, 1971, 37-58.

Ekman, P.; Sorenson, E.R.; and Friesen, W.V. Pan-cultural elements in facial displays of emotion. Science Ap. Psy. 164, 1969, 86-88.

Engen, T.; Levy, N.; and Schlosberg, H. The dimensional analysis of a new series of facial expressions. J. Exp. Psy. 55, 1958, 454-458.

Eriksen, C.A. Perceptual defense as a function of unacceptable needs. J. Abn. Soc. Psy. 46, 1951, 557-564.

Fair, P.C.; Schwartz, G.E.; Friedman, N.J.; Greenberg, P.S.; Klerman, G.C.; and Gardner, E.A. Facial Expression and Emotion: An Electromyographic Study. Unpublished paper read at Eastern Psych. Assn., Philadelphia, Pa., April 1974.

Feleky. The expression of the emotions. Psych. Review 21, 1914, 33-34.

Forrest, D.W., and Lee, S.G. Mechanisms of defense and readiness in perception and recall. Psychological Monographs, No. 523, Vol. 76, No. 4, 1962.

Freedman, D.G. Smiling in blind infants and the issue of innate versus acquired. J. of Child Psychology and Psychiatry. Vol. 5, 171-184.

Frijda, N.H. The understanding of facial expression of emotion. Acta Psychologica, 9, 1953, 294-362.

Frijda, N.H. Facial expression and situational cues. J. Abn. Soc. Psychol. 57, 1958, 149-154.

Frijda, N.H. and Philipszoon, E. Dimensions of recognition of expression. J. Abn. Soc. Psychol. 66, 1963, 45-51.

Frois-Wittman, J. The judgment of facial expression. J. Exp. Psychol. 13, 1930, 113-151.

Fulcher, J.S. "Voluntary" facial expression in blind and seeing children. Archives of Psychol. 38, No. 272, 1943.

Gates, G.S. A test for ability to interpret facial expression. Psychol. Bull. 22, 1925, 120.

Gitter, George,; Black, H.; and Mostofsty, D. Race and sex in the perception of emotion. J. of Soc. Issues. 28 (4), Fall 1972, 63-78.

Gladstone, W.H. A multidimensional study of facial expressions of emotion. Australian J. of Psychol. 14, 1962, 95-100.

Glass, G., and Stanley, J. Statistical Methods in Education and Psychology. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970.

Goodenough, F.C. The expression of emotions in infancy. Child Development 2, 1931, 96-101.

Goodenough, F.C. Expression of the emotions in a blind-deaf child. J. Abn. Soc. Psychol. 27, 1932-3, 328-333.

Goodenough, F.C., and Tinker, M.A. The relative potency of facial expression and verbal description of studies in the judgment of emotion. J. Comp. Psychol. 13, 1931, 365-370.

Goren, C.; Sarty, M.; and Wu, P. Visual following and pattern discrimination of face-like stimuli by newborn infants. Pediatrics 56, Oct. 1975, 544-9.

Gregory, W.K. Our Face from Fish to Man. New York: Putnam, 1929.

Gubar, G. Recognition of Human Facial Expressions Judged Live in a Laboratory Setting. Ph.D. Dissertation Rutgers University, 1966, p. 313.

Guilford, J.P. An experiment in learning to read facial expressions. J. Abn. Soc. Psychol, 24, 1929, 191-202.

Haggard, E.A. Professor of Psychology, Department of Psychiatry, University of Illinois, College of Medicine, Personal Communication, October 21, 1974.

Haggard, E., and Isaccs, F. Micromomentary facial expressions as indicators of ego mechanisms in psychotherapy. In Methods of Research in Psychotherapy, Gottschalk, L.A. and Auerbach, A.H. (Eds.). New York: Appleton Century Croft, 1966, 154-165.

Hamilton, M.C. Imitation of facial expression of emotion. J. Psychol. 80 (2), March 1972, 345-50.

Harrison, R.P. Pictic Analysis: Toward a Vocabulary and Syntax for the Pictoral Code; With Research on Facial Communication. Ph.D. Dissertation, Michigan State University.

Hoshino, Kikuzo. The ability to identify affective meanings of facial expressions at successive age levels. Japanese J. of Ed. Psychol. 17 (2), 1969, 90-101.

Howell, R.J., and Jorgenson, E.C. Accuracy of judging emotional behavior in a natural setting--A replication. J. of Soc., Psychol. 31 (2), 1970, 269-270.

Howes, P.H., and Solomon, P.C. A note on McGuinnies' 'Emotionality and Perceptual Defense.' Psych. Review 57, 1950, 229-234.

Huber, E. Evolution of Facial Musculature and Facial Expression. Baltimore: Johns Hopkins University Press, 1931.

Izard, Carol E. Face of Emotion. New York: Appelton-Century-Crofts, Merideth Corporation, 1971.

James, W. What is an emotion? Mind 9, 1884, 188-205.

Jenness, A. The effects of teaching subjects in the recognition of facial expressions. J. Gen. Psychol. 7, 1932, 163-178.

Jorgenson, E.; Clay; and Howell, Robert, J. Judging unposed emotional behavior. Psychotherapy--Theory Res. Pract. 6 (3), 1969, 161-65.

Kanner, L. Judging emotions from facial expressions. Psychol. Monograph 41, 1931, (3, Whole No. 186).

Kozel, Nicholas. Perception of Emotion: Race of Expressor, Sex of Perceiver, and Mode of Presentation. Proceedings, 77th Annual Convention of the APA., Vol. 77, 1969, 39-41.

Kreutzer, M.A. and Charlesworth, W.R. Infants Reactions to Different Expressions of Emotions. Paper presented at the Society of Research in Child Development, Philadelphia, Pa., March, 1973.

Kwint, C. Ontogeny of mobility of the face. Child Development 5, 1934, 1-12.

Landis, C. Studies of emotional reactions I: A preliminary study of facial expressions. J. Exp. Psychol. 7, 1924, 325-341.

Landis, C. Studies of emotional reactions: II. General behavior and facial expression. Journal Compar. Psychol. (4), 1924, 447-509.

Landis, C. The interpretation of facial expression of emotion. Journal General Psychol. 2, 1929, 59-72.

