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ABSTRACT

The study attempted to determine whether deaf individuals could more accurately identify facial expressions than normal individuals. The 30 adult (mean age: 18 years) deaf subjects were asked to identify emotional states of photographed actors. Results generally indicated that deaf individuals are neither better nor worse at identifying emotional expressions than normal speaking and hearing individuals, though the six profoundly deaf subjects did score significantly lower than both partially deaf and normal hearers. There were no significant differences between scores of male and female deaf subjects. Deaf subjects, however, scored much lower than hearing subjects in identifying the emotion of disgust, often confusing it with the emotions of anger and sadness, a finding possibly explained by the nature of the sign language gesture for disgust. (DB)

The Ability of Deaf Individuals to Identify Facial Expressions

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1 Introduction

Since the time of Aristotle, scholars have been interested in the study of emotions. During the 1800s, Darwin began the scientific study of classifying emotional expressions. His work was later rediscovered and developed by two present day researchers: Ekman and Friesen. These scholars have studied facial expressions in great detail and suggest that six emotions--happiness, sadness, fear, anger, surprise, and disgust--can be reliably identified and are similarly expressed across cultures. Ekman and Friesen's findings have encouraged other scholars to look for relationships among different individuals and their ability to identify facial expressions. In short, an effort has been made to see if some people can more accurately identify facial expressions than others.

Studies to date have examined differences in ability between males and females, those with low and high IQ scores, and those who are mentally impaired. However, no one has examined the deaf population to see if they can identifying facial expressions more accurately than individuals with normal hearing. Are the deaf more perceptive, because they cannot rely on verbal cues? This study attempts to determine if deaf individuals more accurately identify facial expressions than normal hearing individuals.

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Literature Review

Communication researchers have long recognized the profound impact of nonverbal cues on human discourse. In fact, one researcher has estimated that 93% of the affect of a message is nonverbally transmitted (Mehrabian, 1968). Researchers have examined a variety of nonverbal factors in diverse contexts. Some have studied the controlling effect of kinesic cues on discourse. Kendon, for example, has suggested that during a conversation the speaker looks at the listener for cues on which to base future discourse behavior (Kendon, 1967). Should he continue speaking? Has the listener comprehended the message? And Woodall and Folger found that the speaker's hand gestures increase message retention by the listener (Woodall, 1985). Other researchers (Exline, 1972) have examined eye behavior in interaction. Exline's and Ellyson's studies of ROTC members of officer and enlisted rank showed that eye gaze can communicate power and status (Ellyson, 1973).

As a major communicative component in discourse, the face has received considerable attention in communication research. Mehrabian has even estimated that 55% of the affect of a message is communicated through facial expressions (Mehrabian, 1968). Since the publication in 1872 of Darwin's classic book, *The Expression of Emotion in Man and Animals*, scientists have been exploring the facial expressions of emotions (Goldstein, 1983). Shapiro, Foster, and Powell, for example, showed the importance of facial expressions during interaction (Shapiro, 1968). They took photographs of counselors who were selected a being high, medium, or low on empathy, genuiness, and warmth. The photos were presented so that subjects saw only the face, the lower body, or the entire body. The face proved to be the most important determinant in accurate judgments of counselor style.

Ekman and Friesen suggest that the face actually communicates three types of signals: static, slow, and rapid (Ekman and Friesen, 1975, p. 10 - 11). Static signals normally communicate information about a person's age, sex, and race. Slow signals, such as skin texture and wrinkles, alter gradually over times. Finally, rapid signals are examined during the study of emotions. Ekman and Friesen have studied facial expressions in great detail and suggest that six emotions--happiness, sadness, fear, anger, surprise, and disgust--can be reliably identified and are similarly expressed across cultures (Ekman and Friesen, 1975). A vocabulary of emotions was determined by showing subjects a picture of a face and then asking them to identify the expression. The six emotions were reported in every research study of this type (Ekman and Friesen, 1975, p. 22). In a study involving subjects from the United States, Brazil, Chile, Argentina, and Japan, Ekman found a high degree of agreement on the emotions being expressed (Ekman, 1978). In other words, the six emotions seem to have a similar meaning for a number of cultures.

