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An exploratory study on the discrimination of emotion from ocular cues and on beliefs regarding the eye as an indicator and communicator of emotion

Smith, Mary Christine, Ph.D.
The Ohio State University, 1994
AN EXPLORATORY STUDY ON THE DISCRIMINATION OF EMOTION FROM OCULAR CUES AND ON BELIEFS REGARDING THE EYE AS AN INDICATOR AND COMMUNICATOR OF EMOTION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By
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The Ohio State University
1994

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In Loving Memory of My Father
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CHAPTER I

INTRODUCTION

Look into a person's pupils; he cannot hide himself
(Confucius, 551-478 B.C.)

According to a well-known saying, the eyes are the windows to the soul. The eye and its significance as an indicator and communicator of emotion has long been the subject of scientific research and curious beliefs documented by such authors as Johnson (1993), Kleinke (1986), Grumet (1983), Donaldson-Evans (1980), and Gifford (1958). Frith (1989), in discussing the importance of gaze in communication, suggests that "by using eye contact we try to read what someone else might think or wish" (p. 143). Much of the aforementioned literature also recognizes the communication of emotions through the eye. As Heider (1958) succinctly put it: "Communion through the eyes creates such an intense interpersonal experience that usually only when a deep intimacy is sought is the mutual perception maintained. More typically, one of them breaks the connection by gazing away
Beliefs concerning the power of the eye and its role in communication have influenced the world for ages and affect cognition and behavior even today.

The topic of this research concerns the relation between developmental abilities to discriminate and perceive emotion from ocular cues, and beliefs about the eye as an indicator and communicator of emotion. Beliefs were also investigated concerning a particular process of communicating emotion through the eyes. In particular, subjects were asked if they believed different emotions are derived from the eye, in the form of emissions. There is current evidence that children and adults believe in extramission via the eyes (Cottrell, 1992; Smith, 1993; Winer, Smith and Cottrell, 1993).

One of the main areas of investigation in the present research also involves whether children and adults can perceive or discriminate emotions involving cues from the eye (photographs including the eyes/lids, brow and root of the nose). Subjects were shown pictures of eyes representing four different emotions (happiness, sadness, anger, fear), and were required to match a particular emotion to the specific pair of eyes. A major question was whether developmental trends in the perception of emotion, through the
discrimination of different pairs of eyes, was revealed across the four age groups that were tested. That is, were older subjects better able to discriminate emotion in the eyes than younger subjects?

There has been considerable research on the development of the ability to perceive emotions from faces. For example, Ekman (1971) has demonstrated that certain basic universal facial expressions can be identified. Moreover, current research from Kestenbaum (1992) continues Ekman's research but indicates that individuals were also accurate in facial discrimination when focusing more discretely on one feature over another, rather than more globally. However, in most studies, investigators have generally not examined specific facial features and their contribution to the evaluation of emotional expression. By contrast, a significant focus of this study entailed whether children and adults could perceive or discriminate emotions involving cues specifically from features of the ocular area alone.

While one facet of this study deals with the ability to perceive or discriminate emotions from the eye, another area explores children and adults' beliefs about the eyes as indicators/communicators of emotion. For example, subjects
were asked questions such as, "Do you believe that you can tell if someone is angry (sad, happy, afraid) by looking at that person’s eyes and no other parts of the face?" Since such questions did not include facial cues to assist the subjects, subjects had to rely on what they knew or believed about eyes as "barometers of emotion". Other questions probed further to determine what is it about the eye that suggests a particular emotion to the subject. For example, is it the shape, size, or color that prompts the subject to identify some specific emotion?

Since the majority of questions explored subjects’ beliefs regarding the eye as an indicator and communicator of emotion, the belief component of the study relied heavily on the area of metacognition. The specific area of metacognition pertinent to this research includes the act of thinking about beliefs and perceptions. One such metacognitive system is referred to as theory of mind (Flavell, 1986) and it refers to a system of inferences about the self and other’s perceptions, beliefs, and knowledge. O’Neill and Gopnick (1991) have described theory of mind as “our commonsense understanding of how our own minds and the minds of others work” (page 390).
The first issue described in this study involves whether children and adults perceive emotion from ocular cues. The second issue concerns beliefs regarding the perception of emotion from the eye, by children and adults. One question which emerged concerns the relationship between the perception of emotion from the eyes and beliefs about such perception. Does the ability to discriminate develop at a different pace from developmental belief states about the eyes? Similarly, does the discrimination precede beliefs about the eyes and emotions, developmentally?

Another related question involves whether the experience of perception of emotion affects beliefs regarding the role of the eye as an indicator and communicator of emotion. Specifically, with experience in the perception of emotion from ocular cues, would the subject's responses to questions about the eye change? This was investigated by manipulating the order of the perception of emotion questions.

In one condition the perception questions followed belief questions; in the second condition, the perception questions were asked first. When perception of emotion questions preceded the others, it was hypothesized that there would be a greater number of affirmative responses to belief
questions. The experience of perceiving was expected to result in the creation of a belief system regarding the eye as an indicator of emotion. The act of perceiving emotions from ocular cues was expected to create the belief that emotion is communicated via the eye.

The final area of research involved the study of beliefs in a specific process or mechanism by which emotions might be communicated. In this study, children and adults were questioned regarding whether they believe that emotion actually comes out of the eye. That is, does emotion travel out of the eye in the form of rays, waves, energy, or power? To examine this question, subjects were asked if something comes out of the eye such as anger or love in the form of some type of rays, waves, energy, or power that the subject feels.

This area of research derived from other studies which indicated that children and adults subscribe to the belief that there are emissions from the eye (Cottrell, 1992; Winer, Smith, and Cottrell, 1993). Such belief has been shown to occur in different domains. For example, Winer, Smith and Cottrell (1993) reported that children believed something comes out of the eyes during the act of vision. These
authors also found such beliefs in visual extramission decreased with age.

The belief in extramission during the act of vision is only one example of the belief that something comes out of the eyes (Cottrell, 1992; Smith, 1993; Winer, Smith, and Cottrell, 1993). Winer, Smith, and Cottrell (1993) also found extramission beliefs in other domains. Specifically, they found that children and adults believed that the looks of other people and some animals could be felt. This belief in feeling the stares of another also suggested a belief in something coming out of the eyes which could be felt, and the belief in feeling the stares of another increased with age, in contrast to extramission beliefs, noted above, which decreased developmentally.

In summary, studies in this dissertation concern the relationship between the ability to discriminate and perceive emotion from ocular cues, and beliefs about the eye as an indicator and communicator of emotion, as children develop. Beliefs related to the particular process of communicating emotion through the eyes was also investigated.
CHAPTER II

LITERATURE REVIEW

As mentioned in the introduction there were four major questions of this research. The first question involved the perception of emotion asking children and adults to discriminate between four basic emotions (happiness, anger, sadness, fear) by using only ocular cues. The second question asked children and adults what they believed about the eyes as indicators or communicators of emotion. The third question compared the results of the first two questions by asking about whether giving children and adults experience in the discrimination of emotion utilizing only an ocular cue has significant impact on their beliefs? Finally, the fourth question queried children and adults regarding a specific process or mechanism involved in the transmission of emotion.

Evidence from several diverse sources contribute to studying the questions involved in this research. Specifically, superstitions regarding the eye, the extramission
theory of visual perception, ethology and neuropsychology, linguistic and historical trends, beliefs from alternative medicine and current psychological research provide the basis of the present study.

In the review that follows I will present the following areas of research suggesting the importance of gaze and the concept of the eye as a communicator of emotion. First, as background, I will examine the history of the evil eye describing ancient beliefs in the power of the eye of both humans and animals. The literature on the evil eye emphasizes the power of the eye as a communicator, dealing as well with the process or mechanism by emotions are communicated. The process of communication involved in the evil eye is extramission in which something comes out of the eye and strikes the objects of a gaze.

The literature on the evil eye will be followed by examples of cultural-linguistic references relating to the importance of gaze in communication and the eye as an indicator and communicator of emotion. This body of literature suggests an implicit belief that something goes out of the eyes much like that of the extramission theory of visual perception. The emotion most commonly discussed in such
literature is that of love. Specifically, looks of love have been thought to kindle the fires of the soul. Metaphors depict the extramission of emotion, with eyes as archers, shooting arrows in order to inspire love in the beholder (Donaldson-Evans, 1980). In numerous examples of romance literature the eyes are portrayed as having the ability to communicate by the emission of emotion, similar to ancient theories of visual perception.

In the next section, scientific theories of visual perception will be reviewed relating specifically to the extramission theory. I will then briefly introduce the ethological perspectives, focusing on the adaptive significance of the eye and gaze in the nonverbal communication and survival of man and animal. Much of the ethological literature also emphasizes the eye as a communicator of emotion across numerous animal species. Note that the topic of this research and the literature reviewed in the above areas is heavily reliant on Cottrell (1992), Smith (1993) and Winer, Smith, and Cottrell (1993) as the current study extends their prior research.

In addition to early beliefs in a sense of power ascribed to the eye as a communicator, as well as the eye's
adaptive significance, the eye has also been viewed as a possible indicator of the internal states of another person or animal. A major issue in this investigation is the question of the differentiation of beliefs regarding the eye as a determinant of internal states and emotion. In examining this question several current areas of interest will be addressed. First, I will discuss the area of alternative medicine which places particular emphasis on the eye as a determinant of internal states, personality characteristics, and health. Then, because I am interested in developmental beliefs regarding the eye, I will briefly discuss the role of theory of mind in distinguishing between beliefs about the eye versus the actual perception of emotion. Finally, in addressing the question of whether or not subjects can actually determine an emotion by looking at the eyes, I will turn to current research on the understanding of facial perception of emotion. In conclusion, current psychological research leading to the subject of this proposal will be reviewed. The last section will be heavily reliant on implications of the importance of the eye and gaze in infancy, as well as, the research of Smith (1993) and Winer, Smith, and Cottrell (1993).
The History of the evil eye

Pervasive beliefs regarding the power of the eye have an extensive cultural-linguistic heritage and are prevalent throughout ancient literature. Gifford (1958) and Elworthy (1895/1989) document one such pervasive belief in the power of the eye to cast evil. For example, the ancients held widespread beliefs about the power of the eye to bewitch or destroy those who are the recipient of one's gaze. Moreover, many relatively modern cultures or societies still maintain a belief in the evil eye. Roberts (1976), in a cross-cultural analysis of two hundred past and present societies, found relatively recent evidence indicating that evil eye beliefs still exist in sixty-seven cultures.

By far the most revered, the most universal, the most prevalent of such references to the eye is the occult superstitions that the eye is capable of projecting "the malignity of it owner", and of inflicting an injury wherever its gaze happens to fall (Gifford, 1958). Animals as well as people were believed to have powers corresponding to the evil eye.

One such reference to the evil eye was discussed by Pliny the Elder (Gaius Plinius Secundus, 23/24-79 A. D.), a Roman scholar who authored a 36-volume encyclopedia called
the Natural History, discussing Evil Eye beliefs in several pages of his text (Smith, 1993). In particular, descriptions of beliefs regarding the communicative power of the eyes of several animals such as wolves, hyenas, and goats are prevalent in the specific volume on animals. We are told the eyes of wolves are harmful to people, and if "they look at a man before he sees them, it temporarily deprives them of utterance" (VIII, XXXIV, 80-81). Specifically, the hyena is attributed with having "certain magic arts by which it causes every animal at which it gazes three times to stand rooted to the spot" (VIII, XLIV, 106). The eyes of night-roaming animals such as cats shine and flash in the dark so that one cannot look at them, and those of the wild-goat and the wolf gleam and shoot out light. (XI, LV, 151). Many of Pliny's descriptions can be looked upon as a combination of both the theory of extramission with the concept of the Evil Eye.

Pliny also attributed several more mysterious creatures with the power of the evil eye. For example, he makes reference to an Ethiopian animal of moderate size, sluggish movement, and a heavy head bent to the earth, known as a catoblepas and which could destroy with a glance. Pliny also mentions a serpent found in Libia, called a basilisk, about
twelve fingers in length, with a white spot on its head, which moved with head held upright, and which was also capable of killing with its eyes (Smith, 1993). Specifically, the mere glance of the basilisk was so deadly that when reflected back by a mirror it could kill the animal itself.

References to the power of the eyes of animals are expressed elsewhere by Roger Bacon (Smith, 1993). Bacon (1214-1294) relates that Alexander the Great once attacked a city which was defended by a basilisk placed on the city wall. Acting upon the advise of Aristotle, the philosopher, Alexander used large polished surfaces to reflect the poisonous glance and thus destroyed the serpent with its own venom. Modern commentators suggest that the catoblepas was an antelope gnu, and the basilisk was the hooded cobra (Gifford, 1958).

In the seventeenth century, Thomas Browne (1605-1682) also spoke of the evil eye in the form of the basilisk:

"That his venenation shooteth from the eye, and that this way a Basilisk may empoison, although thus much be not agreed upon by Authors, some imputing it unto the breath, others unto the bite, it is not a thing impossible. For eyes receive offensive impressions from their objects, and may have influences destructive to each other...thus sore eyes affect those which are sound, and themselves
also by reflection, as will happen to an inflamed eye that beholds itself long in a Glass; thus is fascination made out, and thus also it is not impossible, what is affirmed of this animal, the visible rays of their eyes carrying forth the subtlest portion of their poison, which received by the eye of man or beast, infecteth first the brain, and is from thence communicated unto the heart" (cited in Gifford, p. 8).

This literature, therefore, relating ancient superstitions of the evil eye suggests a significance and dominance of the eye as a communicator. In addition, such literature implicitly suggests that something emanates from the eye as a means of communication. Emanations from the eye relate to the question in this research asking about the specific process involved in the communication of emotion. For example, does something come out of the eyes during the communication of emotion? Let us now look at a another body of literature suggesting eye emissions resulting in more positive consequences.

**Linguistic Influences on Beliefs**

The belief system involved in notions regarding the eye as an indicator and communicator of emotion is likely influenced by a number of quite diverse literary references as well as every-day linguistic expressions. Linguistic
reinforcement may in fact be one of the sources of such beliefs. Generally, some such references describe the eyes as exposing an internal state or refer to the eyes as communicators. Several examples of such references are found in Bartlett (1965) and Kleinke (1986). For example:

These lovely lamps, these windows of the soul.  
(Du Bartas cited in Bartlett, 1965)

The light of the body is in the eye.  
(Matthew cited in Bartlett, 1965)

Soft eyes look'd love to eyes which spake again  
(Lord Byron cited in Bartlett, 1965)

And Oh, that eye was in itself a soul!  
(Lord Byron cited in Bartlett, 1965)

The eyes those silent tongues of love  
(de Cervantes cited in Bartlett, 1965)

The eyes have one language everywhere.  
(George Herbert cited in Kleinke, 1986)

He speaketh not; and yet there lies a conversation in his eyes.  
(Longfellow cited in Bartlett, 1965)

Your eyes are so sharpe that you cannot onley looke through a Milstone, but cleane through the minde.  
(Lyly, cited in Bartlett, 1965)

There are often voice and words in a silent look.  
(Ovid cited in Kleinke, 1986).
For eyes can speak and eyes can understand  
(Chapman cited in Kleinke, 1986)

An unforgiving eye, and a damned disinheriting countenance.  
(Sherman cited in Bartlett, 1965)

Such linguistic references suggest a possible explanations for beliefs in the power of the eye as an indicator and communicator of emotion. That is, linguistic expressions describing communications and projections from the eye are incorporated into the language system. These linguistic expressions might then contribute to an individual's belief system and even explain the presence of modern mythical figures such as Superman, whose x-ray vision has been portrayed as projective in nature. However, the projective implications of vision have many early metaphorical origins.

Metaphorical expressions that make reference to imagery associated with the eyes, include eyes that shoot arrows, daggers or swords, or eyes that emanate withering glances and icy stares. Such expressions suggest that the eyes are primary indicators and communicators of emotion. Eyes project fiery beams which burn the soul and kindle love's
flame; eyes are directly associated with Cupid and are often the instrument by which he casts his shafts; eyes are trappers, ensnaring the unsuspecting glances of others; the glance of love casts a spell, a *fascinatio*, over its victim (Donaldson-Evans, 1980). The earliest linguistic reference to the power of the eyes as a communicator has been traced to the 8th century and is also common today (Donaldson-Evans, 1980). The first reference in Antiquity to the eye actually casting arrows appears to be in Aeschylus' *Agamemnon* (cited in Donaldson-Evans, 1980). In this instance Iphigeneia attempts to instill pity by the power of her glance in those who are about to sacrifice her: "And she, as she let fall to the ground her saffron-dyed rainment, smote each one of her sacrificers with a pitiful arrow from her eye [. . .]" (cited in Donaldson-Evans, 1980, p. 4).