Landis, C. and Hunt, W.A. Magnification of time as a research technique in the study of behavior. Science, 85, 1937, 384-85.

Landis, C., and Hunt, W.A. The Startle Pattern. New York: Farran, 1939.

Langfeld, A.S. The judgment of emotions from facial expressions. J. Abn. Soc. Psychol. 13, 1918, 172-84.

Levitt, E.A. The relationship between abilities to express emotional meaning vocally and facially. In J.R. Davitz (Ed.), The Communication of Emotional Meaning N.Y.: McGraw-Hill, 1964, 87-100.

Lindsey, D.B. The Role of reticulo-thalamocortical systems in emotion. In Black (Ed.) Physiological Correlates of Emotion. N.Y.: Academic Press,1970.

LoCastro, Joseph S. Judgment of emotional communication in the facial-vocal-verbal channels. Dissertation Abstracts International, Vol. 33 (1_B), 1972, 443.

Lanzetta, J.T., and Kleck R. Encoding and Decoding of facial affect in humans. J. Pers. Soc. Psy. 16 (1), 1970, 12-19.

McGinnies, E. Emotionality and perceptual defense. Psych. Review 56, 1949, 244-251.

Munn, N.C. The effect of knowledge of the situation upon judgment of emotion from facial expressions. J. Abn. and Soc. Psy., 35, 1940, 324-338.

Murphy, G.; Murphy, C.B.; and Newcomb, T.M. Experimental Social Psychology. New York: Harper, 1937.

Postman, L.; Bruner, J.; and McGinnies, E. Personal values as selective factors in Perception. J. Abn. Soc. Psy. 43, 1948, 142-54.

Royal, D.C. A Multidimensional Analysis of Perception of Emotion From Schematic Facial Expressions, Ph.D. Dissertation, University of Michigan, 1959.

Schiffenbaur, A. Effect of observers emotional state on judgments of emotional state of others. J. Pers. Soc. Psy. 30 (1), 1974, 31-5.

Schlosberg. A scale for the judgment of facial expressions. J. Exp. Psy., 29, 1941, 497-510.

Schlosberg, H. Perception of facial expression in terms of two dimensions. J. of Exp. Psychol. 44, 1952, 229-237.

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

Schwartz, G.E.; Fair, P.C.; Greenberg, P.S.; Friedman, M.J.; and Klerman, G.C. Facial Electromyography in the Assessment of Emotion. Unpublished paper read to the Society for Psychophysiological Research. Oct. 1973.

Schwartz, G.E.; Fair, L.; Greenberg, P.S.; Mandel, M.R.; and Klerman, G.L. Facial Expression and Emotion: An Electromyographic Study. Unpublished paper read at meeting of American Somatic Society., Philadelphia, Pa., 1974.

Schwartz, G.; Fair, P.; Salt, P.; Mandel, M.; and Klerman, G. Facial muscular patterning to affective imagery in depressed and non-depressed subjects. Science, 192, April 30, 1971.

Secord, B.E.; Dukes, W.F. and Devan, W. Personalities in faces: I: An experiment in social perceiving. Gen. Psy. Monographs, 49, 1954, 231-279.

Secord, B.E.; Dukes, W.F. and Devan, W. Personalities in faces III: A cross cultural comparison of physiogonomy and personality in faces. J. Soc. Psychol., 43, 1956, 283-288.

Shannon, Anna Marian. Differences Between Depressives and Schizophrenics in the Recognition of Facial Expression of Emotion (D.N.S. Dissertation). Dissertation Abstracts International. Ann Arbor, MI., Univ. M-Films, No. 71-27067.

Thompson, J. Development of facial expression in blind and seeing children. Archives of Psychol., 37, 1941, No. 264.

Thompson, P.F., and Meltzer, C. Communication of emotional intent by facial expression. J. Abn. Soc. Psychol., 68, 1964, 129-35.

Tomkins, Sylvan, S. Affect Imagery and Consciousness Vol. I, The Positive Affects. New York: Springer Publishing Co., 1962.

Tomkins, Sylvan S. Affect Imagery and Consciousness Vol. II, The Negative Affects. New York: Springer Publishing Co., 1963.

Tomkins, S.S. Introduction to Affect Symposium. Proceedings, of the 72nd Annual Convention of the American Psychological Association, 1964.

Tomkins, S.S. Introduction to Affect Symposium, APA, 1964.

Tomkins, Sylvan S., and Izard, Carol E. Affect, Cognition and Personality Empirical Studies, New York: Springer Publishing Co., 1965.

Tomkins, S.S., and McCarter. What and where are the primary affects -- Some evidence for a theory. Perceptual and Motor Skills, 18, 1964, 119-158.

Triandis, H.C., and Lambert, W.W. A restatement and test of Schlosberg's theory of emotion with two kinds of subjects from Greece. J. Abn. Soc. Psychol. 56 1958, 321-328.

Vinake, W.E. The judgment of facial expressions by three national racial groups in Hawaii, I. Caucasian faces. J. of Pers. 17, 1949, 407-429.

Vinake, W.E. The judgment of facial expressions by three national-racial groups in Hawaii, II. Oriental faces. J. of Soc. Psychol., 41, 1955, 184-195.

Watson, S.G. Judgment of emotion from facial and contextual cue combinations. J. Pers. Soc. Psy. 24 (3), 1972, 334-42.

Wenger, M.A. "Emotions as Visceral Action: An Extension of Lange's Theory." In M.L. Reyment (Ed.), Feelings and Emotions: The Moosehart Symposium, New York: McGraw-Hill, 1950.

Wilcox, B.M. Visual preferences of human infants for representations of the human face. J. Exp. Child Psychol. 7, 1969, 10-20.

Wilcox, B., and Clayton, F. Infant visual fixation on motion picutres of the human face. J. Exp. Child Psy. 6 (1), 1968, 22-32.

Woodworth, R.S. Experimental Psychology. New York: Henry Holt, 1938.

Young, Paul Thomas. Emotion in Man and Animal Its Nature and Dynamic Basis, 2nd ed. Robert E. Krieger Pub. Co. 1973.

Zlatchin, Carl. Accuracy and inaccuracy in the recognition of facial affects and the relationship to personality. Diss. Abstr. Int. #74-13400.

