

DEVELOPMENTAL CHANGES IN THE SELECTION OF  
DIFFERING EMOTIONAL CUES

by

Jon Mayhew

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APPROVAL

Name: Jonathan Charles Mayhew

Degree: Master of Arts

Title of thesis: Developmental Changes in the Selection  
of Differing Emotional Cues

Examining Committee:

Chairperson: Dr. Paul Bakan

---

Dr. Janet Strayer

---

Dr. Roger Blackman

---

Dr. Robert Ley

---

Dr. Tony LePage  
External Examiner  
Director  
Department of Psychology  
Children's Hospital  
Vancouver

Date Approved: \_\_\_\_\_

Oct. 20, 1983

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Author: \_\_\_\_\_

(Signature)

Jonathan Charles Mayhew

(Name)

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(Date)

## ABSTRACT

The purpose of this study was to investigate a possible developmental shift in the use of different communication channels that indicate emotion. A videotape was presented to adults, 9 year olds, 7 year olds and 5 year olds in which a 12 year old actress simultaneously portrayed emotion in three communication channels: facial expression, vocal tone and verbal message. A total of 24 trials was presented: for 6 trials the same emotion was portrayed in all three channels and for 18 trials one channel portrayed an emotion which was incongruent with the other two channels. Subjects were asked to label how the actress felt and this label identified the channel chosen by them as communicating the expressed emotion. This procedure also permitted identification of whether older observers would characteristically choose the emotion conveyed by two congruent channels.

As hypothesized, it was found that facial expression was overwhelmingly salient for older subjects. However, verbal message was significantly more salient than the other two channels for 5 year olds. The vocal channel was rarely the channel of choice across age groups, even when observers were specifically prompted as to the importance of this channel in indicating emotion. Contrary to expectations, there was no age-related increase in the choice of a two-channel in contrast to a one-channel emotional message.

Results have interesting implications for young children's interpretations of double messages in which intentional or unintentional inter-channel incongruence is introduced. Proposals are made for future research in the area.

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## A. INTRODUCTION

The purpose of this research is to investigate developmental changes in the use of different communication channels (facial expression, vocal tone and verbal message) in the identification of an actor's prevailing emotion. Accurate perception of the emotional states of others is undoubtedly a desirable, if not essential, skill for any established social group. Social cognition fosters successful interpersonal communications both at the macro level of international diplomacy and the micro level of interpersonal relationships. Obviously, in order to develop this skill, observers must become familiar with methods used in their society to display emotion. In the case of humans, exhibition of emotion involves coordinating discrete communication channels, each with a unique style of expression. Thus the observer need not rely solely on a verbal message to infer how another is feeling. Verbal messages are typically delivered in a tone characteristic of the stated emotion and accompanied by a facial expression bearing the same functional relationship to the emotion as does the verbal message. For example, a downturned mouth and plaintive quality to the voice may be as reliable as the phrase "I'm really sad" in indicating an actor's emotion.

Facial expression as one indicator of emotion has been widely studied by researchers from various disciplines. Charles

Darwin (quoted in Schneider, Hastorf and Ellsworth, 1979, p.206) believed that facial expressions constitute vestiges of functional movements once used in arousing, survival situations and that, consequently, these expressions are innate and universal within a species. To test his assertions, Darwin invented the "Judgment Study" (Ekman, Friesen and Ellsworth, 1972, p.153) in which subjects were asked to judge the emotion being experienced by a model on the basis of a photograph or, as is sometimes now the case, a motion picture. If observers proved to be accurate on this task, one must agree with Darwin that there is a systematic relation between facial expression and emotion, albeit not necessarily innate. Inaccuracy of judgment would not conclusively demonstrate randomness of expressive information. It may be that the observers have not yet learned the nature of the emotion-facial expression link, that the model is a poor encoder of emotions, or that these cues typically occur in situational context so that the mock-ups are not ecologically veridical.

Results of such judgment studies proved equivocal. Irrespective of the methodological and interpretive possibilities noted above, early researchers (e.g., Feleky, 1914 and Langfeld, 1918) held that their findings of low judgment accuracy and high inter-judge disagreement supported a viewpoint of no systematic relation between facial expression and emotion. The early studies, however, often suffered from serious methodological flaws in their choice and labelling of emotions

and, according to Woodworth (quoted in Schneider, Hastorf and Ellsworth, 1979, p.208) used methods and materials which could be held directly responsible for an underestimation of the accuracy of emotional judgment from facial expression. As examples of methodological flaws, virtually synonymous terms such as "astonishment" and "amazement" were frequently regarded as separate categories, a very limited range of emotions was characteristically used as were drawings which poorly represented the emotions portrayed.