Egyptian poems have also reinforced the concept of the eyes as powerful communicators. Riess (1988) exemplifies this with quotations such as: "When she opens her eyes, my body is young." "She captures me with her eyes." "When I see you my eyes shine" (p. 404). The importance attributed to the eyes as messengers of love is also prevalent throughout the sixteenth century particularly in France with the
Lyonnais poets who were the first group of French Renaissance writers to make frequent and consistent use of this type of ocular communication and imagery (Donaldson-Evans, 1980).

These linguistic examples relate to several questions involved in this research. The first question regards the eye as an indicator of emotion. Perhaps, this romantic body of literature, more than any other, suggests that the eyes are indicators and communicators of emotion and internal states. References to the eye as a communicator of emotion and the social implications of ocular contact are often apparent in current accounts of everyday nonverbal interactions.

**Nonverbal Implications of Ocular Contact**

**Eye Contact**

C.T. Brown and P.W. Keller (1979) suggested that eye contact is the single most important feature of non-verbal communication in the conveying of interpersonal meaning. A recent example infers that "eyes without speaking confess the secrets of the heart" (St. Jerome cited in Long, 1992). In such communication "pupil dilation and changes in muscles around the eyes may either say come hither or run for your life" (page 34). Such movements of the face and eyes are
often considered critical indicators of initial impressions and estimations of personality. For example, eye contact often regulates the length and flow of conversation as well as potential opinions of honesty and aggressiveness (McConnell, 1989). Humans tend to develop rules to regulate who looks at whom, and when. A direct gaze appears is often considered a sign of encouragement when a person is talking or lecturing. Conversely, looking away from a person who is speaking indicates boredom or the desire to control the conversation (Argyle and Cook, 1976).

Nadler and Nadler (1987) discuss how the rules of eye contact may vary from one society to another and thus appear to be primarily learned behaviors. Not only do the rules of eye contact vary from culture to culture, they also appear to vary within a particular culture (McConnell, 1989). For example, Brown and Keller (1979) suggest differences between the eye signals of residents of the United States. They describe people who are reared in lower-class homes who tend to stare directly at people when talking, but avert their eyes when listening to show respect.

In middle-class America, people who engage in prolonged direct gaze are often perceived as being more powerful, and
of higher social status. Brooks, Church, and Fraser (1986) had undergraduates view video tapes of a woman student who maintained direct eye contact with an interviewer for five, thirty or fifty seconds. Students rated the woman as being more socially "potent" (and as having a higher grade point average) based on longer periods of time in which she engaged in direct mutual eye gaze with the interviewer. The rules of eye contact appear to be learned early in life and strongly influence perceptions and behaviors (McConnell, 1989).

Many similar social and communicative implications of gaze and the eye as an indicator and communicator of emotion are evidenced in everyday nonverbal communication. For example:

"On Monday Cpl. Floyd Johnson, 23, and the then Ellen Skinner, 19, total strangers, boarded a train at San Francisco and sat down across the aisle from each other. Johnson didn’t cross the aisle until Wednesday, but his bride said, "I’d already made up my mind to say yes if he asked me to marry him.” "We did most of the talking with our eyes," Johnson explained Thursday the couple got off the train in Omaha with plans to be married. Because they would need to have the consent of the bride’s parents if they were married in Nebraska, they crossed the river to Council Bluffs, Iowa, where they were married Friday.” (Burgess and Wallin in Oatley, 1993).
This newspaper report appears to be representative of a Western cultural ideal. Averill (1985) suggests that 40% of an American sample, after reading this newspaper article, said that they had experiences with a similar theme. Another 40% said that their experiences of love were not similar, but they were affected by the ideal presented in the article (Oatley, 1993). Among humans, such instances of "mutual gazing" of substantial duration occurs primarily among (1) lovers, (2) two people locked in some kind of emotional confrontation, and (3) a mother and her infant (Patterson, 1983; Patterson et al., 1984). Recall, that the eye has often been considered the most important feature in nonverbal communication.

Grumet (1983) describes other positive connotations as a result of ocular contact. For example, he describes a pedestrian crossing the street in front of an automobile at a "Stop" sign. The pedestrian establishes eye contact with the driver prior to crossing the street to ensure that the driver is aware of his presence and is allowing him to cross safely.

In contrast, many instances prevail when the avoidance of eye contact is preferred such as when Russell Baker (cited in Grumet, 1983,p.) of the New York Times describes,
"Veterans of New York's guerrilla life know better than to make eye contact with other people on the streets. For the criminal, eye contact is an invitation to produce his knife .... The rule of survival is never look anyone in the eye, and it is a hard, hard rule to follow at times.... Among outlanders there is an embittered old saying about New York that there are a million people on every street corner and not one of them will give you so much as a glance. Those million people are not being coldblooded. Just surviving."

There is additional evidence that people who are handicapped, or who suffer from mental disorders, often maintain poor eye contact. For example, Laurie Weiman (1986) reports that physically-disadvantaged individuals often display "low status" eye contact when talking with able-bodied individuals, but not when talking with another disabled person. Ellgring (1986) found that depressive patients tend to avoid direct eye contact, while schizophrenic and autistic patients often display what we might call "generally inappropriate" body language, including poor eye contact.

As evidenced above, ocular contact is often considered a means of gaining everyday information which possibly relates to the question of beliefs about the eye as a communicator. The significance of the eyes as indicators and communicators
of emotion also suggests a process of emotional communication akin to ancient theories of extramission where something comes out through the eyes to strike the object of vision. Let us now turn to a brief review of the theories of visual processing.

Explicit theories of visual processing

Recall that one area of questioning in this research asks about the specific processes or mechanisms underlying the belief that the eye is a communicator of emotion. These questions ask if something comes out of the eye when a person is angry, sad, happy, or afraid. Questions regarding emissions from the eye may originate in theories of visual perception as well as in language. The ancient theory of visual processing relevant to the current proposed study is known as extramission theory of perception. According to this theory, emissions come out from the eyes and strike an object sending back its image along the rays (Smith, 1993). Vision was considered a form of energy originating in the observer (Gifford, 1958). The discovery of the retina offered the scientific support to refute the extramission theory and lent support to the intromission theory (which proposed that rays enter the eyes and produce some kind of
change in them that causes us to see). However, more current literature, as well as continuing beliefs in the evil eye (Gifford, 1958), show that a modern interpretation of the extramission theory may still be a part of the current belief system of several children and adults (Smith, 1993).

The extramission theory is the main impetus behind one question proposed for this thesis. If subjects of all ages believe that they can feel the looks of another do they concurrently believe that they can also feel emotion? In turn, what do subjects believe about the process or mechanism involved in the communication of emotion. Do subjects believe in an extramission theory of emotion in which emotions come out of the eyes? If so, what process and form do the emotions take?

I am interested in investigating beliefs about the ability of the eye to reveal emotional and internal states and beliefs regarding how those states affect the ability to feel how another person feels. An additional question is whether people experiencing different emotional or internal states are considered to have greater projective emotional powers than others. It is the focus of the present study to offer possible explanations for a continuing belief in the
eye as a communicator of emotion and the importance of gaze throughout the lifespan. Superstition, extramission, and linguistic references have been discussed as potential sources of belief in the eye as an indicator and communicator of emotion. Another possible origin of beliefs in the eye as a communicator is found throughout the area of ethology where the eyes and gaze are considered paramount to survival.

Ethological Origins in the Importance of Gaze and Ocular Contact

Recall from the introduction that a primary question in this research is whether or not children and adults can perceive emotions from ocular cues. In several nonhuman species there is evidence that ocular cues are utilized in communication and survival. Evidence of the importance of the eye is prevalent in ethological theories of development. Generally, the importance of the eye as an indicator and communicator of emotion is emphasized throughout the lifespan of nearly all species. Across species, numerous features of the eye appear to play a role in the process of the eye as an indicator and communicator of emotion. Specifically, in determining the importance of gaze and eye contact, intensity
and direction seem markedly to increase the importance of the eye in facial expression. Prolonged direct eye contact is a mark of intense emotionality (Strom and Buck, 1979). Features such as eye widening in anger seems to serve threat and intimidation purposes. Staring as antagonistic behavior is common in animals (Andrew, 1963), and many animals react aggressively or by being frightened when stared at. For example, Exline and Yellin (1969) had human experimenters stare at male rhesus monkeys: In 47% of the trials the stared-at monkey attacked, and in an additional 29% they showed threat behavior. Staring someone down and stern looking as a form of disciplining occurs in animals and humans. Alerting effects of being gazed at are biologically widespread (Argyle and Cook, 1976). The threat value of looking at is dealt with by the interactive behavior of looking away (Frijda, 1993). Dogs when meeting for the first time appear careful not to look at each other, presumably in order not to incite attack; the same sort of thing occurs in rats and birds (Chance, 1962) and submissive primates (Hall and DeVore, 1965).

In general, tactical cues of submissiveness have characteristics opposite of the those described for
dominance. In animals as well as humans, submissiveness is manifest in glance aversion, general unobtrusive behavior, and conventional bowing. The "expressions of shame" described in the literature, or those of guilt (Tomkins, 1962; Izard, 1971), are best understood as submissive behaviors: head bent, glance downward, hands hanging down in explicit inactivity (Frijda, 1993). Important cues and features of the eye are seen in both humans and animals. The animal evidence may lead us to consider the evolutionary significance of the eye in survival. It has even been suggested that the "rules of eye contact" are probably grounded in innate emotional responses.

Much of this evidence originates in ethological literature. One leading ethologist, Eibl-Eibesfeldt (1989), defined human ethology as the biology of human behavior with the goal of elucidating why humans behave in certain ways. Answers to this question are pursued along different line of inquiry such as attempting to understand the physiology of behaviors, trying to reconstruct their phylogeny and cultural evolution through the comparative approach, and by functional analysis which attempts to understand the selective pressures which brought a behavior or custom into existence, be it
culturally or phylogenetically determined (Eibl-Eibesfeldt, 1989)? Ethologically, the power of the eye is demonstrated by many different approaches. In this section I will discuss the address specific ethological evidence for the power of the eye as an indicator and communicator of emotion.

Recent ethological literature addresses the issue of the power of the eye in animals (Smith, 1993). Janet Elisabeth Larson (1987) describes a trait that sets the Border Collie apart from most other breeds of canines in his use of "eye." This breed exhibits a crouching, snake-like movement with an intense stare used to hypnotize live-stock. Larson (1987) suggests that using "eye" is so instinctive in Border Collies that even eight-week-old puppies have tried to eye and herd small animals. Young pups can be seen eying cats, chipmunks, and even blowing leaves (Larson, 1987). Larson describes that "eye" refers specifically to the inborn power of the Border Collie to control sheep and other types of livestock with its keen and intent gaze. The dog's gaze is said to mesmerize or intimidate its charges into doing what it wants without having to use more extreme measures.

The importance of gaze is seen in other species as well. Specifically, primates are particularly noted for their use
of gaze and the eye as a means of communication. Because nonhuman primates are so closely related to man, their particular use of gaze and emphasis on the eye as a means of communication is of particular interest to the topic of this research.

In primate social groups, looking behavior principally has been considered to be a function of a dominance network (Chance & Jolly, 1970). Attention and receptivity are evident from gaze and the directional character of the posture of any animal (e.g., craning neck, downward gaze). With gorillas, as is sometimes the case with humans, direct staring constitutes a threat (Fossey, 1983). Yerkes (1927) described how he characterized emotional states of the mountain gorilla through descriptions of its eyes and how by watching a gorilla's eyes, he could often predict its actions. Specifically, Yerkes (1927) described the eyes in a quiet state as bland. In a state of interest-arousal, he reported that the gorilla's eyes become fixed, but their soft hue remains. In states of annoyance, the eyes grow hard and fixed much like when in an anger state. During anger, eyes are hard and usually fixed on the animal causing the anger. The description of eyes to communicate and predict internal
states has been expanded to include many other species as well.

In cats, eyes have also been used to indicate or predict the internal states of an animal. For example, a blink is reportedly a friendly gesture (Bateson, 1990). A prolonged stare is intimidating, and may cause a subordinate cat to retreat. Perhaps for this reason, nonaggressive cats blink when staring at other cats or at humans, thereby indicating their nonhostile state (Bateson, 1990).

The critical role of eye contact to affect, influence, and protect can be perceived even in the eye patterns displayed on various parts of animals' bodies. For example, eyes are used as nature's camouflage to confuse predators (Riess, 1988). Butterflies, birds, snakes, fish, and peacocks display eye-shaped patterns to mimic the eyes of predators and thus induce an avoidance response. Bobcats also display eyes on back of the ears which may fool predators. Such display patterns likely evolved to dispel predators via an innate avoidance response.

In many species a common effect of staring eyes is physiological arousal (Argyle & Cook, 1976). A recent finding in neuropsychology is the establishment of a specific
neurological reaction to eyes and face (Perrett & Rolls, 1983). In monkeys, certain neurons respond selectively to faces as compared to other body configurations such as the leg. There are those that propose that human babies appear to prefer faces from birth such that it may be that all primates are born with the potential specific stimulus configurations particularly a human face and specific patterns of neuronal firing (Desimone et al., 1984).

Neuropsychology

Neurologically, there is additional animal research that supports the importance of the animal eye. That is, there is neuropsychological support for beliefs regarding the importance of the eye in facial recognition (Smith, 1993). This neuropsychological evidence may provide a mechanism to explain the emphasis on the eye as a communicator throughout ethology.

In support of the importance of the power of the eyes in facial recognition, Perrett and Rolls (1983) conducted experiments with a primate relative of humans, the rhesus macaque monkey. They recorded the activity of single neurons with microelectrodes placed in the region of the macaque’s temporal lobe that corresponds to the area of the brain
implicated in facial analysis in humans. The monkeys were conscious during the experiment and were presented with a variety of visual stimuli which permitted Perrett and Rolls (1983) to discover a category of individual cells that responded two to ten times more frequently to images of human or monkey faces than to all other objects. Within this category, different cells reacted somewhat differently. One cell responded equally strongly to faces whether close up or distant, upside down or covered with red filters, but it barely increased its firing rate at all to a face in profile. Another cell fired just as much to an image of two eyes as to a complete face, but ignored a face in which the eyes had been covered.

Thus, cells were seen to fire to the image of two eyes but not to a face that did not include eyes. Macaques apparently have a battery of cells whose integrated activity provides an analysis of faces, which is an important activity in the lives of these highly social primates (Perrett and Rolls, 1983). Again, this is quite a different approach to the power of the eyes, but clearly supports the importance of the eyes as a focal point in neurophysiological mechanisms. This is not surprising when one considers that the eye,
vision, and gaze are of prime importance in the struggle for survival in virtually all species and that references to the eye are prominent throughout all areas of our culture including superstition, literature, nonverbal communication, ethology, and with implications ranging from love to survival. However, there is additional evidence areas in alternative medicine, than those areas mentioned above, emphasizing the eye as a means of acquiring information about health, internal states, and personality characteristics.

**Alternative Medicine**

Specifically relying on literature, Leonardo da Vinci (MacCurdy, 1938) proclaimed the eyes as *the window of the soul*. Similarly, in an area of alternative medicine termed iridology, the eyes are acknowledged as *the mirror of the body*. In the area of iridology, manifestations in and about the eyes have long been used to gain insight into a person's state of health (Jensen, 1980). Under the concept of iridology, the eye is also considered an indicator of social and personality styles (Johnson, 1993). One example is the Rayid method of iridology recognizing three patterns in the iris of the eye representing levels of mind, body, and spirit (Johnson, 1993). By distinguishing distinct structural
differences between the structures of the eye the Rayid method of iridology presumably guides the description of personality, temperament, brain dominance, and interpersonal relationships. Notice, the method of iridology relates to a primary question in this dissertation asking about beliefs in the eye as indicator and communicator of emotion. Specifically, the area of iridology is an example of a profession that relies on the eye as the primary means of communication in health-related diagnoses and indications of personality style.

It is difficult to determine what is belief and what is knowledge in the field of iridology. How do such beliefs about the eye come about and where do they originate? Perhaps, the importance of the eye as a means of communication is a belief developing over time beginning with the meaningful role the eye plays in communication during infancy.