Others have extended the work of Ekman using the same six emotions. Kirouac and Dore examined the effect of a subject's educational level on the subject's ability to identify facial expressions (Kirouac, 1985). They found that educational level did not affect the subjects ability to determine the emotions being sent. However, in an earlier study, Tagiuri asserted that the ability to judge facial expressions is dependent upon intelligence (Tagiuri, 1969). The more intelligent a person, the more likely he will be able to identify the emotion being sent. In additional studies, Toner and Gates have examined the effect of sex and the identification of facial expressions and found that women are better perceivers than men (Toner, 1985).

Several more variables that may affect a person's ability to judge facial expressions must also be considered. Burgoon and Saine suggest that social context, physical environment, people variables, and the nature of the emotion being sent affect the accuracy of judging expressions (Burgoon, 1978).

Like communication researchers, researchers in the field of communication disorders have recognized the importance of nonverbal behavior. In 1973, Egolf and Chester suggested nonverbal areas in which to conduct research (Egolf and Chester, 1973). To date, several authors have begun to examine the differences between the communication disorders and speaking population. For instance, Light, Collier, and Parnes analyzed nonverbal variables in communication interactions of physically disabled children and their primary caregivers (Light, 1985). The researchers coded the frequency of nonverbal variables like eye gaze, facial expression, and gestures. They found that the children gained and clarified information by using their communication boards. Confirmations and denials were communicated by vocalization and gestures. Most recently, Egolf and Corder found that nonspeaking, cerebral palsied individuals did not identify facial expressions as well as normal speakers (Egolf and Corder, 1986). It seems likely that the nonspeakers were unable to identify the expressions, because of their limited interaction experience with unfamiliar individuals.

With the exception of one study (Egolf and Corder, 1986), research concerning the perception of emotional expression has centered on normal hearing and speaking individuals. As a result, the nature of the hearing impaired's perception skills is not known. We might speculate that those skills might lie at either end of a continuum. At one pole, we might anticipate deficits in the hearing impaired's abilities, because they must rely on hand gestures rather than spoken words. Therefore, they concentrate more on the movement of the hands and arms than on the face. At the opposite end of the continuum, it is conceivable that the hearing impaired's ability to interpret facial cues is heightened as a mechanism by which to compensate for his inability to speak as normal speakers. Submissive people sometimes become better perceivers. Because the deaf individual cannot naturally hear, he may over-compensate by more intently watching what others are saying.

3

Research Questions

The purpose of this study was to find answers to the following questions:

1. How accurate are the deaf in perceiving emotional expressions in comparison to individuals with normal hearing levels?

2. What confusions do the deaf make when they incorrectly identify emotions? For example, if anger is shown, do the deaf perceive this emotion as sadness, fear, surprise, disgust, or happiness?

3. How do the deaf confusions compare with the confusions of individuals with normal hearing levels?

4. Are there significant differences between the scores of the deaf females and deaf males?

4 Method

4.1 Instrument

The instrument that was used for this experiment was the same instrument used by Ekman and Friesen. Briefly, Ekman and Friesen used specially prepared facial photographs, where actors posed for six emotional expressions (i.e., happiness, sadness, fear, anger, surprise, and disgust). The actors do not pose how they would "feel" if they were experiencing one of these emotions. Rather, the actor's poses are based on a detailed Atlas of emotional expressions. In short, the Atlas directs the model to do certain things with the eyes, brows, and so on.

4.2 Subjects

Ninety-one subjects from two groups participated in this study. Two groups comprised of the following subjects were used:

- **Group 1:** Thirty adult (mean age of 18), reading, normal intelligence, deaf individuals were asked to participate.
- **Group 2:** Sixty-one college undergraduates were included as a control group. The students were included to represent normal speakers and hearers.

4.3 Experimental Process

Testing Group 1

A couple of weeks before the experiment began, subjects were asked to volunteer. They were told what the study would be about and that they would each receive a $ .50 food coupon for participating.

On the day of the experiment, each subject was tested individually and away from other subjects to reduce any pre-test sensitization that might occur. Each subject was handed a written list of instructions to be read, before the testing began. The instructions were as follows:

1. I will show you 30 pictures, one at a time.
2. Look at each person.
3. Think of how they are feeling. Are they feeling **happy**, **sad**, **frightened**, **angry**, **surprised**, or **disgusted**?
4. Please point to the word that shows how they are feeling.
5. Thank you!

After the subject read the instructions, they were handed a definition sheet that contained the meaning of each word. Below is a copy of how each word was defined.