APPENDICES

APPENDIX A

SIGN UP SHEET FOR PARTICIPATION IN RESEARCH ON AFFECTIVE COMMUNICATION

APPENDIX A

SIGN UP SHEET FOR PARTICIPATION IN RESEARCH

As part of my dissertation research, I am making a series of videotapes of people discussing their feelings and emotions. The participants will be involved in a half-hour interview which will be videotaped, followed by a half-hour recall session during which the videotape will be reviewed and processed. In the past this has proved to be an interesting and rewarding experience for those who wish to participate. Times for interviews will be available during the period of August 7 until August 15. If you are interested, please sign up below and you will be contacted regarding specific times. Thanks for your participation.

Dave Inman

NAME	ADDRESS	PHONE

APPENDIX B

COMPOSITION OF SUBJECT GROUP

APPENDIX B

COMPOSITION OF SUBJECT GROUP

Subject	Sex	Age	Academic Level	Interview*
1	M	22	Grad	1
2	F	19	Jr	1
3	F	20	--	1
4	F	30	Grad	1
5	M	21	Sr	1
6	F	20	Jr	1
7	M	25	Grad	1
8	F	20	Jr	1
9	M	28	Sr	1
10	F	47	Jr	2
11	F	21	Sr	2
13	M	38	Jr	2
14	M	26	Jr	2
15	F	34	Jr	2
16	F	31	Grad	2
17	F	31	Grad	2
18	M	27	Grad	2

* 1 = Structured
  2 = Unstructured

Sex	Raw Score	Percent
Male	7	.41
Female	10	.59
Total	17	1.00

Age
Average = 27
Minimum = 19
Maximum = 47
Range = 28

APPENDIX C

SUBJECT RELEASE FORM FOR STUDY ON AFFECTIVE COMMUNICATION

APPENDIX C

SUBJECT RELEASE FORM FOR STUDY ON AFFECTIVE COMMUNICATION

I understand that this is a research project investigating variables which are thought to be relevant to the process of affective communication. I hereby agree to permit films known as videotape recordings of my participation to be prepared. I understand that these films are being produced solely for the purposes of research for this study and that my confidentiality will be strictly maintained.

I understand that at any time during this study I am free to discontinue my participation totally. I am also free to disallow preparation of videotape recordings of my responses, if I so desire.

I have voluntarily agreed to participate in this study, and have not been offered nor expect any remuneration for my participation.

____

Signature of Participant

____

Date

____

Witness

APPENDIX D

SUBJECT INFORMATION FORM

APPENDIX D

SUBJECT INFORMATION FORM

Subject Number: ________ Sex: Male_____

Female _____

Name: ____________________________________ Age: _____

Address: _________________________________
Street

____
City State

Phone: ___________________ Major ___________________

Academic Status

Freshman
Sophomore
Junior
Senior
Graduate Student

APPENDIX E

SUBJECT INSTRUCTIONS:

STRUCTURED INTERVIEW CONDITION

APPENDIX E

SUBJECT INSTRUCTIONS: STRUCTURED INTERVIEW CONDITION

This is a study of how various emotions or affects are experienced. We are interested in how various emotions are identified, how they are stimulated by various situations, and how they are experienced, or felt, by the person. You will be shown a set of photographs depicting various facial expressions of emotion. Each photograph is labeled with a specific emotional phrase. After the photograph is displayed, you will be asked to describe certain aspects of the emotion in the photograph as you experience it. We are interested in such aspects as: where you feel the emotion occurring in your body, what it is like to experience that affect, and finally, what situations in your life stimulate or "trigger" that particular affect. Following this procedure, a series of eight emotional states will be explored. The emotions we are interested in are: interest-excitement, happiness-joy, surprise-startle, fear-terror, anger - rage, contempt-disgust, distress-anguish, and shame-humiliation. Do you have any questions?

APPENDIX G

SUBJECT INSTRUCTIONS:

RECALL INTERVIEW

APPENDIX G

SUBJECT INSTRUCTIONS: RECALL INTERVIEW

During the next few minutes you will be viewing a videotape which was made of your previous conversation. As you view the tape we would like you to stop it at points where you see yourself as experiencing an emotion. Since the tape will be played without sound, it will be necessary for you to pay attention to the non-verbal indications of emotions. In this way we hope to isolate points on the videotape where you think your face shows that you were feeling an emotion. At the same time you will probably become much better at identifying how you as an individual communicate emotions non-verbally. To identify the affects on the videotape we will be using the following emotional labels: interest-excitement, happiness-joy, surprise,-startle, fear-terror, anger-rage, contempt-disgust, distress-anguish, and shame-humiliation. Do you have any questions?

APPENDIX H

FORM USED TO RECORD INFORMATION FROM RECALL INTERVIEW

APPENDIX H
FORM USED TO RECORD INFORMATION FROM RECALL INTERVIEW

Subject Number ______________ Tape Number______________

	Time	Happiness-Joy	Interest-Excitement	Surprise-Startle	Anger-Rage	Fear-Terror	Distress-Anguish	Contempt-Disgust	Shame-Humiliation	
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
16.										
17.										
18.										
19.										
20.										
21.										
22.										
23.										
24.										
25.										
26.										
27.										
28.										
29.										
30.										
31.										
32.										
33.										
34.										
35.										
36.										
37.										
38.										
39.										
40.										