Current Psychological Research Relating to Beliefs about the Eye

Infant Origins in the Importance of Gaze

Recall that a central question in this investigation involves developmental changes in the perception of emotion
using only ocular cues. In the first few months of life the infant begins to focus on the eyes and the direction of the gaze of a caretaker. There is likely an adaptive advantage to the attractiveness of the face and the importance of gaze to the infant (Smith, 1993). From birth on, the human face is one of the most attractive visual stimuli to the infant (Fantz, 1963). It is possible that this innate readiness for reciprocal gaze interacts with the child’s expanding cognitive skills and the caretaker’s attention, resulting in the infant’s increasing sensitivity and responsiveness to adult facial changes (Smith, 1993).

Consider, the contribution of the parents to the infant’s awareness of gaze. No matter how firmly parents may believe that newborns cannot see, they still endeavor to achieve direct, eye-to-eye visual contact with neonate from the first interchange. They seek a vertically parallel, face-to-face position toward the infant, and use various forms of stimulation in order to increase the probability of visual contact (Papousek and Papousek, 1987). This human parental tendency is rather unique in the animal world. For example, nonhuman primates do not try to capture the infant’s visual attention, although monkeys and apes carefully observe
neonates and infants, and sporadically have eye-to-eye contact with them (Ehardt and Blount, 1984).

Humans have good reasons for drawing infant attention to the parental face since facial behavior mediates relevant messages, including instructions for the proper production of speech sounds and oral feeding competence (Osofsky, 1987). Moreover, while matching infants' facial expressions parents also provide a "biological mirror," which may contribute to the development of self-awareness in their infants through kinesthetic feedback (Papousek and Papousek, 1974). The reinforcing role of eye-to-eye contact in mother-infant attachment has been discussed by Robson (1967) and Rheingold (1961) among others.

Winer (1991) suggested that a child's early awareness of visual perception is a process that is shared by other people. This suggestion is illustrated by an infant's ability to follow the gaze of its mother. As early as four months infants indicate an awareness of the direction of the gaze of their mother (Scaife and Bruner, 1975). There is increased improvement and differentiation of gaze to eighteen months when they are able to turn and follow a gaze directed behind them (Butterworth and Grover, 1988). These increased
visual abilities have many adaptive advantages for the infant.

Control of infant visual contact is one of the earliest regulators of the human physiological system. Affective and physical disturbances in the infant may sometimes be related to a nonsynchronous maternal-infant gaze pattern, with the gaze pattern then eliciting appropriate maternal responses (Field, 1987).

Brazelton and associates (1974) have suggested that mothers adjust to infants' arousal patterns in three ways: (1) with increased and decreased stimulation following the infant's gaze and gaze away cues; (2) by not following their infant's cues and continuing stimulation, thus reinforcing the gaze away behavior; (3) by attempting to establish a rhythmic pattern of their own. Therefore, the regulation of physiological as well as social systems is demonstrated through the use of gaze and visual contact from infancy throughout adulthood. The importance of visual contact and gaze to guide behavior and regulate physiological begins in infancy. Additionally, the perception of emotion, another important topic to this investigation, also begins in infancy.
The Role of Facial Perception in Communication

One question addressed in this research relates to the perception of emotion via ocular cues. Another question involves beliefs about the eye as indicators of emotion. These questions are important because beliefs and perceptions impact behavior. The influence exerted by our emotional states on our theory of mind and visual processes is extensive, ranging from inferences we make about the behavior of other people to the prominence of the eye in thinking. Between the two extremes we regularly engage in assessments about people who do or do not make eye contact with us, and when we feel we are the object of their gaze. Yarbis (1967) notes that experimental subjects direct foveal attention primarily to the eyes and lips of photographed faces, as these provide the most information to the observer. Argyle and Dean (cited in Grumet, 1983) support this view by suggesting that "without eye-contact, people do not feel that they are fully in communication," emphasizing the role of the eyes in facial expression as a means of communication.

Facial expression of affect is a primary means of communication. Recognition and display of this form of non-verbal communication is a part of normal socialization and
interaction skills (McAlpine, Singh, Kendall, and Ellis, 1992). Facial expression can be viewed as a means of conveying feelings without speech.

Beliefs that people hold regarding gaze and their perceptions of others' emotions or internal states have a direct influence not only on one's relationship with the world but also on their behavior with other people. Specifically, expressive behavior has an inherent significance, as relational activity, in the manner in which a person positions him/herself with respect to the environment. This inherent significance in relational activity is represented in abundant research showing the importance of gaze dynamics (see Exline and Fehr, 1982).

Throughout the lifespan the amount of eye contact appears to depend, to some extent, upon status relations and factors relating to gender (Mehrabian, 1972). Depending upon the relationship, a longer look between sexes can be interpreted as too intimate or too imposing. Looking seems to decrease in frequency or duration when looking is directed at a person who has just treated you badly (Exline and Winters, 1965). Different aspects of such looking behavior are often
described or explained by terms involving or referring to a specific emotion.

Emotion terms are almost unavoidable when describing the behavior of humans. Emotion thus appears to be a construct to explain behavior that has neither sufficient nor adequate external purpose or reason: the explanation, then, is sought "within" the subject (Frijda, 1993). Frijda (1993) suggests that emotions may be related to norms and values, to human modes of interaction, and to human cognitive possibilities, in particular, those of reflective awareness and intentional activity. The study of expressive behavior is considered an appropriate entry point into the study of emotion. The behavior is considered "expressive" because because it allows the observer to attribute emotional states to the person or animal concerned and serves the important role of communication during social interactions. Specifically, the ability to understand the emotional meaning in facial expressions is a necessary component in the development of social competence (Gross and Ballif, 1991).

Development of Emotions

The study of expressive behavior of infants reflects not only the surface manifestation of emotion but also the
possibility that an internal state exists (Lewis, 1993). Although the topic of this research involves the perception of four basic emotions using ocular cues, such emotions are briefly discussed in order to emphasize the early emergence of these basic emotions during infancy and the role of facial expressions of emotion during early development (Gross and Ballif, 1991). Specifically, by three months of age, an expression of happiness is said to emerge. Simultaneously, sadness emerges, especially in connection with the withdrawal of positive stimulus events (Lewis, 1993).

Although Stenberg, Campos and Emde (1983) observed the emergence of anger between four and six months of life, Lewis (1990) has demonstrated the earliest emergence of anger at two months of age. Since Darwin (1872/1965) anger has been associated with a unique cognitive capacity. Lewis (1990) describes anger as "both a facial and motor/body response designed to overcome an obstacle" (p. 233) pointing out that, in this definition, the organism has to have some means-end knowledge necessary to accomplish a goal.

Fear emerges still later. Schaffer (1974) has shown that children must be capable of yet another cognitive accomplishment to experience fear. Specifically, they must be
capable of comparing the fear inducing object or situation with another object or event. Children begin to show this behavior at seven to eight months of age (Lewis, 1993). It has been noted in the first eight or nine months of life that children exhibit the emergence of the six early emotions (Izard, 1978; Tomkins, 1962).

**Perception of Emotion**

Facial expression is an important source of knowledge for individuals to gain nonverbal information from others and also enabling the development of social competence. Darwin (1965) was the first to describe this source of knowledge in his book titled *The Expression of the Emotions in Man and Animals*. Since the early 1970's, evidence was gathered supporting the hypothesis that there is a set of discrete emotional expressions that are universally recognized as conveying particular emotional states (Izard, 1971; Ekman, 1973). Izard’s (1971) research has indicated that recognition of emotions increases with age, and that happiness and sadness are recognized first, followed by surprise and anger. Ekman’s (1973) research suggests that by the age of two years a child is able to recognize facial expressions.
Across several studies the perception of facial features has been found to influence's ability to discriminate facial expressions of emotion (Cunningham and Odom, 1986). In Cunningham and Odom's (1986) research, children were found to be most accurate in matching facial features to emotions when the match was based on specific facial features. For example, children were most accurate when the match was based on the mouth and then on the eyes. As might be expected, they made the most errors when matching was based only on the nose. These findings suggest that children pay more attention to and give more weight to certain facial features than to others when matching facial expressions (Gross and Ballif, 1991).

Current research from Kestenbaum (1992) also supports the existence of such feature dominance in the perception of emotion. Looking at the role of facial features in the perception of different emotions, Kestenbaum (1992) extends Ekman's research suggesting that there is an accuracy in facial discrimination when focusing on one feature over another. Specifically, for happiness, the mouth was found to be the dominant feature for children, although there were no differences between eyes and mouth for the adults. For
surprise, although the eyes were dominant for the adults and the seven-year-olds, there were no differences between the two features for the five-year-olds. For fear and anger, the eyes were the dominant feature for all age groups.

Recall Darwin’s assumption that the expressive repertoire is a part of a species-specific native endowment. More recent research has examined the infant’s capacity to both produce (Campos, Barrett, Lamb, Goldsmith, and Stenberg, 1983; Izard and Malatesta, 1987) and recognize these emotional expressions (Nelson, 1987). Note however, the topic of this investigation is limited to the issue of recognition of emotional expression.

The availability of such a biologically grounded signaling system suggests that children’s early concepts of emotion might be anchored to facial expression. According to this line of thinking, children will, irrespective of culture, focus on the same set of emotions: core emotions such as happiness, sadness, and anger that are easily conveyed by means of facial expressions (Harris and Saarni, 1989). Darwin (1972/1965) argued that infants have an innate capacity not simply to recognize particular facial expressions of emotion but also to identify the emotional state
that is conveyed. More recently, those beliefs extended to include the child's capacity to recognize and differentiate such expressions as inextricably tied to the identification of facial expression as a reflection of a person's internal states.

More generally, facial expressions are seen as only one component of a repertoire of expressive behaviors, and such behaviors are, in turn, recognized as being part of a temporally organized script that can include an appropriate cause, a subjective emotional state, and ensuing behavior (Harris, 1989). But, how do children initially come to understand that another person is feeling happy or sad, angry or afraid? The origin of the understanding of the feelings of other people is part of a broader and more general capacity to make sense of other people's thoughts, desires, and beliefs. (Harris, 1989).

**Theory of Mind**

Recall that one question in this research involves distinguishing between beliefs versus knowledge about the eye as an indicator of emotion. The question of beliefs versus knowledge about the eye as a communicator leads us to look at an area, referred to in the introduction, as theory of mind.
Because the role of the eye in communication is of central importance to this research, so is the relationship between theory of mind and the 'language of the eyes'. If one wants to share one's own mental states with another person, the relevant aspects of an experience must be communicated. Looks as communicators include: pleading and imploring looks, triumphant looks, glaring looks, looks that kill, looks that mock, and looks that seduce. Frith (1989) suggests that the meaning of these looks lies in shared mental states, or awareness of other minds. Therefore, if there were no mental states, the language of the eyes would not exist. Based on these assumptions, would there be no perception of emotion without a belief system allowing for attribution and intentionality?

The question regarding beliefs in the eye as a determinant in the perception of emotion relates to two pertinent areas of current research in psychology regarding what a person believes, theory of mind, and what a person knows about the perception of emotion. It has been suggested that an individual's need to control facial expression might be based on their interest in communication and is sustained by
the appreciation of other people's different states of mind
(Frith, 1989).

Theory of mind refers to a system of inferences about
the self and other's perceptions, beliefs, and knowledge.
Theory of mind provides us with the ability to predict rela-
tionships between external states of affairs and internal
states of mind (Frith, 1989). This ability has been called
'mentalizing' and has been described as an unavoidably
compulsive activity through which "we cannot avoid drawing
inferences between the causes and effects of behavior"
(Frith, p.157).

Recent research has shown that understanding of two of
the key components of theory of mind - beliefs and desires -
are in place at the end of the preschool period (Astington,
Harris, & Olson 1988). Those components not only help the
child to predict another's actions, but also to make sense of
another person's emotions and emotional displays (Harris,
Harris & Gross, 1988). Several researchers (Smiley and
Huttenlocher, 1989; Stein and Trabasso, 1989; Gnepp, 1983)
place their research in that wider context by asking how the
child's understanding of emotion borrows from and contributes
to a child's general theory of mind. In particular, they
claim that basic emotions such as happiness, sadness, or fear imply a specific relationship between desire and reality, and that such relationships are understood early in the preschool years. For example, sadness usually involves the loss of an object that the person wanted to keep or failure to attain that desired object. By attending to the relationship between desire and reality, young children can grasp that many diverse aspects of different situations can elicit sadness so long as they all lead to the loss of the desired object.

Another concept involving theory of mind and underlying the linkage of diverse areas in this investigation, the eye as a communicator of emotion and the perception of emotion, is a question regarding the origins of knowledge. According to O’Neill and Gopnick (1991) knowing what kind of event leads to a belief plays an important role in evaluating and justifying the belief. Nisbett and Ross (cited in O’Neill and Gopnick, 1991) suggest that failure to consider the sources of one’s knowledge may result in false impressions, interpretations, and beliefs.

Regarding the origins of knowledge, children as young as three-years-of-age appear to have an appreciation of the
relationship involved between visual perception and knowledge (O’Neill and Gopnik, 1991). Specifically, emerging around three-years-of-age, there appears to be an appreciation of the connection in looking at something and knowing about it (O’Neill and Gopnik, 1991). Other investigators have also studied the implications of gaining knowledge through visual inspection (see Pillow, 1989; Pratt and Bryant, 1990).

Grumet (1983) also discusses visual perception as "an active process in which incoming stimuli are combined with learned information in order to make deductions which go far beyond the immediate sensory evidence" (p.175). Soltis (cited in Grumet) writes that our knowledge about things and the world is “threaded” into the process of visual perception. The current research involves not only beliefs regarding the eye and their source, as well as the issue of, whether seeing is knowing in visual perception or whether feeling is knowing in the perception of emotion.

The area of perception of emotion encompasses what is known about the expression of emotions or the visceral changes that accompany an emotion. The proposed study is not merely a study of the perception of emotion using ocular cues; it is also a study of beliefs regarding the eye’s
involvement in the perception of emotion. Specifically, do subjects believe that emotions can be read from the eyes, and at what age do they believe they are able to do so?

**Current Child Research on Gaze and the Eyes**

Recent literature, has also demonstrated the importance of the eye in the facial expressions of children. For example, Zivin (1977) studied dominance aspects and the resemblance of the primate threat face in children's aggressive faces in preschoolers. She found that children exhibited facial expressions that resembled those of primates. She also found similar facial expressions appearing in response to similar contextual cues, human and nonhuman primates (Zivin, 1977). These findings concluded that children ranking higher in dominance made more of these faces than lower-rank children.

It is possible that many early experiences and developmental phenomena pertaining to vision actually form the basis for cultural notions regarding the power of the eye. This theme was expressed in a recent theoretical article by Riess (1988). The author suggested that ancient beliefs in the function and power of the eye were rooted in universal gaze patterns of childhood. She used four developmental phases of
childhood and their characteristics in respect to eye experiences and assigned eye power to propose belief transformations throughout childhood. It appears that the significance of gaze begins early in life for an infant placed apart from its mother looks at her almost constantly, if it can (Ainsworth, 1967). From birth, there appears to be an innate readiness for interpersonal gazing. This readiness interacts with the child’s expanding cognitive skills and the caretaker’s nurturing. This interaction results in the infant’s increased sensitivity and responsiveness to the mother’s facial messages, and in the developing child’s increasing its level of differentiation to the mother’s gaze. While the infant’s response to the mother depends on her physical presence and multiple daily encounters with her, older children develop a more complex scheme, in which mental representations of the mother as well as other objects, animate and inanimate, become “intrapsychically” available and can be evoked and recalled (Riess, 1988). Hence, the importance of the eye as a communicator and its implications in gaze have definitive social implications for the developing infant.
Recent research findings have demonstrated that looking and staring has a perceived effect on the object of the gaze. Specifically, Winer and Cottrell (1991) initially examined a specific question regarding visual perception using two types of intromission-extramission questions. One was direct, asking children whether they believed in rays coming out of the eyes. Another question asked children and adults whether they could feel the stare of another without seeing the other's eyes. If one could feel this, then this may indicate an implicit belief in extramission perception. Winer and Cottrell's (1991) research found that almost all college students said they had experienced the feeling that someone was staring at them without actually seeing the other person's eyes. Virtually all of them also said that they believed other people had also experienced feeling someone staring at them.