1. Happy = glad, cheerful, joy, smiling

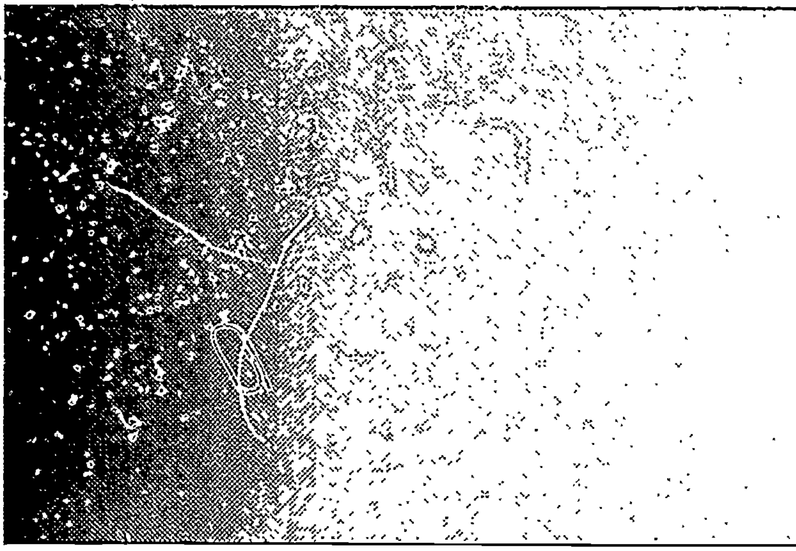
2. Sad = feeling grey, feeling blue, unhappy
3. Fear = afraid, fright, anxious, nervous
4. Anger = mad
5. Surprise = amaze, startle, awe
6. Disgust = not like, repel, sick of

After both the instructions and definitions were read, subjects were shown six cards placed in front of them. These cards contained sign language for the six emotions being expressed. Each subject was asked, nonverbally, to point to the response they thought was best.

Subjects were then shown 30, randomly arranged photographs of the six emotions (i.e., happiness, sadness, fear, anger, surprise, and disgust) and ask to point to the card that contained the emotion they thought was being expressed. Subjects had as long as they needed to decide upon the emotion being expressed, but could choose only one of the six emotions. The experimenter then recorded their responses on a score sheet. Finally, after the experiment was completed, each subject received their food coupon.

Testing Group 2

Subjects from **Group 2** were tested in pairs. They were shown 30, randomly arranged photographs of the six emotions. They had as long as they needed to respond, but could choose only one of the six emotions. After each subject completed identifying all thirty photographs, the pictures were reshuffled. This was done to control for ordering and any expectancy effects.



5 Results

5.1 Accuracy Scores

For each subject and each group an accuracy score was computed. The highest possible score was 30--equivalent to identifying correctly each of the 30 emotions presented. Group means, standard deviations, and ranges appear in Table 5.1.

Table 5-1: Means, Standard Deviations, and Ranges for Each Group

Group	**Mean**	**S. D.**	**Range** *(0 - 30)*
Deaf	22.67	3.25	(16 - 28)
Normal	23.85	2.39	(19 - 29)

Data show that the deaf subjects had a slightly lower mean than individuals with normal hearing. An independent t-test was conducted and it was determined that the differences were *not* statistically significant ($p > .05$).

After examining the data, it appeared that subjects who were profoundly deaf (n = 24) (i.e., *Better Ear Average (BEA)* score of 90 db or above) scored differently than those with scores less than 90 db (n = 6). Table 5.1 contains the means, standard deviations, and ranges for these two groups.

Table 5-2: Means, Standard Deviations, and Ranges for Deaf Groups

Group	Mean	S. D.	Range *(0 to 30)*
Below 90 db	25.83	.75	(25 - 27)
90 db +	21.88	3.17	(16 - 28)

When those who were profoundly deaf (i.e., *(BEA)* 90 db or above) were compared to the normal group, a t-test revealed a statistically significant difference between the two groups ($p < .05$). Therefore, the profoundly deaf subjects did not identify the 30 facial expressions as well as those with normal hearing.

5.2 Accuracy Scores for Each Emotion

Table 5.2 list the emotions from most to least accurately perceived.[1]

Table 5-3: Most to Least Accurately Perceived Emotions

Deaf		Normal	
Happiness	(99.0)	Happiness	(99.7)
Anger	(81.3)	Surprise	(86.1)
Sadness	(78.7)	Sadness	(76.3)
Surprise	(75.3)	Fear	(72.2)
Fear	(68.7)	Anger	(72.1)
Disgust	(49.3)	Disgust	(71.0)

[1]Percentage of correct identification are in the parentheses.

