Neuropsychosocial Factors in Emotion Recognition: Facial Expressions

It has often been said that the eyes are the "window to the soul." This statement may be carried to a logical assumption that not only the eyes but the entire face may reflect the "hidden" emotions of the individual. With this assumption in mind, this paper will describe the various theories subsumed within the rubric of emotion recognition from the fields of social psychology and human neuropsychology. In deference to the emphasis of this course, the opening sections of this paper will detail social psychological theories behind the communication of emotions. Later sections, will emphasize biological correlates and etiological factors in the recognition of facial expressions. It is hoped that this paper will prove useful to clinicians, specifically individuals exposed to neurologically complicated populations, in the diagnosis of possible neurological insult. For those not exposed to the above aforementioned populations, hopefully this document will prove interesting enough to stave off boredom.

Without doubt, the crown jewel of nonverbal communication is the facial expressions channel. This aspect of communication has the longest history of research, beginning with Charles Darwin's (1898) book, *The Expression of the Emotions in Man and Animals*. Darwin's research on facial expressions has had a major impact on the field in many areas; foremost, his belief that the primary emotions conveyed by the face are universal. Given Darwin's interest in evolution, it is not surprising that he believed nonverbal forms of communication to be "species-specific" and not "culture-specific." He stated that facial expressions were vestiges of once-useful physiological reactions. Darwin enunciated a number of general principles which he thought guided the evolution of expressions. The first of these is the principle of serviceable associated habits. He states in his 1898 text, "certain complex actions are of direct or indirect service under certain states of mind...whenever the same state of mind is induced...there is a tendency for the same movements to be performed, though they may not then be of the least use." One of his examples of this principle include the lifting of a forepaw by many dogs when they are attending (a gesture which could be preparatory to cautious approach). His second principle is that of antithesis: "when a direct opposite state of mind is induced, there is a strong and involuntary tendency to the performance of movements of a directly opposite nature." Examples of this are the position of a dog's tail, or of many animals' ears, which are held up when the animal can be presumed to be in a positive emotional state and down when it is in a negative one. His third principle was that of direct action of the nervous system. He writes, "Of course, every movement we make is determined by the constitution of the nervous system; but actions performed in obedience to the will, or through habit, or through the principle of antithesis are here excluded." Beyond his three principles, Darwin placed considerable emphasis on the analysis of the action of different muscle groups in assessing expression.

With these esteemed origins, the study of emotional expression was "off and running", but the "ball" was not picked up until the mid-1960s with the work of researchers on the "universality" of human expressions. Ekman and Friesen (1969) hypothesized that the universals of facial expression are to be found in the relationship between distinctive patterns of the facial muscles and particular emotions (happiness, sadness, anger, fear, surprise, disgust, interest. See pg.1 of Figures section.). They suggested that cultural differences would be seen in some of the stimuli, which through learning become established as elicitors of particular emotions, in the rules for

controlling facial behavior in particular social settings, and in many of the consequences of emotional arousal. In order to test the assumption of "universality", Ekman and Friesen (1971) traveled to the regions of New Guinea and tested the Fore tribe, a preliterate society, with emotionally arousing stimuli. The Fore members were to replicate facial expressions that were described by a situational story. The faces judged in literate cultures as showing particular emotions were comparably judged by people from a preliterate culture who had minimal opportunity to have learned to recognize uniquely Western facial expressions.

Veridical / Deceptive Communication & Facial Feedback:

According to theorists, a facial expression in response to an emotional stimulus may have three consequences for social interaction: veridical communication, deceptive communication, and emotional regulation through facial feedback.

As mentioned above in the introduction, Darwin, in addition to relatively recent day researchers (Eibl-Eibesfeldt, 1973), have argued that human facial musculature and expression have evolved to communicate information to receivers in order to change their behavior. For example, if an animal shows an angry or a threatening face, causing other animals to act submissively, the sending animal has gained the advantage of winning an antagonistic encounter without the energy expenditure or risk of an actual fight.

Research in the 1970s has documented that facial expressions of emotions are stereotyped behavior patterns that are probably innately communicative. The ability to send and understand a small number of pure emotional expressions seems to be universal (Eibl-Eibesfeldt, 1973; Ekman, 1973). The ability also seems to follow a fixed developmental sequence resistant to developmental disruptions (Eibl-Eibesfeldt, 1973). If human facial expressions of emotion evolved for the sake of communication, one might expect that for evolutionary reasons they would be most informative about the senders' intentions or emotional states when the senders were in the presence of others. This hypothesis follows the social nature of communication. Among out evolutionary ancestors, senders needed recipients before they gained an advantage from emotional displays. This argument is implicit in the evolution literature of the communication value of behavior (MacKay, 1972).