In additional research on this question, Cottrell (1993) in her dissertation, again examined the same types of explicit and implicit beliefs. In questions designed to reveal an implicit extramission theory, she compared beliefs about animals and humans. For example, she asked if subjects thought an animal could feel the child staring at it without
seeing their eyes, and if subjects could feel an animal like a dog or a cat staring at them if they could not see its eyes.

Cottrell's (1992) results showed a difference in beliefs about people versus animals. To begin with subjects believed that they were more likely to feel the stares of other people than the stare of an animal. Cottrell's findings indicated that first graders answered that they could feel the staring of an animal about as often as an animal could feel them staring whereas older children and college students believed an animal could feel them stare more than they could feel an animal stare at them. Only about 35-45% of subjects in all age groups thought they could feel an animal stare at them.

A clear developmental trend was evident, however, in the number of subjects who thought an animal could feel a person staring at it. First-graders made no distinction between a person feeling an animal (37.5%) or an animal feeling a person (34%). About one-half of 3rd-graders and college students, and as many as 75% of 5th-graders thought an animal could feel them staring at it. There seemed to be an increasing trend, with age, in the belief that animals could feel a human stare. Most children and adults thus appear to
hold an implicit belief in a level of superiority of humans over animals in eye power. The gaze of an animal such as a dog or a cat is apparently not powerful enough to be felt by most humans. The majority of the Cottrell subjects tended to believe, on the other hand, that a human gaze can be felt by such animals.

In previous research (Smith, 1993) third-graders, fifth-graders, and college students were asked whether they could feel the stare of another, and whether the other could feel their stare, when the 'other' was a child, baby or another person, and when the other was one of five animals: a tiger, gorilla, cat, rabbit and fox. Animals were selected to represent (and separately rated by subjects on) degree of power, fierceness, similarity to human beings, domesticity and perceived intelligence.

ANOVAs of responses to questions referring to people showed a developmental trend. With increasing age, there was an increasing tendency to differentiate, by rating babies lowest, self and others the highest, and children in between, in the ability to project and receive stares.

Subjects attributed significantly more feeling of and by the fierce (gorilla and tiger) than non-fierce animals,
suggesting the importance of power. Humans (other than babies and children) were \((M = 1.75)\) not distinguished from the fierce animals (tiger \(M = 1.75\); gorilla = 1.7) but were considered significantly more projective and receptive than the other animals (fox \(M = 1.5\); cat \(M = 1.4\); rabbit = 1.35). These results which are significant for understanding the development of intuitive belief systems and theory of mind led to the topic of this investigation.

Since subjects believed in the ability of humans and animals to project and receive stares, do they also have intuitive beliefs regarding the transmission of emotion? If so, does the ability to determine emotion vary based on different emotions? Can the transmission of emotion be felt much like stares? Are some emotions (anger, love) more powerful than others? And ultimately, can subjects explain the process and origin of their beliefs? The purpose of the proposed dissertation is to gain insight into such questions relating to beliefs about the eye as an indicator and communicator in the perception of emotion.
The ideas behind the questionnaire employed in the present study are based largely on the results from research by Winer and Cottrell (1990, 1991, 1992, 1993), Cottrell (1992), and Smith (1993). Subjects were questioned about their perception of emotion via the eye and their beliefs regarding the eye as an indicator and communicator of emotion. The ocular extramission questions, a subset of the belief questions, were designed to tap extramission beliefs of emotion. Any positive response to an ocular extramission question was considered an extramissionist response.

The formal hypotheses and goals that guided this study were as follows:

(1) Based on Izard's (1971) results, a developmental trend was predicted in the perception of emotion with adults predicted to give more correct identification of emotions using ocular cues than younger children.

(2) An age effect was predicted in beliefs regarding the perception of emotion from the eyes. Therefore, greater affirmative beliefs regarding the eyes as indicators of emotion were predicted to increase with age.
(3) An order effect was predicted for subjects answering ocular identification questions before belief questions. Subjects who answered ocular identification questions first were predicted to be more inclined to respond affirmatively to belief questions than those subjects in the order answering identification questions after belief and ocular extramission questions.

(4) An additional question compares developmental trends in the identification of emotion via ocular cues versus beliefs about the perception of emotion. A positive correlation was predicted between ocular identification of emotional states and beliefs regarding the eye as indicators of emotion.

(5) The process questions asked about the specific mechanism by which emotions actually come out of the eye. For example, "if a person is happy does something come out of their eyes?" Overall, based on prior findings in visual perception, younger subjects were predicted to subscribe to an implicit theory of emotional extramission, by answering affirmatively to ocular extramission questions.
(6) Responses to belief and extramission questions were predicted to vary for different emotional states. Emotions which were perceived as stronger, fiercer or more powerful were predicted to be perceived as having a greater ability to project than less powerful emotions. For example, emotional states such as anger or fear were perceived to project more often than other emotional states.
CHAPTER III

METHODOLOGY

Recall from the introduction that this investigation dealt with four areas of questions. The first area of questions involved subjects' ability to discriminate between emotions utilizing only ocular cues. The second area of questions was directed toward determining what subjects believe about the eye as an indicator of emotion. The third area of questions involved beliefs in a particular process by which emotions are communicated. The overall purpose of this study was to investigate developmental trends comparing the areas of the perception of emotion, beliefs about the eye as a communicator of emotion, and the mechanism by which emotion is communicated.

Subjects

To investigate the above questions, urban elementary school students (3rd, 5th, and 7th grade) located in Columbus, Ohio were tested, as well as Ohio State University
students who volunteered for the experiment to fulfill a basic psychology course requirement, were tested individually. The elementary school students were: 53 third-graders (mean age = 9 yrs, 2 mos, range = 8 yrs, 6 mos - 10 yrs, 1 mo.); 53 fifth-graders (mean age = 11 yrs, 3 mos, range = 10 yrs, 5 mos - 12 yrs, 5 mos); 43 seventh-graders (mean age = 13 yrs, 2 mos, range = 12 yrs, 5 mos - 14 yrs, 2 mos); and 47 college students (mean age = 19 yrs, 2 mos, range = 17 yrs, 4 mos - 20 yrs, 9 mos). Subjects were relatively equally divided by sex within grades and conditions.

Procedure and Measures

Four sets of questions were administered verbally to subjects in one-on-one interviews. The elementary school students were withdrawn individually from their classroom and tested in areas not being used for other purposes at the time; the college students were tested individually in a university room used as a psychology laboratory. Subjects were asked a set of belief questions, extramission questions, identification questions, and probe questions.
Belief Questions - Table 1.

The seventeen belief questions (Table 1) in this investigation explored children and adults' beliefs about the eyes as indicators or communicators of emotion. For example, subjects were asked questions such as, "Do you believe that you can tell if someone is angry, sad, happy or afraid if you can only see another person's eyes and no other parts of the face?"

Anger, sadness, happiness, and fear were selected for this investigation because they have been noted (Ekman, 1975) to be the earliest discriminated emotions. Also, research with children has tended to focus on the simplest emotions - namely, happiness, sadness, anger, and fear. According to Gnepp (1989) these emotions are most clearly associated with discrete facial expressions and characteristic behaviors. Finally, these emotions were chosen for this investigation because they are most easily understood by children.

Recall the belief questions did not include facial cues to assist the subjects. Instead subjects had to rely on their beliefs about the eye as a communicator of emotion. Other questions asked what is it about the eye that indicates the emotion. For example, is it the shape, size, or color...
that cues the subject to identify an emotion? To prevent order effects, the five core questions regarding the ability to determine emotions via the eyes, were randomly numbered using a previously generated list of random numbers.
Table 1. List of Belief Questions Used in the Investigation

1. Do you think you can tell what another person is feeling if you can only see a person's face and nothing else? For example, do you think that you can tell if another person is happy or sad if you can only see that person's face?

2. What part of the face tells you the most how someone feels?
   
<table>
<thead>
<tr>
<th>Nose</th>
<th>Mouth</th>
<th>Eyes</th>
<th>Ears</th>
<th>Cheeks</th>
</tr>
</thead>
</table>

3. What feelings can you tell if you can only see another person's face and no other parts of the body?

4. Can you tell how a person feels if you can only see a person's mouth and no other parts of the face?

5. Can you tell how a person feels if you can only see a person's eyes and no other part of the face?

6. What is most important about the eyes that tells you how a person is feeling? shape ___ size ___ color ___ direction ___ how they move ___

7. What else about the face tells you how another person feels?

8. Does it matter what color the person's eyes are?

9. If yes, then ask - What color tells you if a person is happy _______? angry _______? sad _______? afraid _______?

   Let's say that someone is happy. Can you tell if a person is happy if you can only see that person's eyes and no other parts of the face?

10. Can you see well in a completely dark room?

   Let's say someone is angry with you. Do you think you can tell if a person is angry if you can only see that person's eyes and no other parts of the face?
Table 1. Continued

<table>
<thead>
<tr>
<th>Let's say someone is sad. Can you tell if a person is sad if you can only see that person's eyes and no other parts of the face? Do you smell with your eyes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Let's say someone is afraid. Can you tell if a person is afraid if you can only see that person's eyes and no other parts of the face?</td>
</tr>
<tr>
<td>Let's say that one person loves another person. Can you tell if a person loves another person if you can only see the eyes and no other parts of the face?</td>
</tr>
<tr>
<td>Let's say that someone is sick. Can you tell if another person is sick if you can only see that person's eyes and no other parts of the face?</td>
</tr>
</tbody>
</table>
Extramission Questions - Table 2.

The second area studied involved a subset of the belief questions and investigated beliefs regarding a specific process or mechanism by which emotions might be communicated. With the seventeen extramission questions (Table 2) children and adults were questioned about whether they believed emotion comes out of the eyes. That is, does something come out of the eyes to tell you how a person feels. Does emotion travel out of the eye in the form of rays, waves, energy, or power? In examining this question subjects were asked if something comes out of the eyes such as anger or love in the form of rays, energy, or power that the subject feels? Finally, questions asked about different emotions to determine whether the ability to feel an emotion changes as a result of emotional or internal state? For example, do subjects believe that more negative emotional states such as anger or fear are more readily felt than more positive emotions such as happiness or sadness? As in the belief questions, to prevent order effects, the five core questions regarding the mechanism by which emotions are determined via the eyes, were randomly ordered using a previously generated list of random numbers.
Table 2. List of Extramission Questions Used in the Investigation

18. Does anything come out of another person’s eyes, like rays, waves, energy, or something else, to tell you how that person feels? If yes, what?

19. Does it just seem like something is coming out of the eyes or is something really coming out of the eyes? Seems like ___ Really____

20. Can you actually feel what it is that is coming out of the eyes?

21. What if a person is standing behind you and looking at you, but you can’t see the person’s face: can you still feel what they are feeling?

22. Do feelings come out of the eyes like a breath comes out of the mouth?

23. Can you tell what comes out of the eyes if the person is wearing glasses?

24. Do you think you can see through a solid brick wall?

25. I’ve been asking you what you think about feeling coming out of the eyes. Does it matter if the person is a friend, relative or someone you don’t know? If yes, then who can you feel more? friend relative someone else

26. Let’s say you are in the dark. Can you tell what comes out of another person’s eyes when you are in the dark?

___ If a person is happy does something come out of their eyes?
___ If a person is angry does something come out of the eyes?
___ If a person is sad does something come out of the eyes other than tears?
___ If a person is afraid does something come out of the eyes?

32. Can you see with your ears?

___ If one person loves another person does something come out of the eyes?
___ If a person is sick does something come out of the eyes?
Control Questions

Four control questions were dispursed throughout the belief and extramission of emotions questions. Control questions included: Can you see well in a completely dark room?; Do you smell with your eyes; do you think you can see through a solid brick wall; and, can you see with your ears? These questions were intended to have an obvious negative response. The purpose of these questions was the prevention of possible response sets. If a subject responded affirmitively to any of the control questions, they were corrected and encouraged to listen to the question before questioning continued. Unless interesting results were detected, responses will not be reported for control questions.

Identification Questions - Table 3.

Finally, with the eight identification questions (Table 3), subjects were shown pictures of both male and female eyes representing four different emotions (happiness, sadness, anger, fear). The ocular cues used in this investigation were photographs including the eyes/lids, brow and root of the nose. In addition, subjects were shown an index card with one of the four basic emotions indicated on
the card allowing them to concentrate on the ocular identification task. Specifically, subjects were not required to remember the specific emotion while they were asked to indicate which set of eyes represented each core emotion. Subjects were required to match an emotion to the appropriate set of eyes. Subjects selected their choices by pointing or verbally indicating an arabic number assigned to each set of eyes they wished to select. Responses were then coded as either correct or incorrect. Recall, from the introduction, that a major concern of this research was whether there is a developmental trend in the perception of emotion using ocular cues. That is, would older subjects be better able to discriminate emotion in the eyes than younger subjects? Sets of eyes were randomly ordered and randomly assigned to subjects.

Within each age group, the order of the verbal sets of questions was varied based on a random assignment of subjects, so that for half the subjects the belief questions were first and ocular recognition questions were last, while for the other half, the ocular recognition questions were asked first. Specifically, in one condition the identification questions preceded both the belief and extramission
questions. In the second condition, the belief and extramission questions were administered first with the identification questions administered last. In both conditions the extramission questions, a subset of the belief questions, always followed the belief questions. Presumably, those subjects who discriminated emotions prior to answering the belief and extramission questions were predicted to give a greater number of affirmative answers to belief questions as a result of having experienced the perception of emotion.

Within the belief and extramission questions, subjects were asked about the ability to differentiate emotional states such as anger, happiness, fear and sadness by looking at the eyes and no other parts of the face. Because of the abundance of literature referring to love, I asked one question regarding love. Finally, one physical state was introduced (sick). Subjects were asked if they believed they could tell if a person was physically ill by looking at their eyes and no other parts of the face.

**Probe Questions - Table 4.**

In all conditions, two probe questions followed the administration of emotional belief/extramission/identification questions. One specific question explored whether subjects
believed they could feel another person looking if they could not see that person’s face. If the subjects responded affirmatively to that question, they were then asked to recall an instance in which they had felt someone staring but couldn’t see their face. The final question asked subjects whether they believed they could determine if a person was happy and sad and the same time by looking at that person’s face.
Table 3. Ocular Identification Questions

Lay the sheet with four different sets of eyes in the center of the desktop facing the subject. On the back of the emotion card there will be a number. Pick up emotion card #1 and instruct the subject to pick the eyes that show emotion. Indicate the number of the subjects answer below.

<table>
<thead>
<tr>
<th>Male</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotion 1 (Anger) _____</td>
<td>Emotion 1 (Anger) _____</td>
</tr>
<tr>
<td>Emotion 2 (Happy) _____</td>
<td>Emotion 2 (Happy) _____</td>
</tr>
<tr>
<td>Emotion 3 (Fear) _____</td>
<td>Emotion 3 (Fear) _____</td>
</tr>
<tr>
<td>Emotion 4 (Sad) _____</td>
<td>Emotion 4 (Sad) _____</td>
</tr>
</tbody>
</table>
43. Have you ever felt someone looking at you when you couldn’t see their eyes? If the answer is yes, tell me what you remember about that time.

44. Can you tell by looking at someone’s face that they are happy and sad at the same time?
Recall that the questionnaire consisted of four main sets of items which included belief, extramission of emotion, identification, and probe questions. The seventeen belief questions queried subjects on beliefs regarding the eyes as indicators or communicators of emotion. The seventeen extramission of emotion questions, immediately following the belief questions in both conditions, asked if subjects thought something comes out of the eyes to communicate feelings during the perception of emotion. Next, eight identification questions explored whether subjects could discriminate emotion via ocular cues with no other parts of the face showing. Finally, probe questions investigated related beliefs in order to more accurately explain previous responses. The majority of answers were forced choice responses consisting of yes or no.
In the sections that follow, all questions are analyzed separately as well as in groups. Recall that, prior to administration, questions were grouped into belief questions, extramission of emotion questions, identification questions, and probe questions. Initially each question will be discussed individually. Tables will be included for significant results. Following a separate discussion of the results of each question, the analyses of question groups will complete each section. For example, questions one through seventeen will be discussed individually, followed by analyses pertaining to all belief questions. After each complete section (belief, extramission of emotion, ocular identification) has been discussed, a final section comparing groups will follow. In the final section, analyses including comparisons utilizing analyses of variance (ANOVAS) will be discussed. Specifically, in this final section, groups such as all belief questions, will be compared to ocular identification questions and extramission of emotion questions.
1. Individual Belief Questions.

   Question 1. Do you think you can tell what another person is feeling if you can only see a person's face and nothing else? For example, do you think that you can tell if another person is happy or sad if you can only see that person's face?