Notable in this table is the deaf individuals' agreement with normal hearers on happiness, sadness, and disgust, the most, second most, and least successfully identified emotions. The only significant difference with the emotion of disgust.

5.3 Most Common Confusions

Table 5.3 show the most c mmon confusions for each emotion for both groups when the identification was incorrect.[2]

Table 5-4: Highest Confus ons for Each Group

Emotion	Normal	Deaf
Happiness	*	*
Sadness	Disgust	Fear
Fear	Surprise	Surprise
Anger	Disgust	Disgust
Surprise	Fear	Fear
Disgust	Anger	Anger

The data show that the deaf subjects were not dramatically different than normal hearers. In fact, their highest confusions agreed with normals on five of the six emotions (happiness, fear, anger, surprise, and disgust).

[2]The symbol "*" indicates that there is less than 1% confusion.

5.4 Deaf Males Versus Deaf Females

Females scored slightly better (mean = 23.56, S.D. = 2.73) than did males (mean = 21.64, S.D. = 3.59), but the results were not statistically significant ($p > .1$).

6

Discussion

While the deaf subjects scored slightly lower than subjects with normal hearing and speaking abilities, these differences were not statistically significant. In addition, the *most to least accurately perceived emotional rankings* and *highest confusions* give support to the fact that the deaf subjects were not dramatically different than normal hearing and speaking individuals. In short, they were almost identical.

In the same vain, the scores of the male and female deaf subjects were not statistically different. These scores seem to contradict earlier research by Toner and Gates (1985).

The only major difference between the two groups was with the ability to identify the emotion *disgust*. The deaf subjects scored much lower, often confusing the emotions anger and sadness. How is this possible? The most logical reason is that perhaps some of the deaf children did not understand the meaning of the word "disgust." The sign-language gesture for disgust is similar to "don't like" or "repel," which could have been mistaken for anger and sadness.

The important difference among deaf individuals is that those who are profoundly deaf (BEA >= 90 db) scored significantly lower than those subjects who had BEA averages lower than 90 db. Although there were only six subjects who fell into the lower than 90 db range, they scored much better than did the remaining subjects. Perhaps the reason for this is that deaf subjects who have partial speaking ability watch lips and face of their conversation partners. Because they must concentrate intently, perhaps they have developed hightened perceptual capabilities. The remaining individuals may concentrate more on hand and arm gestures for their interaction cues, thus paying less attention to the face.

It is important to note that the accuracy scores and confusions followed, in general, those found by Ekman (1978, p. 102-103). The ranges of the percentage of correct responses for the various cultures follow each of the emotions: happiness (95-100), disgust (90-97), surprise (87-100), sadness (59-88), anger (67-94), and fear (54-85). When the groups used in this study are compared to the groups used by Ekman, several similarities exist. For example, deaf subjects were able to identify clearly happiness, sadness, anger, and fear when compared to the subjects used by Ekman. However, normal speaking and hearing individuals scored *identically*. The implication is that the deaf individual's results become more significant, because normal speakers scored the same as did the deaf individuals.

Two methodological limitations of this study must be noted. First, photographs were used that contained the expression of the six emotions. Knapp (1978) has asserted that the means of expression--live faces, still photographs, drawings, sketches, video tapes, or films--may influence the results obtained. For example, using a filmed expression allows a viewer to decipher permanent facial features not detected by a still photograph. Second, the means of recording subject's responses may affect the results. For example, open ended and forced choice questions may lead to different results and conclusions.

7

Summary

The overall conclusion of this study is that deaf individuals are not better and are not worse at identifying emotional expressions than normal speaking and hearing individuals. Each type of data analysis conducted supports this conclusion. In addition, deaf subjects are closely related to normal speakers and hearers, when the results are compared to Ekman's work. Therefore, it seems that, although deaf individuals are impaired in their hearing, they are not impaired in their ability to identify facial expressions. It was thought that they might even have a heightened perceptual capability, however, the data do not support this conclusion.

Data do, however, show significant differences between profoundly deaf individuals and those who are partially deaf. The subjects who are profoundly deaf do indeed score lower than both partially deaf and normal hearers. Perhaps, those individuals who can hear are most perceptive of facial expressions, because they must concentrate on the face for interpersonal interactions.

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