APPENDIX I

COMPOSITION OF STIMULUS TAPE SEGMENTS

APPENDIX I

COMPOSITION OF STIMULUS TAPE SEGMENTS

Category	Segment Number	Sex	Category	Segment Number	Sex	Category	Segment Number	Sex
Interest/			Enjoyment/			Surprise/		
Excitement			Joy			Startle		
1	4	F	1	2	F	1	21	M
2	16	M	2	3	M	2	22	F
3	25	M	3	6	F	3	31	F
4	35	M	4	13	F	4	33	F
5	42	M	5	20	M	5	48	F
6	47	M	6	23	M	6	67	F
7	53	F	7	27	F	7	99	F
8	61	F	8	28	F	8,9 Void		
9	62	F	9	29	F			
10	68	F	10	37	F	Distress/		
11	71	F	11	41	M	Anguish		
12	75	M	12	43	M	1	1	F
13	80	F	13	54	M	2	5	F
14	81	F	14	55	M	3	9	F
15	83	F	15	57	M	4	10	F
16	84	F	16	60	M	5	11	F
17	100	F	17	94	M	6	32	F
18,19,20 Void			18	101	F	7	40	M
			19,20 Void			8	45	F
						9	50	F
						10	51	F
						11	56	M
						12	58	M
						13	64	F
						14	65	F
						15	66	M
						16	70	F
						17	77	M
						18 Void		

APPENDIX I (Continued)

Category	Segment Number	Sex	Category	Segment Number	Sex
Anger/Rage			Contempt/ Disgust		
1	17	F	1	7	F
2	26	M	2	8	F
3	34	F	3	14	M
4	36	M	4	15	F
5	44	F	5	19	F
6	73	F	6	39	M
7	78	F	7	49	F
8	79	F	8	52	F
9	82	F	9	59	M
10	85	M	10	63	F
11	89	F	11	76	F
12	90	F	12	96	F
13	91	F	13	98	F
14	92	M	14,15,16 Void		
15	93	M			
16	97	M			
17,18 Void					

APPENDIX J

COMPOSITION OF STIMULUS TAPE SEGMENTS--SUMMARY

APPENDIX J

COMPOSITION OF STIMULUS TAPE SEGMENTS--SUMMARY

	Number Segments	Number Void	Sex		Structured	Unstructured
			M	F		
Interest-Excitement	17	3	6	11	9	8
Enjoyment-Joy	18	2	10	8	10	8
Surprise-Startle	7	2	1	6	5	2
Distress-Anguish	17	1	5	12	7	10
Anger-Rage	16	2	6	10	8	8
Contempt-Disgust	13	3	3	10	7	6
Totals	88	13	31	57	46	42
Percent	100%		35%	65%	52%	48%

APPENDIX K

SPEED OF A SAMPLE OF SEGMENTS AND PAUSES BETWEEN SEGMENTS CHOSEN FROM THE SLOW MOTION TAPE

APPENDIX K

SPEED OF A SAMPLE OF SEGMENTS AND PAUSES BETWEEN SEGMENTS CHOSEN FROM THE SLOW MOTION TAPE

Segment	Time	Space
1	37	10
5	34	8
8	33	6
11	27	7
14	35	9
		12
18	30	14
22	32	
25	31	9
29	35	8
35	31	8
40	32	13
45	32	9
50	32	10
55	33	5
60	30	5
65	32	11
70	33	10
76	35	6
80	35	5
85	32	18
90	40	7
95	33	5
100	33	9
	32.91	8.86 Sec.

6.71 times slower than normal speed or 15 percent of normal speed

APPENDIX L

RATER SAMPLE COMPOSITION

APPENDIX L

RATER SAMPLE COMPOSITION

		Raw	Percent
Sex	Male	16	55
	Female	13	45
	Total	29	100
Academic Status	Undergrad	0	
	Master	19	66
	Doctor	10	34
	Total	29	100
Age	20 - 25	6	20
	26 - 30	11	38
	31 - 40	9	31
	41 - 50	1	4
	Over 50	2	7
	Total	29	100

APPENDIX M

RATER INFORMATION FORM

APPENDIX M

RATER INFORMATION FORM

Rater number: ____________

Name: ______________________________ Sex: Male ______

Female ______

Address: __________________________
Street

Age: ___________

____
City State

Academic Status

Phone: ______________ Major: __________

Freshman
Sophomore
Junior
Senior
Graduate Student

I (do, do not) want a summary of the results of this study.

APPENDIX N

RATER RELEASE OF INFORMATION FORM

APPENDIX N

RATER RELEASE OF INFORMATION FORM

I understand that I am participating in a research study investigating variables thought to be relevant to the process of affective communication. I understand that all information recorded here will be used solely for research purposes and that my confidentiality will be strictly maintained.

I have voluntarily agreed to participate in this study, and have not been offered nor expect any remuneration for my participation.

I understand that at any time during this study I am free to discontinue my participation totally.

Signature ____________________

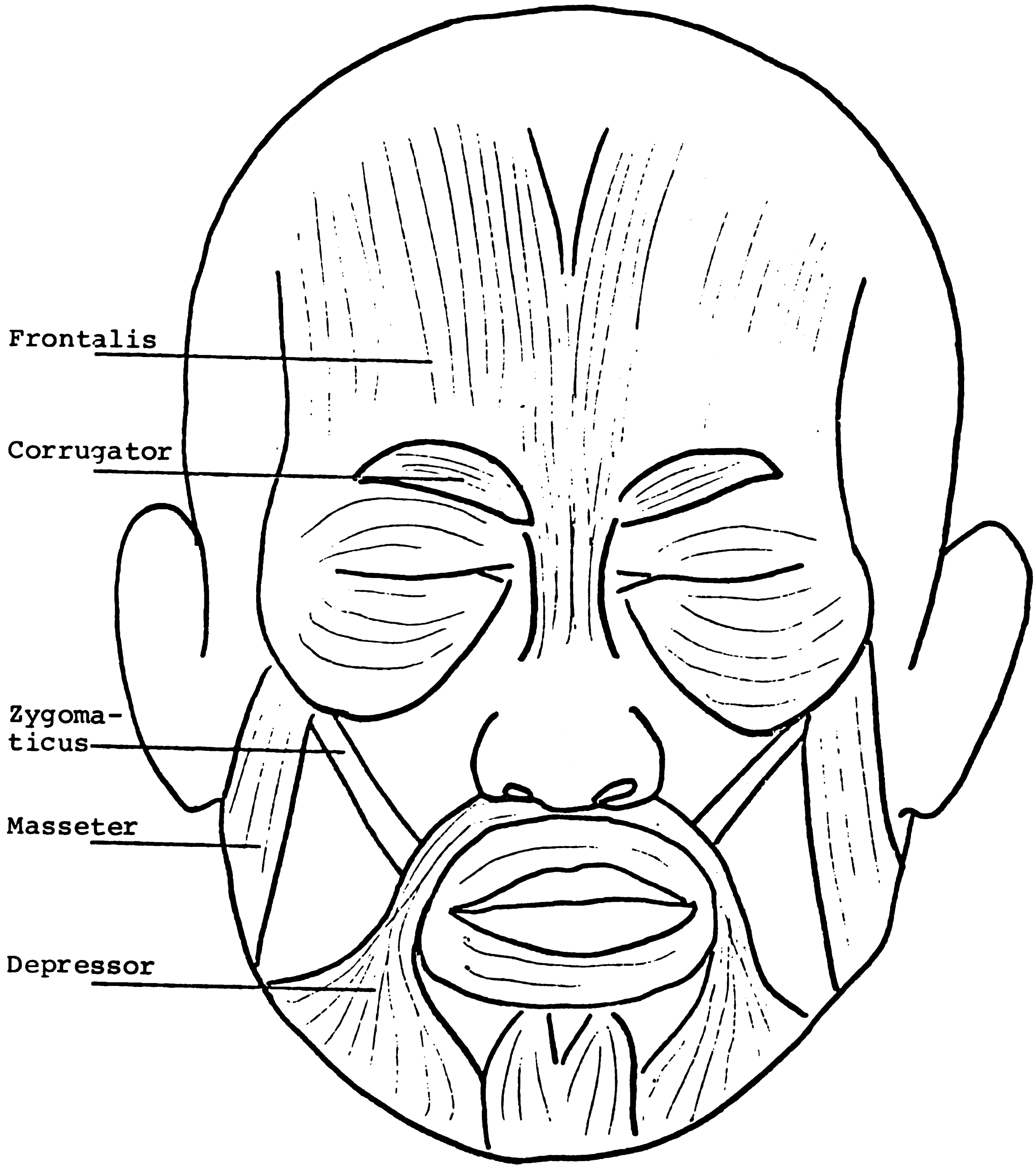
Witness ____________________ Date ____________