   When the frequency of responses were examined 95.9% (188/196) of the total sample responded affirmatively to question 1. Specifically, 51/53 third-graders and 52/53 fifth-graders answered affirmatively. In older subjects, 42/43 seventh-graders and 43/47 college students answered affirmatively to question 1.

   Question 2. What part of the face tells you the most about how someone feels?

   Chi-square tests were used to examine subjects' responses by grade from question 2, investigating what part of the face subjects believed tells the most about how someone feels. Responses to question 2 were forced choice answers including nose, mouth, eyes, ears and cheeks and are reported in Table 5. The overall chi-square value for each of three responses (eyes, mouth, cheeks) was indicative of a significant grade effect, $X^2(6, N = 196) = 18.85, p < .005$. 
Further examination of the responses to question 2 revealed that considerably more than half of the fifth-grade (66%), seventh-grade (76.7%), and college students (78.7%) believed that they could tell the most about how someone feels by seeing the eyes and no other parts of the face. In contrast, more than half of the third-grade graders in the investigation believed they could discriminate emotion by seeing the mouth and no other parts of the face.

Based on initial results to question 2, using dummy coding, a comparison was made using grade three as a control group. Results indicated that responses from all other grades were significantly different from those of grade three, for example, when compared to responses from children in grade three, responses from children in grade seven, $F(1, 192) = 8.07, p < .006$ college, $F(1, 192) = 9.78, p < .003$ and grade five were significantly different, $F(1, 192) = 3.78, p < .06$. 
Table 5: Frequency of Responses to Question 2 asking what part of the face tells the most about how someone feels?

<table>
<thead>
<tr>
<th></th>
<th>EYES</th>
<th>MOUTH</th>
<th>CHEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>24</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>n=53</td>
<td>45%</td>
<td>55%</td>
<td>0%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>35</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>n=53</td>
<td>66%</td>
<td>32%</td>
<td>2%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>33</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>n=43</td>
<td>77%</td>
<td>21%</td>
<td>2%</td>
</tr>
<tr>
<td>College</td>
<td>37</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>n=47</td>
<td>79%</td>
<td>19%</td>
<td>2%</td>
</tr>
</tbody>
</table>

N = 196

\[ X^2 (6, N = 196) = 18.85, p < .005 \]
Question 3. What feelings can you tell if you can only see another person's face and no other parts of the body?

Question 3 was initially analyzed by examining the frequencies of responses by grade. First, responses were analyzed by the number of responses given to the question. The overall number of responses most frequently given to question three was four responses. Third and fifth-graders most frequently gave three answers. Seventh-graders and college students most frequently responded with four answers. However, upon visual inspection, there appeared to be a difference in the number of responses across age, and, upon observation, a developmental progression in the number of answers given, with a greater number of emotions given with age. The youngest subjects, third-graders, never gave more than five answers. When the frequencies of older subjects' responses were examined, one seventh-grader responded with seven answers and one gave nine answers. In the college population, five subjects gave six answers, one gave seven answers, and one gave nine answers, $X^2(21, N = 196) = 40.43$, $p < .008$. 
ANOVA of Responses to Question 3.

Since frequency results suggested response differences across ages, a 4 (Grade) x 2 (Gender) x 2 (Order: belief questions first vs. ocular identification questions first) ANOVA (Table 6) was performed on the responses given to question 3 resulting in significant grade effects, $F(3, 180) = 6.35$, $p < .0005$. A further analysis of the means indicated the number of responses given by college students was significantly greater than the number of responses given by all other grades. Means follow in descending order: college students $M = 4.15$, grade 7 $M = 3.28$, grade 5 $M = 3.11$, grade 3 $M = 3.06$.

In addition, there were significant effects in the number of responses by order, $F(1, 180) = 6.38$, $p < .013$. Specifically, when belief questions were administered first scores were higher (Order 1 $M = 3.63$) than in order two when ocular identification questions were administered first (Order 2 $M = 3.13$).
Table 6. Analysis of Variance Summary of the Number of Feelings Indicated by Another Person’s Face (Question 3)

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>35.61</td>
<td>3</td>
<td>11.87</td>
<td>6.35**</td>
</tr>
<tr>
<td>Order</td>
<td>11.91</td>
<td>1</td>
<td>11.91</td>
<td>6.38*</td>
</tr>
<tr>
<td>Gender</td>
<td>0.07</td>
<td>1</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
<td>Grade x Gender</td>
<td>0.59</td>
<td>3</td>
<td>0.20</td>
<td>0.11</td>
</tr>
<tr>
<td>Grade x Order</td>
<td>2.61</td>
<td>3</td>
<td>0.87</td>
<td>0.47</td>
</tr>
<tr>
<td>Order x Gender</td>
<td>1.45</td>
<td>1</td>
<td>1.45</td>
<td>0.78</td>
</tr>
<tr>
<td>Grade x Order x Gender</td>
<td>2.03</td>
<td>3</td>
<td>0.68</td>
<td>0.36</td>
</tr>
</tbody>
</table>

N = 196

** p < .0005

* p < .02
Total responses to question 3 were also coded for the four basic emotions (happy=1, sad=2, angry=3, afraid=4) utilized in the ocular identification questions. All remaining responses were coded together as "other". The number of times each core emotion was given as a response to question 3 was determined. The analysis showed that 85% of all subjects answered with a response of "happy" as one of the emotions they believed could be discriminated by seeing the face and no other parts of the body. A "sad" response was given by 81% of the subjects. In turn, 61.7% of subjects cited "anger" as a response and "fear" was included in 29.1% of total subjects.

The order in which the core emotions were given in response to question 3 was also examined. Specifically, what emotion was most frequently given as the first answer, second, third, fourth, and last? When the frequency of responses was examined, happiness was the answer most often given as a first response (46%). Sadness was given as a second response in 49% of the sample. Seventeen percent of the time anger was given as a third response and fear was a fourth response in 29% of subjects.
Question 4. Can you tell how another person feels if you can only see a person’s mouth and no other parts of the face?

Chi-Square tests were used to examine the frequencies of subjects’ responses by grade pertaining to beliefs regarding the ability to discriminate emotions by seeing the mouth and no other parts of the face. Results (Table 7) indicated that younger subjects more frequently responded affirmatively to beliefs regarding the mouth as an indicator of emotion than did college students. Seventy-four percent of third-graders, 64.2% of fifth-graders, and 69.1% of seventh-graders responded affirmatively, whereas only 46.8% of college students gave a “yes” answer to question four, \( X^2 (3, N = 196) = 8.55, p < .04. \)

Question 5. Can you tell how another person feels if you can only see a person’s eyes and no other parts of the face?

In contrast, in all four age groups, over 80% (165/196) of subjects responded affirmatively to beliefs regarding the eye as an indicator of emotion.
Table 7: Frequency of Subjects’ Responses of Beliefs Regarding the Mouth as an Indicator of Emotion (Question 4)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>39</td>
<td>14</td>
</tr>
<tr>
<td>n = 53</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td>n = 53</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>n = 42</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>College</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>n = 47</td>
<td>47%</td>
<td>53%</td>
</tr>
</tbody>
</table>

N = 196

$X^2 (3, N = 195) = 8.55, p < .04$
Question 6. What is most important about the eyes that tell you how a person is feeling?

Across all ages, shape (36.1%) was believed to be the most important feature of the eye in determining how another person feels. The next most important indicator was how the eyes move (28.4%), followed by size (17.0%), direction (14.4%) and color (3.6%).

Question 7. What else about the face tells you how another person feels?

The frequencies of subjects' ($X^2 (27, N = 196) = 54.39, p < .002$) indicated that subjects in all age groups believed "the mouth" (42.9%) was another indicator of how a person feels. "Eyebrows" (11.3%) and "eye color" (10.7%) were also reported as indicators of emotion. Other responses included "expression", "wrinkles", and "the whole face".

Question 8. Does it matter what color the person's eyes are?

Ninety five percent (186/196) of all subjects in this investigation reported that color did not matter in the indication of emotion.
Question 10. Let's say that someone is happy. Can you tell if another person is happy if you can only see that person's eyes and no other parts of the face?

When I examined the frequency data, 75% (148/196) of subjects of all ages responded affirmatively when asked whether they could discriminate happiness utilizing only ocular cues. Grade effects were not significant although seventh-graders responded with a slightly higher number of positive responses than subjects in all other grades.

Question 11. Can you see well in a completely dark room?

Although question 11 was considered a control question, during the administration of the questionnaire there was a noticeable difference in third-graders' responses to this question. When corrected, they appeared egocentric in that they insisted that although others could not see in a dark room, they could do so. Twenty-three percent of all third-graders answered they could see well in a completely dark room in comparison to only four fifth-graders, six seventh-graders and seven college students.
Question 12. Let's say someone is angry with you. Do you think you can tell if another person is angry if you can only see that person's eyes and no other parts of the face?

Over ninety percent of third, fifth and seventh-graders responded affirmatively indicating they believed they could tell if another person was angry using only ocular cues. Although there was not a significant age difference in subjects' responses, eighty percent of college students believed they could discriminate anger when looking only at the eyes and no other parts of the face. This trend of college students indicating fewer beliefs in the eye as a communicator of anger continued with the next question asking about the discrimination of sadness.

Question 13. Let's say someone is sad. Do you think you can tell if another person is sad if you can only see that person's eyes and no other parts of the face?

Again, more than ninety percent of younger subjects responded affirmatively to the item asking whether they could discriminate sadness using only the eyes as determinants. However, by comparison, only seventy percent of college students believed they could discriminate sadness using ocular cues. Although not significant, recall that the same
trend of college students indicating fewer affirmative beliefs occurred with anger responses.

**Question 15.** Let's say someone is afraid. Do you think you can tell if another person is afraid if you can only see that person's eyes and no other parts of the face?

The same trend continued when examining beliefs regarding the discrimination of fear. The vast majority of all subjects believed they could discriminate fear utilizing only the eyes as indicators of emotion. However, college students responded affirmatively with fewer affirmative responses than did younger subjects.

**Question 16.** Let's say that one person loves another person. Do you think you can tell if another person loves another person if you can only see their eyes and no other parts of the face?

Recall that when asked questions referring to anger, fear and sadness, third-graders more frequently believed the eye was an indicator of emotion. This trend reversed when the subjects were asked about the eye as an indicator of love. Only 37% (20/53) of third-graders responded affirmatively when the question asked about love. More than fifty percent of fifth (29/53), seventh (24/43), and college students (27/47) responded positively to question 16,
indicating that they believed they could tell when a person loves another person if they can see only the eyes and no other parts of the face.

Question 17. Let’s say that a person is sick. Do you think you can tell if another person is sick if you can only see their eyes and no other parts of the face?

A chi-square analysis of responses to question 17 (asking subjects if they think they could tell if another person was sick if they could only see the eyes), by grade, was not significant. Fifty-five percent of subjects responded affirmatively and forty-five percent responded negatively.

In summary, subjects of all ages believed they could discriminate emotion using only ocular cues and no other parts of the face. Older subjects (5th, 7th, college students) indicated the eyes were the most informative feature in determining emotion whereas third-graders suggested the mouth was most often considered an indicator of emotion. When subjects were asked what emotions could be detected from facial cues, there was a significant grade effect. Results indicated a developmental progression in the number of answers, with an increasingly larger number of
emotion responses given with age to question 3 asking what emotions subjects could tell by only seeing the face. When I examined the total number of responses to question 3 for the prevalence of specific emotions, 85% of all subjects answered with "happy" as one of the emotions they most frequently believed they could discriminate by seeing the face and no other parts of the body, followed by sad (81%). In turn, 61.7% of subjects cited anger as a response, and fear was included in 29.1% of total subjects.

Although eighty percent of all subjects believed the eyes were indicators of emotion, third-graders' more frequently believed the mouth was a primary indicator of emotion. When asked about emotions such as happiness, sadness, fear and anger most subjects believed they could discriminate such emotions specifically utilizing ocular cues and no other parts of the face. A developmental trend emerged in responses to questions exploring beliefs about ocular cues as indicators of fear, anger, happiness and sadness. A greater number of third-graders responded affirmatively to such questions as compared to fifth-graders, seventh-graders, and college students.
In contrast, when asked specifically about the eyes as indicators of love, third-graders less frequently responded affirmatively than older subjects.

ANOVAS - BELIEF QUESTIONS

Belief questions queried subjects about the eyes as indicators or communicators of emotions. In this analysis, for a priori reasons, responses to the 7 initial belief questions (5, 10, 12, 13, 15, 16, 17) were combined. These questions were selected because they appeared to represent the most direct questions regarding the eye as a communicator of emotion. In coding, an affirmative response was assigned a score of one and a negative response was given a numerical score of zero. Thus, in looking at a continuum of lower to higher scores, higher scores indicated beliefs in the eye as a communicator of emotion. Lower scores indicated fewer beliefs in the eye as a communicator. Recall that question 5 asked, "Can you tell how another person feels if you can only see their eyes and no other parts of the face?" Question 10, 11, 12, 13, 15, 16 and 17 asked subjects if they could tell, by specifically looking at the eyes and no other parts of the face, if another person is happy, angry, sad, afraid, loves another person, or is sick, respectively. This group
represented the greatest number of questions that could be appropriately included in the belief grouping. Maximum number for scores to the belief grouping of questions was 7 which would indicate no belief in the eye as an indicator of emotion. The minimum score that could be obtained was 0, indicating no affirmative beliefs in the eyes as communicators.

In an analysis of the 7 initial belief questions, a 4 (Grade) x 2 (Order: belief questions first vs. ocular identification questions first) x 2 (gender) ANOVA was performed on belief questions. Only one grade x gender interaction emerged (Table 8), $F(3, 179) = 3.61, p < .02$). Interactions in this investigation should be interpreted with caution and their examination were presented leading to larger scale analyses. In an analysis of the means, the most significant differences appeared between grade 5 females $M = 5.93$ and college males $M = 4.58$ (Table 9). Recall that higher means indicated greater beliefs in the eyes as indicators of emotion. These results indicated that males in college had fewer beliefs in the eye as an indicator of emotion than fifth-grade females. Fifth-grade and college females had higher means to belief questions than males
indicating greater beliefs in the eyes as communicators. Third and seventh-grade males had higher means to belief questions than females. Nearly identical results occurred when question 18 was dropped from the group.

In the next analysis (Table 10) responses to each of the four core emotion questions (10, 12, 13, 15) referring to happiness, sadness, fear and anger, were combined. Recall the same core emotions were represented by the four sets of eyes in ocular identification questions. This group of four questions was considered as tapping core emotions because they asked about the first four emotions (happiness, sadness, fear, anger) emerging in the development of emotion and they referred to emotions represented in ocular cue items as well. A 4 (Grade) x 2 (Order: belief questions first vs. ocular identification questions first) x 2 (gender) ANOVA yielded significant effects for order, $F(3, 179) = 7.38, p < .008$. Means for the order effect were as follows; order 1 $M = 3.23$, order 2 $M = 3.53$. In order 1 belief questions were administered prior to ocular identification questions. Belief questions followed ocular identification questions in order 2. Recall that for belief questions, responses were forced choice with yes coded as one and no coded as zero.
Table 8: Analysis of Variance Summary: Responses to Initial Belief Grouping of 7 Questions (5,10,12,13,15,16,17).

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>11.88</td>
<td>3</td>
<td>3.96</td>
<td>1.63</td>
</tr>
<tr>
<td>Order</td>
<td>3.80</td>
<td>1</td>
<td>3.80</td>
<td>1.56</td>
</tr>
<tr>
<td>Gender</td>
<td>.08</td>
<td>1</td>
<td>.08</td>
<td>0.03</td>
</tr>
<tr>
<td>Grade x Gender</td>
<td>26.36</td>
<td>3</td>
<td>8.79</td>
<td>3.61*</td>
</tr>
<tr>
<td>Grade x Order</td>
<td>5.26</td>
<td>3</td>
<td>1.75</td>
<td>0.72</td>
</tr>
<tr>
<td>Order x Gender</td>
<td>2.76</td>
<td>1</td>
<td>2.76</td>
<td>1.13</td>
</tr>
<tr>
<td>Grade x Order x Gender</td>
<td>3.79</td>
<td>3</td>
<td>1.26</td>
<td>0.52</td>
</tr>
</tbody>
</table>

N = 179

* p < .02
Table 9: Means for Initial 7 Belief Questions
(Maximum Possible Score = 7, Minimum Possible Score = 0)

<table>
<thead>
<tr>
<th>Grade</th>
<th>N</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>Male</td>
<td>25</td>
</tr>
<tr>
<td>Mean</td>
<td>5.60</td>
<td>4.75</td>
</tr>
<tr>
<td>SD</td>
<td>1.15</td>
<td>1.71</td>
</tr>
<tr>
<td>Grade 5</td>
<td>5.12</td>
<td>25</td>
</tr>
<tr>
<td>SD</td>
<td>0.97</td>
<td>1.02</td>
</tr>
<tr>
<td>Grade 7</td>
<td>5.81</td>
<td>26</td>
</tr>
<tr>
<td>SD</td>
<td>1.41</td>
<td>1.70</td>
</tr>
<tr>
<td>College</td>
<td>4.58</td>
<td>26</td>
</tr>
<tr>
<td>SD</td>
<td>2.08</td>
<td>2.10</td>
</tr>
</tbody>
</table>
Table 10: Analysis of Variance Summary of 4 Core Belief Questions (Questions 10, 12, 13, 15).