Of course, among humans facial expressions of emotion are also used to deceive, to provide an audience with misleading information about senders' emotional states. For example, the primate that simulates a threat face without being angry gains the same benefits from its display as the primate that is actually angry. Emotional deception is also an act most likely to have occurred in the presence of another throughout human evolution and throughout any individual's life. In addition, because of display rules and other social norms, senders often have heightened motivation to deceive facially in the presence of another (Ekman, 1973). Display rules refer to socially learned rules that prescribe procedures for the management of affect displays in various social settings and circumstances (Ekman & Friesen, 1969).
Data dealing with the expression of emotions in the presence of others indicates contradictory results regarding the heightened use of emotional displays. Brightman and his colleagues (Brightman et al., 1975) have found data consistent with heightened emotional expressiveness in the presence of others. Subjects in their experiments ate and evaluated pleasantly sweet and

horribly salty sandwiches. Subjects' facial expressions corresponded to their evaluations of the sandwiches only when they ate them in the presence of the other subjects. On the other hand, Ekman and Friesen (Ekman, 1973) found opposite results. For example, Ekman found that both American and Japanese students who watched stress films showed the same facial expressions of distaste when they were alone. When they answered questions about new stress films in the presence of others, however, the Japanese subjects inhibited their negative facial expressions and simulated positive ones. This research, then, leaves unclear what effects a potential audience has on emotional expressions.

Another hypothesized function of emotional expressions is to provide the senders themselves with information about the emotion they are feeling; a useful mnemonic for this theory is to think of the obvious connection to the James-Lange theory of emotion. This function was initially described by Darwin (1898) and has recently been dubbed the facial feedback hypothesis (Buck, 1980). In its simplest form this hypothesis states that feedback from the facial muscles is important in the subjective experience of emotion. The basic phenomenon of emotional expression, congruence between spontaneous expressions and underlying emotions, is of course consistent with the facial feedback hypothesis. The strongest evidence for the facial feedback hypothesis to date comes from research by Lanzetta et al. (1976). They found that subjects who attempted to hide the painfulness of the shock they were enduring showed decreases in both skin conductance and subjective ratings of pain, and those who attempted to pose the expression of intense pain showed increases on both measures.

To wrap-up the social factors impinging upon emotion recognition, but not totally abandoning the subject, are the following summarized factors: (a) facial expressions reflect emotional stimuli when senders are not trying to hide their emotions; (b) senders can use display rules to hide effectively the emotions they are experiencing; (c) although emotional deception is effective, it is not perfect, in that observers can still guess the underlying emotion at greater than chance accuracy; (d) senders who are best at communicating their emotions with spontaneous facial expressions are worst at hiding their emotions with posed expressions; and (e) nonverbal skill is not general across spontaneous and posed expressions, although it may be general across different expressions and eliciting stimuli (Aronson, E. et al., 1994).

Human Neuropsychological Factors in Emotion Recognition:

Evidence indicates that recognizing other people's emotional expressions and producing our own expressions involve particular neural mechanisms. This factor was elucidated earlier by Darwin, but recently several studies by Bryden et al. (1979) have found that the right hemisphere plays a more important role than the left hemisphere in comprehension of emotion. Ley and Bryden (1979) prepared cartoon drawings of five different people, each displaying one of five facial expressions, ranging from negative to neutral to positive. Using a tachistoscope (an apparatus for differentially exposing visual fields, and thus different cerebral hemispheres), they showed these drawings briefly, one at a time. When the experimenters showed the subjects neutral or mild expressions, the hemispheres performed approximately the same. However, when the experimenters showed the subject strong emotional expressions, the right hemispheres judged them more accurately.

When people show emotions utilizing their facial musculature, the left side of the face usually makes a more intense expression. For example, Sackheim and Gur (1978) cut photographs of people who were posing emotions into right and left halves, prepared mirror images of each of them, and pasted them together. They found that the left halves were more expressive than the right ones. This has been surmised to be representative of the right hemisphere's control of left sided facial musculature. Interestingly, the asymmetry of the face is attended to on the right side of an elicitor. For example, if the right hemisphere is more attendant to emotions then the left visual field will pick up the right side of an elicitor's face. This has not been investigated to my knowledge, and this factor could impact how facial asymmetry effects emotion recognition.

This last section will utilize the evidence from brain injured individuals in investigating the involvement of the right hemisphere in facially relevant emotional information. Buck and Duffy (1980) found deficits in emotional expression in people with right hemisphere brain damage. The investigators showed slides designed to elicit expressions of emotions to patients with damage to the right or left hemisphere. For example, when they showed a picture of a starving child and a crying woman, they found that people with right damage showed fewer facial expressions of emotion. This factor supports observational evidence that right hemisphere damaged individuals exhibit a "flattening" of affect; whereas, left damaged individuals exhibit a more pronounced emotional lability (Feyereisen, 1986).

Blonder et al. (1991) found that patients with right hemisphere lesions had no difficulty making emotional judgments but were severely impaired in judging the emotions conveyed by facial expressions or hand gestures. Patients with left hemispheric damage had no difficulty in making these recognitions. Lastly, Bowers et al. (1991) found that patients with right hemisphere damage had difficulty producing or describing mental images of facial expressions of emotions, but had no difficulty in producing images of neutral content.

Many factors impinge upon the ability of an individual to identify emotional expression. Social factors, such as deception, and display rules, affect one's perception of another's emotional state. These social factors are intertwined with the neural mechanisms underlying the perception of emotional content. I would surmise that both are not mutually exclusive but are reliant upon each other in the effective communication and detection of emotional states.

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