APPENDIX O

SCHEMATIC OF FACIAL MUSCULATURE

APPENDIX O

SCHEMATIC OF FACIAL MUSCULATURE*



*Modified from Fair, Schwartz, Friedman, Greenberg, Klerman and Gardner, 1974.

APPENDIX P

AFFECT RECOGNITION TRAINING: CATEGORIES OF EMOTION

APPENDIX P

AFFECT RECOGNITION TRAINING: CATEGORIES OF EMOTION

By

David J. Inman
1975

This part of the training program is designed to introduce you to the emotional labels that we will be using in this study. There are thousands of emotional words, each signifying various shades of meaning, and you probably already have your own special vocabulary for describing emotion. However, for the purposes of this study, we will all use the same terms so we can have a clear understanding of what we are talking about. In this study, the following emotional labels will be used: Interest-Excitement, Enjoyment-Joy, Surprise-Startle, Distress-Anguish, Anger-Rage, and Disgust-Contempt. We will now consider each of these affects individually.

1. Interest-Excitement (Int)

Synonyms: Curious, concentrating, attending, absorbed, involved, attracted, intense, fascinated.
Description: Interest-Excitement is not usually considered an affect. It consists of mildly pleasant sensations which are aroused when one is spontaneously attending to the environment. Most people are capable of maintaining this affect over long periods of time.
Function: Taking in information about the environment.
Facial Components: Eyebrows level but may be slightly raised or lowered. Eyes open normally and fixated. Lips may be parted and jaw dropped slightly.

2. Enjoyment-Joy (Joy)

Synonyms: Happy, glad, merry, joyful, cheerful, blissful, jubilant, gay, elated, ecstatic, gleeful, jovial.
Description: Enjoyment-Joy is the affect which most people prefer to experience. It is the most pleasant of all the affects. May be stimulated by the onset of positive stimuli or by the cessation of painful or unpleasant stimuli. It can vary greatly from mild enjoyment to ecstasy.

Function: Social bonding, internal positive reinforcement.

Facial components: Eyebrows level or lishgtly lowered. Eyes bright--may be partially closed: wrinkles ("crow's feet") in the outer corners. Corners of mouth lifted back and up (exaggerated with laughing). Teeth may be partially exposed, upper lip tensed. Naso-labial folds (running from the nose to the outer edge of the mouth) are evident.

3. Surprise-Startle (Sur)

Synonyms: Astonished, amazed, shocked, flabbergasted.

Description: Surprise is distinguished by its very brief duration. It is sudden in its onset and fades quickly. It is triggered usually by the unexpected; if one anticipates an event, then one cannot be surprised. It may also be triggered by a sudden change in sensory stimulation such as a gunshot or flashbulb going off.

Function: Clearing the sensory systems for assimilation of new information.

Facial Components: The brows are raised so that they are curved and high, making the forehead wrinkled horizontally. The eyes are widened so that the white is visible above and sometimes below the pupil. The jaw drops so that the lips are loosely parted.

4. Distress-Anguish (Dist)

Synonyms: Sad, unhappy, miserable, hurt, dejected, depressed, despondent, dismal, low, grieved, suffering.

Description: Most often, the feeling of distress is associated with a loss of some sort. Loss of a loved one, loss of an opportunity, loss of self-esteem, loss of health all can cause distress. Distress is usually a prolonged feeling, usually lasting at least a few minutes, and sometimes for years. It is not as acutely unpleasant as some of the other affects, but its prolonged endurance may have profound consequences.

Function: Communicate deficiency to the environment and attract helpgivers.

Facial Components: Inner corners of the eyebrows are drawn up, sometimes creating vertical wrinkles in the forehead. The skin below the forehead is triangulated with the inner corner up. The corners of the mouth are down and the lip may be trembling.

5. Anger-Rage (Ang)

Synonyms: Irritated, hostile, mad, hateful, aggressive, annoyed, cranky, cross, disagreeable, furious, belligerant, resentful.

Description: Intense anger usually implies risk of losing control. Consequently, anger is diligently supressed in early socialization. Anger is likely to be triggered by frustration, or physical threat: it may be a reaction to a psychological hurt, an extreme violation of values, or a failure to fulfill expectations.

Function: To mobilize the individual's resources for confrontation with the disturbing element in the environment.