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>8.20</td>
<td>3</td>
<td>2.73</td>
<td>3.22*</td>
</tr>
<tr>
<td>Order</td>
<td>6.27</td>
<td>1</td>
<td>6.27</td>
<td>7.38**</td>
</tr>
<tr>
<td>Gender</td>
<td>0.00</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Grade x Gender</td>
<td>4.76</td>
<td>3</td>
<td>1.59</td>
<td>1.87</td>
</tr>
<tr>
<td>Grade x Order</td>
<td>1.09</td>
<td>3</td>
<td>0.36</td>
<td>0.43</td>
</tr>
<tr>
<td>Order x Gender</td>
<td>0.51</td>
<td>1</td>
<td>0.51</td>
<td>0.60</td>
</tr>
<tr>
<td>Grade x Order x Gender</td>
<td>2.56</td>
<td>3</td>
<td>0.85</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N = 179

* p < .03

** p < .008
Therefore, the results suggested that in order 2, when subjects answered belief questions following the experience of the identification of emotion utilizing only ocular cues, they exhibited greater beliefs in the eye as a communicator of emotion. As might be expected, there was also a grade effect, $F(3, 179) = 3.22, p < .025$ with means as follows: college $M = 3.04$, grade 3 $M = 3.42$, grade 5 $M = 3.53$, grade 7 $M = 3.64$.

The next analysis was on responses to the two belief questions most presumably indicative of sociocultural influences, questions 16 and 17. Recall, question 16 asked subjects, "Can you tell if a person loves another person by only seeing the eyes and no other parts of the face?" Question 17 asked subjects "Can you tell if a person is sick by only seeing the eyes and no other parts of the face?" Again, a 4 (Grade) x 2 (Order: belief questions first vs. ocular identification questions first) x 2 (gender) was performed, resulting in a significant interaction between grade x gender, $F(3, 180) = 2.80, p < .05$. In this analysis if subjects answered no they received a 0 and if they answered yes they received a 1. Thus the maximum possible score for this grouping was 2 and the minimum was 0. An
analysis of the means indicated that the most significant
differences appeared between third-grade females $M = 0.80$ and
seventh-grade males $M = 1.33$.

3. Individual Extramission Questions.

**Question 18.** Does anything come out of another person's
eyes, like rays, waves, energy, or something else, to tell
you how another person feels? and followup, What comes out of
the eyes to tell you how another person feels?"

Examining the frequencies of subjects' responses to
question 18, nearly 73% (142/196) of all subjects responded
negatively to the explicit extramission question asking
whether something comes out of the eye to communicate emotion
(Table 11). Individual analyses were performed to determine
that the differences were between seventh-graders and all
other subjects, $X^2(3, N = 195) = 11.47, p < .01$. In
contrast, college students responded with fewer affirmative
answers than all other age groups. An affirmative response
to question 18 resulted in further exploration. Specifically
a follow-up questions asked, "What comes out of the eyes to
tell you how another person feels?"

Few subjects responded affirmatively that something
comes out of the eyes during the communication of emotion.
The total number of responses to the follow-up in question
18, in fact, numbered only fifty. In an examination of responses to the extramission question asking, “What comes out of the eyes to tell you how another person feels?”, the most frequent response was energy (28%). There was a gradual increase in the frequency of “energy” responses emerged by grade. Third-graders offered no “energy” responses, whereas, twenty-nine percent of fifth-graders, thirty-five percent of seventh-graders, and forty percent of college students considered energy as the process by which emotion is communicated via the eyes.

**Question 19. Does it just seem like something is coming out of the eyes or is something really coming out of the eyes?**

The total frequency of subjects’ responses to question 19 demonstrated that the majority of subjects in the investigation believed, it only *seems like* something is coming out of the eyes to communicate emotion (68%). Among the 11.8% responding *something really comes out* there were six third-graders, eight fifth-graders and seventh-graders. Only two college students responded “something really comes out of the eyes to communicate emotion”. Interestingly, twenty percent of the sample, or thirty-nine subjects rejected both of the
Table 11: Frequency of Responses to Extramission Question 18 asking, "Does anything come out of another person's eyes, like rays, waves, energy, or something else, to tell you how another person feels?"

<table>
<thead>
<tr>
<th>Grade</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>11</td>
<td>42</td>
</tr>
<tr>
<td>n = 53</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>n = 53</td>
<td>26%</td>
<td>74%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>n = 43</td>
<td>47%</td>
<td>54%</td>
</tr>
<tr>
<td>College</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>n = 46</td>
<td>17%</td>
<td>83%</td>
</tr>
</tbody>
</table>

N = 196

\[ X^2 (3, N = 195) = 11.47, p < .01 \]
forced choice answers, responding "neither answer is correct because nothing comes out of the eyes".

Question 20. Can you actually feel what comes out of the eyes?

Sixty-nine percent of the sample responded negatively to question 20, with no significant effects for grade. Because college students responded with the fewest number of affirmative responses they were individually compared to all other groups. However there were no significant differences.

Question 21. What if another person is standing behind you and looking at you, but you can't see the person's face; can you still feel what they are feeling?

With eighty percent of the total sample responding negatively, no significant age effects emerged in the data. Twelve third-graders (22.6%), ten fifth-graders (18.9%), and twelve seventh-graders (27.9%) responded affirmatively when asked if they could still feel what a person was feeling if the person was standing behind them and they couldn't see the person's face. However, only five college students (10.6%) gave affirmative responses.
Question 22. Do feelings come out of the eyes like a breath comes out of the mouth?

A chi-square analysis of response frequencies to question 22 resulted in no significant age effects. Forty-two percent (82/196) of the total sample responded affirmatively with third, fifth and seventh-graders responding affirmatively over forty percent of the time. Only 32% (15/53) of college students responded affirmatively when asked the question, “Do beliefs come out of the eyes like a breath comes out of the mouth?”

Question 23. Can you tell what comes out of another person’s eyes if they are wearing glasses?

When subjects were asked if they could tell what comes out of another person’s eyes if they are wearing glasses, frequency data indicated that 67.4% (132/196) of the total sample responded affirmatively to question 23.

However, a different trend emerged with the analysis of this question. Specifically 74.4% (32/43) of all seventh-graders responded affirmatively - with a greater number of affirmative responses than emerged in all other grades. A partial explanation may be that such beliefs emerged and
Table 12: Frequency of Responses to Question 25, asking, "I've been asking you what you think about feelings coming out of the eyes. Does it matter if the person is a friend, relative or someone you don't know?"

<table>
<thead>
<tr>
<th>Grade</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td>n = 52</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td>n = 53</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>n = 42</td>
<td>19%</td>
<td>81%</td>
</tr>
<tr>
<td>College</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>n = 47</td>
<td>47%</td>
<td>53%</td>
</tr>
</tbody>
</table>

N = 196

\[ X^2 (3, N = 196) = 28.11, p < .001 \]
were queried on who you can feel more, a friend, relative or someone else?

Question 26. If yes, then who can feel more?

An inspection of frequency responses resulting from a chi-square test suggested no significant differences in the selection of forced choice answers including: friend, relative, someone else. A total of 41/155 subjects responded that relationship makes a difference in beliefs regarding feeling coming out of the eyes. Interestingly, twenty-three out of forty-one (56%) were college-students. A developmental trend was also apparent in the number of affirmative responses.

Specifically, only five subjects (12%) in the each of the third and fifth-grades responded affirmatively as compared to eight seventh-graders (20%) and, as mentioned above, twenty-two college-students. The data suggest an increasing developmental trend in beliefs that relationship influences the receptivity of emotion being transmitted via the eyes. These results replicate the findings of Winer, Cottrell, Karefilaki, and Chronister (1994) suggesting a developmental trend in beliefs regarding the influence of
relationships on the receptivity of emotion being transmitted via the eyes.

Of the three forced choice answers, friend, relative or someone else, subjects believed they could feel emotion coming out of a friend’s (65%) eyes more than relatives (32%) or someone else (2%). Therefore, the data suggest that the process of transmission of emotion via the eyes is influenced by the relation of the transmitter of the emotion to the recipient.

Question 27. Let’s say you are in the dark. Can you feel what comes out of another person’s eyes when you are in the dark?

Results of a chi-square analysis (Table 13) indicated significant grade effects in responses to a question exploring beliefs about feeling what comes out of another person’s eyes in the dark, $X^2(3, N = 194) = 7.87, p < .05$. Individual grade comparisons through chi-square tests revealed significant differences between responses of college students, fifth and seventh-graders.
Table 13: Frequency of Responses to Question 27 asking, "Can you feel what comes out of another person's eyes when you are in the dark?"

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>8</td>
<td>44</td>
</tr>
<tr>
<td>n = 53</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>4</td>
<td>49</td>
</tr>
<tr>
<td>n = 53</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>n = 43</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>College</td>
<td>3</td>
<td>44</td>
</tr>
<tr>
<td>n = 47</td>
<td>6%</td>
<td>94%</td>
</tr>
</tbody>
</table>

N = 196

\[ X^2 (3, N = 194) = 7.87, p < .05 \]
Question 28. If a person is happy does something come out of the eyes?

A chi-square test (Table 14) revealed significant age differences in subjects' responses to the question asking if something comes out of the eyes if a person is happy ($X^2(3, N = 196) = 22.48, p < .001$). Individual comparisons by separate chi-square analyses revealed significant differences between responses given by college students and fifth-graders as well as college students and seventh-graders. Another significant difference emerged between third and seventh-graders.

Question 29. If a person is angry does something come out of the eyes?

A chi-square analysis indicated the same trend in the responses to question 29, asking if a person is angry does something come out of the eyes, as was shown in response to questions 27 and 28. Individual grade comparisons through chi-square tests indicated that although college students (31.9%) again responded with the smallest number of affirmative responses, their responses were not significantly different than the responses of third-graders (41.5%).
Table 14: Frequency of Responses to Question 28 asking, "If a person is happy does something come out of the eyes?"

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>n = 53</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Grade 5</td>
<td>33</td>
<td>20</td>
</tr>
<tr>
<td>n = 53</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Grade 7</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>n = 43</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>College</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>n = 47</td>
<td>28%</td>
<td>72%</td>
</tr>
</tbody>
</table>

N = 196

\(X^2 (3, N = 196) = 22.48, p < .001\)
Responses given by college students were significantly different from responses given by both fifth (64.2%) and seventh-graders (62.8%) \((X^2(3, N = 196) = 14.74, p = .003)\).

Again, grades were dummy coded, in a comparison of responses given by students in college to responses given each other grade. Results indicated that responses from seventh-graders were significantly different from college students' responses, \(F(1, 192) = 9.07, p < .003\). Responses from college students were also different than those given by fifth-graders, \(F(1, 192) = 10.97, p < .002\).

**Question 30. If a person is sad does something come out of the eyes other than tears?**

A similar trend emerged in a chi-square analysis of question 30, asking if anything comes out of the eyes other than tears, to indicate emotion when a person is sad \((X^2(3, N = 196) = 17.18, p < .002)\). Individual grade comparisons through chi-square tests indicated that fifth and seventh-graders gave significantly more affirmative responses than college students and third-graders. Specifically, ten third-graders (18.9%) and nine college students (19.2%) responded yes as compared to 22 fifth-graders (41.5%) and 22 seventh-graders (51.2%).
Question 31. If a person is afraid does something come out of the eyes?

A chi-square test indicated significant differences in subjects' responses between grades, $X^2 (3, N = 196) = 16.69$, $p < .002$. Individual grade comparisons through chi-square tests indicated that college students responded with significantly lower number of affirmative responses (23.4%) than did fifth and seventh-graders. Specifically, fifth-graders (45.3%) and seventh-graders (65.1%) more often believed something comes out of the eye when a person is afraid when compared to college students.

Question 33. If one person loves another person does something come out of the eyes?

Frequency data in an additional chi-square analysis revealed significant grade effects when responses were analyzed to the question asking if something comes out of the eyes when one person loves another person ($X^2 (3, N = 196) = 9.21$, $p < .03$). Individual grade comparison through chi-square tests showed that college students responded with significantly fewer affirmative responses than subjects in both fifth and seventh grades. Responses from third-graders
were not significantly different than responses from college students.

**Question 34. If a person is sick does something come out of the eyes?**

Significant differences in responses emerged in a chi-square analysis, $X^2(3, N = 196) = 16.98, p < .002$. Again, individual grade comparisons indicated that college students (19.2%) and third-graders (22.6%) gave fewer affirmative responses than fifth-graders (43.4%) or seventh-graders (53.5%).

**ANOVAS – EXTRAMISSON OF EMOTION QUESTIONS**

Recall that ANOVAS were performed on seven initial belief questions including one general question (5) and six main questions (10, 12, 13, 15, 16, 17) exploring subjects’ beliefs regarding the eye as an indicator or communicator of emotion. Extramission of emotion questions were grouped for analyses in the same manner. Extramission of emotion questions included questions 18, 28, 29, 30, 31, 33, and 34. Question 18 queried subjects on beliefs regarding whether anything comes out of another person’s eyes, like rays, waves, energy, or something else, to tell you how that person feels? Questions 28 through 34 asked if something comes out
of the eyes if a person is happy, angry, sad, afraid, loves another person, or is sick. When analyzing responses to this initial group of extramission of emotion questions, no effects were significant.

Next, question 18 (the straightforward question regarding beliefs in extramission) was dropped, leaving a set of responses to six main questions (28, 29, 30, 31, 33, 34) regarding more implicit beliefs in extramission to be analyzed. The emotions asked about in these six main questions were also investigated in the main belief questions. When a 4 (Grade) x 2 (Gender) x 2 (Order: Belief questions first versus ocular identification questions first) ANOVA was performed on the six extramission questions excluding question 18, a significant effect emerged for grade, $F(3, 180) = 7.52, p < .0002$. An analysis of the means indicated that college students and third-graders significantly different than fifth and seventh-graders. The means, presented in descending order, were as follows: college $M = 1.51$, grade $3 M = 1.92$, grade $5 M = 3.06$ and grade $7 M = 3.58$. The same effects were found when the four core process (28 - happy, 29 - angry, 30 - sad, 31 - fear) questions were analyzed as a group.
In conclusion, the majority of subjects did not believe in an extramission theory of emotion via the eyes. Of all age groups investigated, fifth and seventh-graders were more inclined to believe that something comes out of the eyes to indicate how another person feels than third-graders or college students.


Recall, question thirty-five through question thirty-eight asked subjects to identify each of four specific emotions from a set of randomly ordered pictures of male eyes (Ekman, 1975) expressing happiness, sadness, fear and anger. Male ocular cues were followed by questions thirty-nine through forty-two representing female eyes. Subjects were asked to select the eyes representing anger, happiness, fear and sadness utilizing only ocular cues. The ocular identification questions were scored as either correct or incorrect. Responses were then coded 1 for a correct response or zero for incorrect response, allowing a maximum score of 8 and minimum score of 0 for the eight ocular identification questions. Results were then analyzed via ANOVAS, repeated measures ANOVAS and chi-square analysis. The analyses of the
ocular identification questions resulted in some of most interesting findings of the study.

**ANOVA Comparing Responses to Eight Ocular Identification Questions**

A 4 (Grade) x 2 (Gender) ANOVA was performed resulting in highly significant effects for age, $F(3, 188) = 7.05, p < .0003$. Additional analyses indicated that subjects in grade 3 scored significantly lower than subjects in other grades. The means, presented in decreasing order were as follows: grade college $M = 7.5$, grade 7 $M = 7.16$, grade 5 $M = 6.83$, grade 3 $M = 6.06$.

Since there was a significant grade effect when examining the responses to all ocular identification questions, another issue emerged. Sets of identical emotions in both male and female ocular cues were presented to subjects. Were developmental differences present in subjects' responses to cues representing male eyes vs. cues representing female eyes? There was an overall total of 111/784 incorrect identifications for male eyes compared to 114/784 incorrect identifications for female eyes. In this investigation the male cues were always presented first followed by the female ocular cues. It might have been supposed that, with practice
in identification of ocular cues, incorrect responses would decrease. However, there was not even a trend toward improvement with practice in the number of correct answers.

Separate analysis of variance for responses to male and female eyes revealed similar grade effects. The analysis for male ocular cues showed a significant grade effect, $F(3, 180) = 4.10, p < .008$. Recall that a correct identification of emotion was coded as one and an incorrect responses was coded as zero. Therefore, the maximum score was four and the minimum was zero for the set of male ocular cues. Analysis of the means indicated that grade three responses were significantly different from responses by subjects in all other grades (college $M = 3.7$, grade 5 $M = 3.57$, grade 7 $M = 3.49$, grade 3 $M = 3.02$).

The analysis of responses for female ocular cues also showed an effect for grade, $F(3, 180) = 6.75, p < .0003$ (Table 15). In the case of responses to female ocular cues, college students and seventh-graders gave significantly different responses than third and fifth-graders. Means presented in descending order are: college $M = 3.79$, grade 7 $M = 3.67$, grade 5 $M = 3.26$, grade 3 $M = 3.04$. 
Overall, the most significant trend in the initial analyses of ocular identification questions was a developmental trend across grades, indicating that with increased age, there was increased accuracy in the discrimination of emotion. Although there were no age differences in the subjects' beliefs that they could tell how another person feels when only seeing a person's eyes. There were differences in how accurate they were. It was observed that third-graders responded more impulsively, made more corrections and, as supported by the data, responded with more incorrect identifications.

In summary, the primary finding generated from analyses of responses to ocular identification questions was a significant grade effect, with third-graders exhibiting more difficulty than older subjects in discriminating between certain emotions conveyed by ocular cues.
Table 15: Analysis of Variance Summary of Female Ocular Identification Questions (Questions 39 - 42).

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>19.62</td>
<td>3</td>
<td>6.54</td>
<td>6.75*</td>
</tr>
<tr>
<td>Order</td>
<td>1.55</td>
<td>1</td>
<td>1.55</td>
<td>1.60</td>
</tr>
<tr>
<td>Gender</td>
<td>1.60</td>
<td>1</td>
<td>1.60</td>
<td>1.65</td>
</tr>
<tr>
<td>Grade x Gender</td>
<td>6.00</td>
<td>3</td>
<td>1.99</td>
<td>2.06</td>
</tr>
<tr>
<td>Grade x Order</td>
<td>6.98</td>
<td>3</td>
<td>2.33</td>
<td>2.40</td>
</tr>
<tr>
<td>Order x Gender</td>
<td>1.99</td>
<td>1</td>
<td>1.99</td>
<td>2.06</td>
</tr>
<tr>
<td>Grade x Order x Gender</td>
<td>.38</td>
<td>3</td>
<td>0.13</td>
<td>0.94</td>
</tr>
</tbody>
</table>

N = 196

* p < .0003
Question Group Comparisons

In the next analysis, I attempted to compare differences between belief, process and ocular identification question groups, initially through a more qualitative look at the data. Since there were an unequal number of questions in each group, I calculated the percent of affirmative and/or correct responses in each group. In this analysis, the total number of possible responses in each grade level were multiplied by the number of questions in each question group to establish the total number of all possible responses by grade. The actual affirmative responses given by subjects in each grade were then divided by the possible total, resulting in a percent of affirmative responses by grade. Recall that available answers to belief questions in this grouping were either yes or no. Therefore, a positive response to the questions in this grouping was considered an indication that subjects believed in the eyes as indicators of emotion.

Note that earlier in this section an initial group of 7 belief questions (5, 10, 12, 13, 15, 16, 17) was formed utilizing only those questions considered the most straightforward in tapping beliefs regarding the eyes as communicators of emotion. In this analysis examining the percent of
affirmative responses, 75.6% of subjects responded affirmatively to the belief question group, indicating beliefs in the eyes as indicators of emotion. Third-graders (73.1%), fifth-graders (79.3%) and seventh-graders (80.4%) exhibited a developmental trend in affirmative responses regarding the eye as an indicator of emotion. However, college students (69.9%) exhibited the fewest number of beliefs regarding the eye as a communicator.

I then examined the initial group of extramission questions. The extramission grouping of seven questions (18, 28, 29, 30, 31, 33, 34) formed an ocular extramission group which were considered to be most direct in probing for beliefs regarding the extramission of emotion. Again, subjects were asked to select from answers of yes or no. Affirmative answers to process questions were considered indicative of extramission beliefs in the communication of emotion. Of the total sample, only 30.46% of all subjects in the investigation responded affirmatively to process questions suggesting that they believed something comes out of the eyes during the communication of emotion.

When results were compared by grade a developmental trend emerged in third-graders through seventh-graders
(third-grade = 30.5% (113/371), fifth-grade = 38.3% (142/371), seventh-grade = 48.8% (147/301)). However, college students (24.5% or 79/322) answered with fewer affirmative responses to questions regarding beliefs of emotional extramission than did all other groups.

The final grouping in this analysis consisted of responses to the eight main ocular identification questions (35, 36, 37, 38, 39, 40, 41, 42). Recall that correct responses to ocular identification questions indicated subjects' ability to discriminate between four core emotions (anger, sadness, happiness, fear) using only ocular cues. Answers were coded either one for a correct response or zero for an incorrect answer. Responses to the ocular identification questions resulted in a clear developmental trend in the ability to discriminate between four core emotions when only using ocular cues (third-grade = 73.8% (313/424), fifth-grade = 85.1% (361/424), seventh-grade = 89.5% (308/344), college students = 93.9% (353/376).

Since my greatest interest was in differences between belief questions and ocular identification questions, a final analysis was performed. In this analysis belief and ocular identification groups were indicated as a percent of
affirmative/correct responses in a repeated measures ANOVA. Therefore, a score was developed for the belief question group as indicated by the subject's total actual score to the belief grouping divided by 7 (the number of questions in the belief group). The ocular identification group score was developed by indicating the total score for main ocular identification questions divided by 8 (the number of questions in the ocular identification group). In this approach each subject was assigned a percentage of total affirmative/correct responses possible for each subject. Results should be interpreted with caution as this is an exploratory analysis.

A 4 (Grade) x 2 (Gender) x 2 (Order: Belief Questions first versus ocular identification questions first) x 2 (Question Group: Belief vs. Ocular Identification) repeated measures ANOVA with repeated measures on the question group was then employed (Table 16). As was expected, the percent of affirmative/correct responses was significantly different between grades, $F(1, 187) = 4.66, p < .004$ with a significant grade x order effect, $F(3, 187) = 2.78, p < .05$. In addition a significant effect emerged for question groups with a grade x question group interaction, $F(3, 188) = 4.66,$
p < .004. Several findings of interest emerged in an analysis of the means (Table 17). Specifically, an analysis of the means indicated that grade three was significantly different than every other grade. At all ages, ocular identification means were always greater than belief means. The greatest differences in means between the belief question group and the ocular identification question group were found in responses by college students. Means for belief and ocular identification question groups were higher in order 2 where ocular identification questions were asked before belief questions.
### Table 16: Differences Between Belief versus Ocular Identification Groups (Percent to Total Affirmative/Correct Responses)

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>1.02</td>
<td>1</td>
<td>1.02</td>
<td>21.63****</td>
</tr>
<tr>
<td>Grade x Group</td>
<td>0.66</td>
<td>3</td>
<td>0.22</td>
<td>4.66***</td>
</tr>
<tr>
<td>Order x Group</td>
<td>0.13</td>
<td>1</td>
<td>0.13</td>
<td>2.74</td>
</tr>
<tr>
<td>Grade x Order x Group</td>
<td>0.07</td>
<td>3</td>
<td>0.02</td>
<td>0.51</td>
</tr>
<tr>
<td>Error</td>
<td>8.69</td>
<td>188</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td><strong>Between</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.65</td>
<td>3</td>
<td>0.22</td>
<td>4.66**</td>
</tr>
<tr>
<td>Order</td>
<td>0.002</td>
<td>1</td>
<td>0.002</td>
<td>0.04</td>
</tr>
<tr>
<td>Grade x Order</td>
<td>0.39</td>
<td>3</td>
<td>0.13</td>
<td>2.78*</td>
</tr>
<tr>
<td>Error</td>
<td>8.78</td>
<td>187</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

N = 188

**** p < .0001
*** p < .004
** p < .004
* p < .05
Table 17: Percent to Total Affirmative Responses: Means by Grade, Order and Question Group.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Order</th>
<th>Question Group</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Belief 1st</td>
<td>Belief</td>
<td>0.69</td>
</tr>
<tr>
<td>3</td>
<td>Belief 1st</td>
<td>Identification</td>
<td>0.71</td>
</tr>
<tr>
<td>3</td>
<td>Ocular 1st</td>
<td>Belief</td>
<td>0.77</td>
</tr>
<tr>
<td>3</td>
<td>Ocular 1st</td>
<td>Identification</td>
<td>0.81</td>
</tr>
<tr>
<td>5</td>
<td>Belief 1st</td>
<td>Belief</td>
<td>0.81</td>
</tr>
<tr>
<td>5</td>
<td>Belief 1st</td>
<td>Identification</td>
<td>0.91</td>
</tr>
<tr>
<td>5</td>
<td>Ocular 1st</td>
<td>Belief</td>
<td>0.77</td>
</tr>
<tr>
<td>5</td>
<td>Ocular 1st</td>
<td>Identification</td>
<td>0.80</td>
</tr>
<tr>
<td>7</td>
<td>Belief 1st</td>
<td>Belief</td>
<td>0.80</td>
</tr>
<tr>
<td>7</td>
<td>Belief 1st</td>
<td>Identification</td>
<td>0.94</td>
</tr>
<tr>
<td>7</td>
<td>Ocular 1st</td>
<td>Belief</td>
<td>0.83</td>
</tr>
<tr>
<td>7</td>
<td>Ocular 1st</td>
<td>Identification</td>
<td>0.86</td>
</tr>
<tr>
<td>College</td>
<td>Belief 1st</td>
<td>Belief</td>
<td>0.67</td>
</tr>
<tr>
<td>College</td>
<td>Belief 1st</td>
<td>Identification</td>
<td>0.98</td>
</tr>
<tr>
<td>College</td>
<td>Ocular 1st</td>
<td>Belief</td>
<td>0.73</td>
</tr>
<tr>
<td>College</td>
<td>Ocular 1st</td>
<td>Identification</td>
<td>0.90</td>
</tr>
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</table>
CHAPTER V

DISCUSSION

The overall purpose of this research was to investigate the relationship between developmental abilities to discriminate and perceive emotion from ocular cues and beliefs about the eye as an indicator and communicator of emotion. The responses to all the main questions in this study indicated that both children and adults believe that the eye is an indicator of emotion. In addition, the majority of subjects in this sample did not believe in an extramission theory regarding the communication of emotion. Specifically, subjects responded negatively to questions asking if anything, like rays, waves, energy or power, comes out of the eyes to communicate feelings. Finally, in the ocular perception questions, although most subjects were able to discriminate emotion using only ocular cues, results indicated a clear developmental trend, with third-graders giving significantly more incorrect answers than older
subjects. However, the data also held a number of surprises, not the least of which was the number of believers in the eyes as the primary feature in the facial communication of emotion.

Discussion of the Hypotheses

Hypothesis 1, which was based on Izard's (1971) results, predicted a developmental trend in the perception of emotion using ocular cues with adults giving more correct identification of emotions than younger children. Overall, the results supported hypothesis 1. With increased age there was an increase in correct responses when subjects were asked to discriminate between four basic emotions using ocular cues (College M = 7.51, Grade 7 M = 7.16, Grade 5 M = 6.83, Grade 3 M = 6.06). Although 84.2% of all subjects responded that they believed they could tell how another person feels when only seeing a person's eyes and no other parts of the face, younger subjects made more incorrect identifications appeared less confident in their responses during the administration of the questionnaire. Moreover, informal observations indicated that third-graders responded more impulsively and made more corrections. The data suggests that, with age and experience, competence in ocular identification improves.
Hypothesis 2 predicted a developmental trend regarding beliefs in the eyes to convey emotion. Several analyses were used to test this hypothesis. In one such analysis, an examination of responses to the item which asked specifically about the eyes as indicators of emotion failed to support the predicted developmental trend in beliefs regarding the eye as an indicator of emotion. When I looked at the frequency of responses to this item, no significant differences emerged by grade. In fact, results indicated the lack of order effects. Although the differences between grades were not significant, an only slightly greater percentage of younger subjects believed in the eye as a communicator of emotion in comparison to older subjects (College = 24%, Seventh Grade = 22%, Fifth Grade = 27%, Third Grade = 27%).

One of the main areas explored in this investigation involved whether children and adults could perceive or discriminate emotions involving only cues from the eyes. In hypothesis 3, subjects who answered identification questions first, were predicted to be more inclined to respond affirmatively to belief questions and extramission questions than those subjects who answered identification questions after belief and extramission questions. When responses to
questions regarding beliefs to anger, fear, happiness and sadness were analyzed as a group, the results supported this expectation. Recall that forced-choice responses included yes = 1 and no = 2. Therefore, lower means indicated greater beliefs. The data contained fewer affirmative responses to belief questions in order 1, where belief questions preceded ocular identification questions (M = 4.78), than in order 2 where belief questions followed ocular identification questions (M = 4.42). Therefore, the research experience of perceiving emotion by viewing ocular cues had an effect on beliefs regarding the eye as a communicator of emotion. However, note that the perception of emotion is a continuous, and often unconscious process, occurring numerous times per day in the normal course of development. Therefore, the perception of emotion cannot be isolated to the research context. Beliefs regarding the eye as a communicator cannot be linked to one particular research experience but are only one example of a continuous and somewhat unconscious discrimination of emotion.

Recall that 84.2% of the subjects responded affirmatively to the question asking, “Can you tell how another person feels if you can only see their eyes and not other
parts of the face?" Thus, although order effects were expected, what was not expected was that so many subjects believed in the eyes as communicators of emotion. The data suggest that subjects of all ages responded in a manner indicating beliefs in the eye as a communicator of emotion with or without the benefit of an immediate experience of the perception of emotion via the eyes.

In Hypothesis 4 a positive correlation between the perception of emotion and beliefs regarding the eye as a communicator of emotion was predicted. When the belief question groups were correlated with ocular identification questions no significant correlations were found. It is of interest however, that 85% (Question 5) of all subjects believed they could tell how another person felt by only seeing the eyes and no other parts of the face. Also note that eighty-five percent of all subjects correctly discriminated emotion using ocular cues. Therefore, beliefs and competence regarding the eyes as indicators of emotion appear to be related.

The extramission question asked about the specific mechanism by which emotions actually come out of the eye. For example, "if a person is happy does something come out of
their eyes?" Overall, Hypothesis 5 was based on prior findings in current developmental research asking children about what occurs during the act of vision. In Hypothesis 5, based on the results of Cottrell (1992) and Smith (1993), a developmental trend was predicted in responses to extra-mission questions. Specifically younger subjects were predicted to subscribe in greater numbers to an extramission theory of emotion than older subjects. This developmental trend was not supported by the data.

Consider, for example responses to question 18 which asked, "Does anything come out of another person's eyes, like rays, waves, energy, or something else, to tell you how that person feels?" When response frequencies were examined by grade, a slightly greater percentage of younger subjects were found to answer affirmatively to question 18 than older subjects (Grade 3 = 27%, Grade 5 = 27%, Grade 7 = 22%, College = 24%). Overall, very few subjects at any age believed in an extramission theory of emotion.

Over seventy percent of college students, fifth and third-graders responded negatively to the question asking if something comes out of the eyes to indicate how another
person feels (Question 18). However, frequencies of seventh-grade responses to this question were close to chance.

When I individually examined each extramission of emotion question involving a specific feeling state (anger, fear, happiness, sadness, love, illness), college students and third-graders answered affirmatively less frequently than all other grades. Responses to questions 28 and 29 which asked about happiness and anger respectively, resulted in a significantly greater number of affirmative responses from fifth and seventh-graders than third-graders and college students.