Facial Components: Brows are lowered and drawn together, creating vertical lines in the forehead. Eyes have a hard stare and a bulging appearance. Lips are either firmly pressed together with corners down or drawn back in a squarish shape, baring the teeth.

6. Contempt-Disgust (Cont)

Synonyms: Scornful, disdainful, skeptical, condemning, critical, arrogant, sarcastic, spiteful, revolted, indignant.

Description: A feeling of aversion to something sensory--as a taste, a smell, a sight, or a touch. Also a feeling of aversion to more complex stimuli--ideas, things, or people. An element of condescension accompanies contempt-disgust--a "looking down on" the object as being "below" you.

Function: To "expel" the object in either a physical sense (i.e., vomiting) or a psychological sens by rejecting the object.

Facial Components: The brow is lowered; one or both cheeks are raised; the nose is sometimes wrinkled. One or both sides of the upper lip is raised and protrudes slightly, leaving the teeth exposed. At times the tongue may be slightly extended.

Thus in this study, you will be learning to recognize and label facial expressions in these six categories:

1. Interest-Excitement (Int)
2. Enjoyment-Joy (Joy)
3. Surprise-Startle (Sur)
4. Distress-Anguish (Dist)
5. Anger-Rage (Ang)
6. Contempt-Disgust (Cont)

These are not the only emotional states that exist, but cross cultural research has shown that observers can accurately recognize facial expressions and name them accordingly using these labels. Please note that two important affects have been omitted from this study: Fear-Terror and Shame-Humiliation. Although we believe these to be important emotional states, we were able to elicit each of them only a few times on videotape. Thus we do not have enough instances of the facial expressions to provide an accurate test of recognition in this study. The facial expressions in the training tape and in the actual study will then only be correctly labeled in one of the six categories discussed, and in no others.

APPENDIX Q

ANSWER SHEET:

AFFECT RECOGNITION TRAINING

APPENDIX Q

ANSWER SHEET: AFFECT RECOGNITION TRAINING

In this part of the training, you will be looking at still photographs and videotapes of people talking about their emotions. Your task will be to watch the film or photo, and after the presentation of the stimulus is over, to write down the emotion or emotions you recognized.

Because the time you will have to record your answers is very brief, you might want to use the following abbreviations for the emotional categories:

Suggested Abbreviations

1.	Interest-Excitement	Int
2.	Enjoyment-Joy	Joy
3.	Surprise-Startle	Sur
4.	Distress-Anguish	Dist
5.	Anger-Rage	Ang
6.	Contempt-Disgust	Cont

If in a particular sement or photo you see more than one emotion, write first the most intense and predominant emotion followed by the other emotion (or emotions). For example, if in one segment you see an expression of interest followed by a brief but intense expression of surprise, your answer would be "surprise, interest" or in abbreviated terms "Sur, int." Likewise if in a segment or photo you see a blend of expressions on the person's face, try to ascertain what the predominant emotion is, and list that one first on the rating sheet.

There will be three separate parts of this training, and each of them have a different purpose:

Part 1: Identification of still photos (posed) which have been used in the cross cultural research. The purpose of this part is to familiarize yourself more thoroughly with the facial expressions and to shorten the time necessary for recognition. (Photographs courtesy of Carrol Izard, 1975).

Part 2: Identification of posed videotapes. Purpose here is not so much that the emotions be identified accurately as that you have a chance to get used to watching videotaped expressions over a short exposure time.

Part 3: Rater accuracy test. Here you will be viewing still photographs of spontaneous facial affect, and be tested on the accuracy and reliability of the responses.

Rater # ____________

Interest-Excitement:	Int
Enjoyment-Joy:	Joy
Surprise-Startle:	Sur
Distress-Anguish:	Dist
Anger-Rage:	Ang
Contempt-Disgust:	Cont

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

24. ______________________________

25. ______________________________

26. ______________________________

27. ______________________________

28. ______________________________

29. ______________________________

30. ______________________________

31. ______________________________

32. ______________________________

33. ______________________________

34. ______________________________

35. ______________________________

36. ______________________________

37. ______________________________

38. ______________________________

39. ______________________________

40. ______________________________

41. ______________________________

42. ______________________________

43. ______________________________

44. ______________________________

45. ______________________________

46. ______________________________

47. ______________________________

48. ______________________________

49. ______________________________

50. ______________________________

51. ______________________________

52. ______________________________

APPENDIX R

ANSWER SHEET:

AFFECT RECOGNITION STUDY

APPENDIX R

ANSWER SHEET: AFFECT RECOGNITION STUDY

In this study you will be viewing videotapes of people talking about their emotions. Your task will be to watch the tape, and when each segment is over, to write down the emotion or emotions that you recognized in that segment.

Since these tapes were recorded without sound, you won't know the content of the conversation. You will be making your judgments solely on the basis of the person's non-verbal communication.

Because the time between segments is very brief, and becuase you will not record your answers until the segment is concluded, you might want to use the following abbreviations for the emotional categories.

Suggested abbreviations:

1. Interest-Excitement: Int
2. Enjoyment-Joy: Joy
3. Surprise-Startle: Sur
4. Distress-Anguish: Dist
5. Anger-Rage: Ang
6. Contempt-Disgust: Cont

If you see more than one emotion during a particular segment, write the most intense and predominant emotion first, and the other emotion (or emotions) second. For example, if, in one segment, the subject holds an expression of mild interest followed quickly by a brief but intense expression of surprise, your answer would be "surprise, interest" or in abbreviated terms, "sur, int." Likewise if in the segment you perceive a blend of expressions on the person's face, try to ascertain what the predominant emotion is, and list that one first on the rating sheet.

If you have any questions about any aspect of this procedure, please bring them up now, since after we start the tape, we will not be able to answer questions.