Recall that Hypothesis 6 was based on the results of Smith (1993) regarding the perceived ability to project or receive the looks of another human or animal. Hypothesis 6 predicted that answers to belief and process questions would vary, based on different emotional states referred to in the questions. For example, emotional states such as anger or fear would be perceived to project more often than other emotional states. This hypothesis was primarily based on the assumption that, from an evolutionary perspective, emotions which are more adaptive and perceived as stronger, fiercer or
more powerful would be perceived as having a greater ability to project than less powerful emotions.

There were only minor differences between responses to the extramission of emotion questions. Responses to questions regarding whether something comes out if a person is happy or angry were relatively equally divided between yes and no. However, for sadness and fear, the response pattern was more negatively weighted. Specifically, for fear, there was a total of 42.4% affirmative responses with 57.7% answering negatively. In a more dramatic pattern, only 32% of total subjects responded affirmatively to the question asking about the extramission of emotion when a person is sad. Questions regarding extramission during the emotions of happiness or anger received more affirmative responses than questions probing fear or sadness (although these differences were not significant). In short, these results only suggested differences in responses between emotions. These responses do not necessarily support an ethological perspective as posited in Hypothesis 6.

General Discussion

Based on the results of this investigation, the majority of subjects believed the eye is a primary communicator of
emotion. How might we explain the numbers of subjects in this research who subscribe to beliefs regarding the eye as a communicator of emotion? In all four age groups, over 80% of subjects responded affirmatively to beliefs regarding the eye as an indicator of emotion. Three out of four age groups in this investigation believed the eye to be the most important facial feature in the discrimination of emotion.

A significant developmental trend also emerged with older subjects ranking the eye as the most important facial feature in the indication of emotion. However, only 45% of third-graders ranked the eye as the most important facial feature indicating emotion. There was a progressive increase in beliefs regarding the eye as an indicator of emotion with age as suggested by 66% of fifth-graders, 77% of seventh-graders, and 79% of college-students. Responses to the question asking subjects to rank the most important feature in the discrimination of emotion were indicative of the developmental trend found in response to ocular identification questions.

In contrast, an opposite trend emerged when analyzing rankings involving the mouth. The majority of third-graders believed the mouth to be the primary indicator of emotion.
Fifty-five percent of third-graders indicated that the mouth was the most important facial feature in determining how another person feels. The remaining subjects in the investigation suggested a decrease in beliefs with age regarding the mouth as the key indicator of emotion: fifth-graders (32%), seventh-graders (21%), and college students (19%).

As might be expected from their beliefs regarding the mouth, third-graders had the most difficulty in the accurate discrimination of emotion when they were exposed to only ocular cues. Note the similar developmental trend in beliefs selecting the eye as the most frequently selected indicator of emotion and the subjects' increased accuracy in the discrimination of emotion with age.

Faces are composed of features that contribute to the distinction between specific emotion expressions. In numerous studies the perception of facial features was found to influence children's ability to discriminate the facial expression of emotion. Recall the research of Cunningham and Odom (1986) where children were most accurate when the match was based on the mouth and then on the eyes. Children made the most errors when the match was based on the nose. Gross
and Ballif (1991) suggested that, based on these findings, children give more weight to certain facial features than to others when matching facial expressions. Patterns indicative of children's misjudgments also suggested that they give more salience to certain facial features (Gross and Ballif, 1991). The results of this research would indicate that, in younger subjects, primary significance was attributed to the mouth whereas, older subjects regarded the eye as most important in the discrimination of emotion. The responses given by third-graders were suggestive of results of Cunningham and Odem (1986) who found that children (ages 5 through 11) were more likely to evaluate information from the mouth region first, the eye region second, and the nose region last. Responses given by older subjects were more indicative of the results of earlier studies indicating a hierarchy of eyes - mouth - nose.

Perhaps the older subjects in this investigation, through exposure to perceived ocular experiences and literary references, have developed what might be considered false beliefs overemphasizing the eye as the primary determinant in the discrimination of emotion, whereas younger children, presumably uncontaminated by social and literary references
to the eye, believe and utilize the mouth in the perception of emotion.

The overwhelming number of responses designating the eye as a communicator of emotion may also have been influenced by an introduction read prior to the administration of the questionnaire. Specifically, the introduction stated, "I am going to ask you several questions about how you tell what a person is feeling from the way they are looking at you. Some people believe that you can tell what a person is feeling by looking only at a person's eyes and not other parts of the face. What do you think?" It is possible that the ocular reference prior to the administration of any questions was perceived as a cue to respond affirmatively to belief questions regarding the eye as a communicator of emotion.

Facial components provide information about other people, their thoughts, beliefs, and behavior. Facial expressions are seen as only one component of a repertoire of expressive behaviors which is recognized as part of a organized script that can include a relevant cause, a subjective emotional state, and resulting behavior (Harris, 1989). But one question implicit in this research involves how children initially come to form beliefs regarding
different emotions. The origin of the understanding of the feelings of another person is part of a larger and more general capacity to make sense of other people's thoughts, desires, and beliefs. Frith (1989) suggested that the meaning interpreted from emotional expression lies in shared mental states, or awareness of other minds. Therefore, if there were no mental states, the language of the eyes would not exist. Based on these assumptions, would there be no perception of emotion without a belief system allowing for attribution and intentionality? Based on Fridja's theoretical orientation, beliefs would have to precede the experience of ocular identification.

The theoretical area often guiding the discussion of the formation of such beliefs as well as the discrimination and interpretation of emotion is theory of mind. Specifically, the perception of emotion is that on the basis of their own experience, children build up a set of emotional scripts in which particular situations are associated with particular emotions (Harris et al., 1989). Harris and colleagues (1989) suggested that "young children predict and explain emotion with reference to a theory of mind, or at least with joint reference to the key components of that theory, namely
beliefs and desires.” (p. 396). These authors also speculated about the cognitive processes that children deploy when they engage in such belief-desire reasoning. In this approach children are credited with a grasp of theoretical entities, such as beliefs, and it is assumed that they reason in a quasi-deductive or somewhat computational mode by retrieving theoretical statements utilizing causal links between beliefs and emotions (Leslie, 1988).

An alternative account is presented by Gordon (1986) and Goldman (1989) which predicts that other people’s emotions involve two steps: first, a set of pretend or make-believe premises, in which the beliefs of the other person are imagined; and secondly, the running of a simulation in which one’s own emotion is estimated. In this viewpoint young children’s beliefs are based on their own experience, rather than on deduction from a set of theoretical postulates.

This investigation deals with the issues of cognition and emotion. In order to discriminate emotions correctly using ocular cues, subjects were required to represent, compare, and choose between different ocular cues indicating emotional states. In order to carry out the discrimination task accurately, subjects were exposed to only one external
component used in determining how another person feels and had to internally represent a state that did not currently exist. With age, subjects demonstrated increased competence in their ability to extract the necessary information from only ocular cues.

An adaptive explanation could also be applied to the discrimination of emotion, which might also explain the great number of subjects holding beliefs regarding the eye as a communicator of emotion. Stein and Levine (1990) discussed a model of emotional experience and understanding using a cognitive system to monitor subjective states and bodily reactions. In their system "emotional reactions are those that involve the autonomic nervous system, as well as higher order thinking processes" (p.49). In Stein and Levine's (1990) system, emotional monitoring is carried out in an adaptive sense to move toward pleasurable states and away from aversive states. A representational system must be functioning in order to discriminate between emotions in other people and cognitively determine whether the monitored emotion is advantageous or aversive. Therefore, the discrimination of emotional states of others is adaptive in
providing information regarding the potential impact of future situations.

Also recall that in a previous section of this dissertation the adaptive significance of the eye in infancy was suggested. In addition there is an extensive body of literature discussing the adaptive significance of the eye in animals. Perhaps there is some innate adaptive significance in the eye and gaze which is then reinforced by life experiences resulting in beliefs regarding the eye as a communicator of emotion.

What is the source of knowledge underlying beliefs regarding the eye? Gopnick and Graf (1988) suggested that "understanding the sources of a belief is important because it involves understanding how things in the world give rise to beliefs through perception and inference". How do beliefs emerge and where do they originate? Most adults are able to determine the source of their belief whether it is based on inference, visual inspection, or knowledge passed from others (Gopnick and Graf, 1988).

However, younger children sometimes have difficulty integrating mental representations and their causal links (Gopnick and Graf, 1988). One issue in this investigation
was whether children would associate the causal link between mental representations they used to discriminate emotions to their beliefs regarding the eye as a communicator of emotion. Results suggested that affirmative beliefs regarding the eye as a communicator were more prevalent after they experienced ocular identification, suggesting that experience had an impact on beliefs.

The majority of subjects in this investigation believed in the eye as an indicator of emotion and were also more accurate with age in the discrimination of emotion using only ocular cues. The results of this investigation support developmental trends found in studies of global facial expression (Izard, 1971) (for a review of the literature see Gross and Ballif, 1991) that children’s recognition of facial expressions of emotion increase in accuracy with increasing age.

Reichenbach and Masters (1983) found improvement in recognition was related to age as well as the particular affect displayed. Results of prior research have indicated that children have discriminated happiness correctly more often than all other expressions (Ireson and Shields, 1982) followed by expressions of sadness, anger and fear. The
perception of emotion utilizing ocular cues follows a slightly different trend. In this investigation there were no significant differences in correct responses between emotions. However, anger was most correctly identified, followed by happiness. Fear and sadness had an equal number of correct identifications.

Additional findings of interest also emerged during the investigation of beliefs regarding extramission. Of all four age groups investigated, fifth and seventh-graders were more inclined to believe that something comes out of the eyes to indicate how another person feels than third-graders or college students. One possible explanation for these results may lie in the early adolescent's tendency to conform to the context and line of questioning in the research experience.

In one such study Costanzo (1970) looked at conformity in a sample of males ranging in age from 7 to 21 years. He found the greatest percentage of conformity to be in adolescents, ages 12-13 and 16-17. Perhaps the fifth and seventh-graders in this investigation were most influenced by contextual influences of the questioning procedure and merely acquiesced by responding affirmatively to process questions.
A further explanation relating to this tendency to conform might be that fifth and seventh-graders are more socially aware and involved in beliefs regarding what peers are thinking and feeling as it relates to increased self-consciousness as supported by concepts such as imaginary audience and adolescent egocentrism. The increase in affirmative responses by fifth and seventh-graders may be explained as the result of influences of an internal state on self-consciousness. This tendency toward increased self-consciousness is increased in adolescence based on Elkind’s (1976) construct of imaginary audience. The aspect of intensified interpersonal peer relationships found in middle childhood and early adolescence could potentially intensify self-consciousness. I might suggest that the adolescent population, more than any other, would believe in the ability to feel the emotions of others based on Elkind’s (1967) construct of imaginary audience. It could also be suggested that younger adolescents would have greater beliefs in the extramission of emotion than older adolescents.

The importance of this study cuts across many areas of psychology. Constructs such as imaginary audience have been widely recognized for providing a framework for interpreting
a variety of commonly observed adolescent behaviors (Breneman, 1990). Insofar as proposed and/or exaggerated manifestations of egocentrism are regarded as an index of maladjustment (Elkind, 1967; Lapsley & Rice, 1988), the identification of cognitive results of egocentrism has potential clinical implications. This study was designed to investigate similarities and differences between knowledge and competence in the perception of emotion. The results are of interest because they show variations in beliefs versus knowledge regarding the perception of emotion at different ages. In particular we can potentially show types of errors or myths that may be dispelled by teaching. Developmental data provides initial clues as to the origins of such beliefs.

The long term objectives of this research are to assist in the explanation of behavior through a better understanding of the development of beliefs and the components involved in the perception of emotion as well as assisting in the better understanding of education through the elimination of false beliefs and myths. Results of this research should also assist in identifying facial features that are prone to influence the perception of emotion and have an impact on
behavior. There are clinical implications as well in the search to understand better the interpretation of the beliefs and emotions of others as well as the manifestations of exaggerated self-consciousness, its origins and the situational factors intensifying it. The suggestion of a relationship between children's understanding of emotion and disabilities that may affect the quality of a child's social experiences needs to be investigated further.
Eyes Questionnaire

I am interested in what you think about how you tell what another person is feeling. In particular, I am curious about what you think the eye can tell us about the feelings of another person.

Belief Questions

I am going to ask you several questions about how you tell what a person is feeling from the way they look at you.

1. Do you think you can tell what another person is feeling if you can only see a person’s face and nothing else? For example, do you think that you can tell if another person is happy or sad if you can only see a person’s face? Yes ____ No ____

2. What part of the face tells you the most how someone feels?

   Nose   Mouth   Eyes   Ears   Cheeks

   What is the next most important Part? Keep going until you have rated all five parts of the face.

3. What feelings can you tell if you can only see another person’s face and no other parts of the body?

4. Do you think you tell how another person feels is you can only see a person’s mouth and no other parts of the face? Yes No

5. Can you tell how another person feels if you can only see their eyes and no other parts of the face? Yes No  Cover face with eye card

6. What is most important about the eyes that tells you how a person is feeling? shape ___ size ___ color___ direction ___ how they move?___

7. What else about the face tell you how a person feels?

8. Does it matter what color the persons eyes are?

9. If yes, then ask - What color tells you if a person is happy___? angry___? sad___? afraid___?
Let's say that someone is happy. Can you tell if a person is happy by only looking at that person's eyes and no other parts of the face? Yes  No

Can you see in a completely dark room? Yes  No

Let's say someone is angry with you. Do you think you can tell if a person is angry by only looking at that person's eyes and no other parts of the face? Yes  No

Let's say someone is sad. Can you tell if a person is sad by only looking at that person's eyes and no other parts of the face? Y  N

Do you smell with your eyes? Yes  No

Let's say someone is afraid. Can you tell if a person is afraid by only looking at that person's eyes and no other parts of the face? Yes  No

Let's say that one person loves another person. Can you tell if a person loves another person by only looking at another person's eyes and no other parts of the face? Yes  No

Can you tell if a person is sick by only looking at that person's eyes and no other parts of the face? Yes  No
**Extramission Questions**

Now I'm going to ask you some questions about how you tell what another person feels if you can only see their eyes.

18. Does anything come out of another person's eyes, like rays, waves, energy, or something else, to tell you how that person feels? Y N

19. Does it just seem like something is coming out of the eyes or is something really coming out of the eye? Seems like ____ Really____

20. Can you actually feel what it is comes out of the eyes? Yes No

21. What if a person is standing behind you and the person is looking at you but you can't see the person's face: can you still feel what they are feeling? Yes No

22. Do feelings come out of the eyes like a breath comes out of the mouth? Y N

23. Can you tell what comes out of the eyes if the person is wearing glasses? Y N

24. Do you think you can see through a solid brick wall? Yes No

25. I've been asking you what you think about feelings coming out of the eyes. Does it matter if the person is a friend, relative or someone you don't know? Yes ____ No ___

26. If yes, then who can you feel more? friend relative someone else

27. Let's say you are in the dark. Can you tell what comes out of another person's eyes when you are in the dark? Y N

___ If a person is happy does something come out of their eyes? Y N

___ If a person is angry does something come out of the eyes? Y N

___ If a person is sad does something come out of the eyes? Y N

___ If a person is afraid does something come out of the eyes? Y N

32. Can you see with your ears? Yes ____ No___

___ If one person loves another person does something come out of the eyes? Y N

___ If a person is sick does something come out of the eyes?
Identification Questions

Lay the sheet with four different sets of eyes in the center of the desktop facing the subject. On the back of the emotion card there will be a number. Pick up emotion card #1 and instruct the subject to pick the eyes that show emotion. Indicate the number of the subjects answer below.

Male

Emotion 1 (Anger) ________
Emotion 2 (Happy) ________
Emotion 3 (Fear) ________
Emotion 4 (Sad) ________

Male

Emotion 1 (Anger) ________
Emotion 2 (Happy) ________
Emotion 3 (Fear) ________
Emotion 4 (Sad) ________

Probe Questions

Have you ever felt someone looking at you when you couldn’t see their eyes? Yes _____ No _____

If the answer is yes, tell me what you remember about that time.

Can you tell by looking at someone’s face that they are happy and sad at the same time? Yes _____ No _____
REFERENCE LIST


Pratt, C. & Bryant, P. (1990). Young children understand that looking leads to knowing (so long as they are looking into a single barrel) Child Development, 61, 973-982.