Rater # ______________________

Interest-Excitement: Int
Enjoyment-Joy: Joy
Surprise-Startle: Sur
Distress-Anguish: Dist
Anger-Rage: Ang
Contempt-Disgust: Cont

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

24. ______________________________
25. ______________________________
26. ______________________________
27. ______________________________
28. ______________________________
29. ______________________________
30. ______________________________
31. ______________________________
32. ______________________________
33. ______________________________
34. ______________________________
35. ______________________________
36. ______________________________
37. ______________________________
38. ______________________________
39. ______________________________
40. ______________________________
41. ______________________________
42. ______________________________
43. ______________________________
44. ______________________________
45. ______________________________
46. ______________________________
47. ______________________________
48. ______________________________
49. ______________________________
50. ______________________________
51. ______________________________
52. ______________________________

53. ______________________________

54. ______________________________

55. ______________________________

56. ______________________________

57. ______________________________

58. ______________________________

59. ______________________________

60. ______________________________

61. ______________________________

62. ______________________________

63. ______________________________

64. ______________________________

65. ______________________________

66. ______________________________

67. ______________________________

68. ______________________________

69. ______________________________

70. ______________________________

71. ______________________________

72. ______________________________

73. ______________________________

74. ______________________________

75. ______________________________

76. ______________________________

77. ______________________________

78. ______________________________

79. ______________________________

80. ____________________

81. ____________________

82. ____________________

83. ____________________

84. ____________________

85. ____________________

86. ____________________

87. ____________________

88. ____________________

89. ____________________

90. ____________________

91. ____________________

92. ____________________

93. ____________________

94. ____________________

95. ____________________

96. ____________________

97. ____________________

98. ____________________

99. ____________________

100. ____________________

101. ____________________

APPENDIX S

PRELIMINARY SUMMARY OF FINDINGS ACCOMPANYING QUESTIONNAIRE

IN A SEALED ENVELOPE

APPENDIX S

PRELIMINARY SUMMARY OF FINDINGS ACCOMPANYING QUESTIONNAIRE IN A SEALED ENVELOPE

Seventeen subjects were interviewed in one of two conditions while their facial expressions were recorded on videotape. The subjects then reviewed their own tapes and labeled their facial expressions in one of the following eight categories: Interest-Excitement, Enjoyment-Joy, Surprise-Startle, Distress-Anguish, Anger-Rage, Contempt-Disgust, Fear-Terror, and Shame-Humiliation. Few facial expressions were labeled in the latter two categories (Fear-Terror and Contempt-Disgust) and these were therefore eliminated from the study. Moreover, during the unstructured interview condition, subjects very seldom labeled the emotions of Anger-Rage, Contempt-Disgust, Fear-Terror, and Shame-Humiliation. Because of the small number of segments obrainable from the unstructured interview condition in these categories, a test of the effect of this treatment was not feasible and the design of the study was altered to exclude such a test.

One hundred and one segments of 5 seconds each were chosen from the interview tapes and edited in a random order. A ten second pause was placed between segments to allow raters time to record their responses. A second stimulus tape was then made which was an exact duplicate of the first, except that the speed of the segments was slowed to 1/5 normal speed.

Twenty-nine graduate students in the College of Education at Michigan State University were trained in identifying emotions from facial expressions. Each rater viewed the stimulus tape twice (Time 1 and Time 2), some seeing it at different speeds. Group 1 viewed the normal speed tape twice; Group 2 viewed the normal followed by the slow motion tape; Group 3 viewed slow motion followed by normal, and Group 4 viewed the slow motion tape twice. A minimum of one week elapsed between viewings.

It was found that spontaneous facial expressions could be accurately identified in each of the six categories. Differences in both number of facial expressions seen and accuracy of identification were related to the speed at which the videotape was shown. When the slow motion tape was seen at Time 1, accuracy of identification was improved at Time 2 (p less than .05). Moreover, there was an interaction effect between speed of tape and Time (T1 x T2) when looking at the overall performance in terms of number of affects recorded. The slow-fast group and the fast-slow group recorded significantly more affects than the other two groups (p less than .05).

The results of viewing facial expressions in slow motion were related to the concept of micromomentary facial expressions (MME's). MME's are facial expressions which occur in less than 1/5 second and which are thought to be related to affective problem areas (Haggard and Issacs, 1964). The current results indicate that if observers view facial expressions in slow motion at Time 1, then they become sensitized to MME's; at Time 2 they then record a greater number of facial expressions per segment and identify segments with greater accuracy than they had at Time 1. Consistent with this conclusion is the finding that the slow-fast and fast-slow groups saw more overall facial expressions than the fast-fast group. It is theorized that the aversiveness of the slow-slow condition caused this group's performance to be detrimentally effected. These results then indicate that speed of videotape has significant effects on both the number and the accuracy of rater's responses to spontaneous facial expressions of emotions.

APPENDIX T

POST HOC RATER QUESTIONNAIRE

Rater number______________

Group______________________

Rater Performance Scale

Instructions: A few months ago you participated in a study in which you identified facial expressions on videotape. In the items that follow, please circle the number that best corresponds to your feelings about various aspects of the study.

After you have completed this form, return it to me in the self-addressed envelope.

	Extremely	Moderately	Mildly	Neutral	Mildly	Moderately	Extremely	
	3	2	1	0	1	2	3	
While I rated the videotapes, I felt:								
1. Interested	3	2	1	0	1	2	3	Bored
2. Distressed	3	2	1	0	1	2	3	Contented
3. Confident	3	2	1	0	1	2	3	Unsure
4. Comfortable	3	2	1	0	1	2	3	Uncomfortable
5. Tired	3	2	1	0	1	2	3	Energetic
6. Relaxed								Tense
I thought the tapes themselves were:								
7. Easy to see	3	2	1	0	1	2	3	Hard to see
8. Of poor quality	3	2	1	0	1	2	3	Of good quality
9. Pleasant	3	2	1	0	1	2	3	Unpleasant
10. Hard to judge	3	2	1	0	1	2	3	East to judge
I think the entire study was								
11. Executed poorly	3	2	1	0	1	2	3	Executed well
12. Valuable	3	2	1	0	1	2	3	A waste of time

APPENDIX U

DATA MATRIX FOR ACCURACY DATA:

MEAN NUMBER OF RIGHT ANSWERS IN A CATEGORY

APPENDIX U

DATA MATRIX FOR ACCURACY DATA: MEAN NUMBER OF RIGHT ANSWERS IN A CATEGORY

Time 1	Time 2	R's	Cell Means at Presentation 1 (P_1)						Cell Means at Presentation 2 (P_2)					
			A1	A2	A3	A4	A5	A6	A1	A2	A3	A4	A5	A6
			Int	Joy	Sur	Dis	Ang	Con	Int	Joy	Sur	Dis	Ang	Con
Fast	Fast		10.37	13.62	3.75	7.49	4.62	4.50	11.74	12.00	4.12	6.87	4.87	3.75
	Slow		9.74	13.75	4.75	7.12	9.00	5.25	8.62	14.12	4.75	7.37	7.25	5.25
	Total		20.11	27.37	8.50	14.61	13.62	9.75	20.36	26.12	8.87	14.24	12.32	9.00
Slow	Fast		9.00	13.25	5.37	8.25	6.43	3.75	10.75	14.87	4.50	8.75	8.24	3.87
	Slow		9.00	12.40	5.20	7.00	6.60	5.80	11.00	12.80	5.20	6.60	6.80	5.60
	Total		18.00	25.65	10.57	15.25	13.03	9.55	21.75	27.67	9.70	15.35	15.04	9.47
Total	Fast		19.37	26.87	9.12	15.74	11.05	8.25	22.49	26.87	8.62	15.62	13.11	7.62
	Slow		18.74	26.15	9.95	14.12	15.60	11.05	19.62	26.92	9.95	13.97	14.05	10.85
	Total		38.11	53.02	19.07	29.86	26.65	20.30	42.11	53.79	18.57	29.59	27.16	18.47
			Overall Performance ($P_1 + P_2$)						Change in Performance ($P_1 - P_2$)					
Fast	Fast		22.12	25.63	7.87	14.37	9.50	8.25	-1.37	1.62	- .375	.625	- .25	.750
	Slow		18.37	27.87	9.50	14.50	16.25	10.50	1.12	- .37	0.0	-2.50	1.75	0.0
	Total		70.49	52.93	17.37	28.87	25.75	18.75	- .025	1.25	- .375	.37	1.30	.75
Slow	Fast		19.75	28.12	9.87	17.00	13.37	7.62	-1.75	-1.62	.875	- .50	-3.125	- .125
	Slow		20.00	25.20	10.50	13.60	13.40	11.40	-2.0	- .40	0.0	.40	- .20	.20
	Total		39.75	53.32	20.27	30.60	26.77	19.02	-2.17	-2.02	.875	- .10	-3.32	.08
Total	Fast		41.87	53.75	17.74	31.37	22.87	15.87	-3.12	0.0	.50	.125	-3.37	.63
	Slow		38.37	53.07	19.90	28.10	29.65	21.90	- .88	- .77	0.0	.15	1.55	.20
	Total		80.24	106.82	37.64	59.47	52.52	37.77	-4.00	- .77	.50	.275	-1.87	.83

APPENDIX V

DATA MATRIX FOR FREQUENCY DATA:
MEAN PERCENT OF ITEMS WITH MORE
THAN ONE ANSWER RECORDED

APPENDIX V

DATA MATRIX FOR FREQUENCY DATA: MEAN PERCENT OF ITEMS WITH MORE THAN ONE ANSWER RECORDED

Time 1	Time 2	R's	Cell Means at Presentation 1 P_1						Cell Means at Presentation 2 P_2					
			Int	Joy	Sur	Dis	Ang	Con	Int	Joy	Sur	Dis	Ang	Con
Fast	Fast		.095	.035	.160	.093	.047	.095	.023	.081	.125	.070	.117	.067
	Slow		.104	.202	.500	.235	.266	.279	.272	.308	.767	.350	.378	.281
	Total		.199	.237	.660	.328	.303	.374	.295	.389	.892	.420	.495	.348
Slow	Fast		.279	.347	.678	.389	.467	.432	.176	.193	.292	.250	.206	.228
	Slow		.259	.155	.514	.117	.266	.138	.107	.111	.238	.117	.126	.107
	Total		.538	.502	1.192	.506	.733	.570	.283	.304	.530	.367	.332	.335
Total	Fast		.374	.409	.838	.482	.514	.527	.199	.274	.417	.320	.323	.295
	Slow		.363	.357	1.014	.352	.532	.417	.578	.419	1.005	.467	.304	.388
	Total		.737	.766	1.852	.834	1.046	.944	.777	.693	1.422	.784	.827	.683
			Overall Performance $P_1 + P_2$						Change in Performance $P_1 - P_2$					
Fast	Fast		.119	.116	.285	.151	.164	.163	.072	-.046	.035	.010	-.070	.028
	Slow		.377	.510	1.267	.585	.645	.560	-.168	-.106	-.267	-.115	-.112	-.002
	Total		.496	.626	1.552	.736	.809	.723	-.096	-.152	-.232	-.105	-.182	.026
Slow	Fast		.455	.540	.970	.639	.674	.647	.103	.154	.386	.139	.261	.218
	Slow		.237	.267	.752	.235	.392	.246	.022	.044	.276	.000	.140	.031
	Total		.692	.807	.722	.874	1.066	.993	.125	.198	.662	.139	.401	.249
Total	Fast		.574	.656	1.255	.790	.838	.810	.175	.108	.421	.149	.191	.246
	Slow		.614	.777	.878	.820	1.037	.806	-.146	-.062	.009	-.115	.028	.029
	Total		1.188	1.433	2.133	1.61	1.875	1.616	.029	.046	.430	.034	.219	.275

APPENDIX W

DATA MATRIX FOR POST HOC RATER QUESTIONNAIRE

APPENDIX W

DATA MATRIX FOR POST HOC RATER QUESTIONNAIRE

Time 1	Time 2	Rater State of Mind						Tape Quality				Value of the Study	
		1	2	3	4	5	6	7	8	9	10	11	12
Fast	Fast	5.15	4.62	5.00	5.39	3.46	4.46	3.61	3.46	4.23	3.23	5.38	5.54
	Slow	5.58	4.50	4.92	5.17	3.67	5.33	4.00	3.58	4.58	2.25	5.33	5.41
Slow	Fast	6.00	5.17	5.08	6.00	3.92	5.75	4.58	3.91	4.66	2.75	5.67	6.17
	Slow	4.77	4.00	4.84	4.62	3.23	4.08	3.08	3.15	4.15	2.77	5.08	4.85