A major reassessment of beliefs regarding the accuracy of facially based emotional judgments resulted in modified views about the informativeness of the face. Thus, both Ekman (1972) and Izard (1971) hold that, with simple emotions such as happiness and sadness, the face can, but does not have to be, informative as to the emotion being experienced. A lack of informativeness may, for instance, be caused by a conscious inhibition of the facial expression of an emotion such as would be the case in a society where display rules require the suppression of public displays of strong emotion. Accordingly, Ekman, Friesen and Malstrom (quoted in Ekman, Friesen and Ellsworth, 1972, p.165) noted that, in an interview situation, Japanese subjects publicly masked expressions when referring to stress inducing stimuli which had previously given rise to facial expressions of negative emotion when the subjects had believed themselves to be unobserved. Bearing this limitation in mind, modern research findings seem to be far more supportive of

Darwin's views in that cross-cultural agreement on identification of posed photographs of facial expressions of emotion has been attained at much higher than chance levels. Amongst these supportive findings, Izard (quoted in Ekman, Friesen and Ellsworth, 1972, p.158) presented 32 photographs to observers in eight different language culture groups. When asked to label the emotions being experienced in the photographs, there was a high consistency rate obtained across cultures as to the emotion being expressed. Perhaps more dramatic than Izard's findings were those of Ekman and Friesen (1971) working with the pre-literate Fore people of New Guinea. Those chosen as subjects had never seen a motion picture, knew no English and no pidgin, had not lived in any civilized community and had not worked for a Caucasian. Despite the above conditions, the Fore subjects consistently chose the same photographed facial expressions as representing particular emotions as had previously been chosen by members of several literate cultures.

It would seem, therefore, that the face is, in some very real way, a mirror for the underlying emotions. It is surely functional for this to be so in that looking at someone's face will often indicate in what manner that person should be approached or avoided. Whether the same function is always served for young children as well as adults is not so clear. Bugental, Kaswan, Love and Fox (1970), for instance, used a 13 point rating scale where colours, rather than words, were used to represent different degrees of positive and negative

evaluation. The colours ranged from vivid orange, for the highest positive evaluation, through pale orange, neutral white and grey to black, for high negative evaluation, and subjects were asked to rate the positivity or negativity of three channel messages (i.e., facial expression, vocal tone, verbal message) by pointing to a segment on this scale. They found that children between the ages of 5 and 8 years responded to a woman's smile as relatively neutral and requiring support from other communication channels to be perceived as positive. In contrast, older children and adults responded to a woman's smile as being positive. Related to this, a later study (Bugental, Kaswan and Love, 1970) found that, whereas adults would interpret negative messages coupled with positive facial expressions as jokes, young children tended to ignore the positive facial expression and would concentrate on the negative message in resolving the contradiction between verbal and non-verbal channels.

Thus, questions arise concerning whether a young child uses facial expression to infer emotions, as well as the relative salience of facial cues compared with other communication channels i.e., vocal tone and verbal message. With respect to the first question, the evidence would seem strongly to support the position that young children can, indeed, recognize emotions from facial expressions. Izard (1971) demonstrated that recognition of emotions from photographed facial expressions developed from an average accuracy of about 45%, at 30 months of age, to an adult level of 75% accuracy at 10 years of age. A

similar developmental course was found by Ekman and Oster (1979). Camras (1980) found that children as young as 5 years could accurately select photographs depicting emotions to be exhibited in conflict situations. The accuracy of 4 to 6 year old children's recognition of emotions, portrayed in posed photographs, is reported to be influenced by the particular emotion being identified regardless of race or sex of the child observers with happiness being the most accurately perceived emotion (Gitter, Mostofsky and Quincy Jr., 1971). Individual differences were reported, however, by Walker (1981) who found differential abilities between normal and certain clinical groups in identifying facial expressions of emotion, with schizophrenic children notably less accurate than normals and other clinical groups. In light of these and other studies using social roletaking tasks (Burns and Cavey, 1957), which require accurate recognition of facial expression, the basic ability of young children to perceive facial expressions of emotion seems to have been established.

Establishing the relative salience of facial expression amongst other emotional indicators is a far more complex question which involves, at least, model and observer age and sex, situational variables and past experience. Originally a linear model, in which different channel inputs were added or averaged, was proposed for the cognitive integration of communication channels in arriving at a decision concerning the predominant emotion conveyed (Mehrabian and Wiener, 1967).

Subsequent work (e.g., Bugental, Kaswan, Love and Fox, 1970) indicates, however, that such a model is relevant only if the emotional message in one channel is unaffected by the presence of an emotional message in another communication channel. These researchers found that, for both adult and child decoders, interpretation of a message in one channel was affected by the nature of the message in other channels. Inherent in this was a strong redundancy factor. Thus, whereas Mehrabian's model would predict each successive channel input adding as much to the overall evaluative rating of a message as the previous input, Bugental et. al. found that each successive input contributed less to the rated evaluative meaning of the message than did the previous input. An example of this would be the propensity of young children to devalue a positive facial expression, from a mother, in the presence of a negative verbal component.

Bugental and colleagues (1970) found evidence suggesting a possible negatively biased discounting process, especially on the part of 5 to 12 year old children by which, if one auditory channel (script or voice) was negative, a positive component in the other auditory channel would be disregarded. For example, a message comprising the statement "Thanks a lot for your help" would be evaluated negatively if the tone of delivery was negative. Related to this, they also found that a communication in which a speaker's smile was accompanied by a critical statement was far more negatively rated by 5-12 year old children than by adults, particularly when the actor was female.

As the authors suggest, such a finding brings into question the advisability of imparting to young children joking messages in which intentional inter-channel incongruity is introduced. In a follow-up study, Bugental, Love and Gianetto (1971) videotaped both normal and disturbed children, mostly boys, interacting with their parents in a clinic waiting room. Across both groups, fathers were found to make significantly more positive statements while smiling whereas mothers' smiles were seemingly unrelated to the positivity of their verbal utterances and were perhaps indicative of a social convention which causes positive expressions in females to be considered normative. A woman's smile might, therefore, become less meaningful for a child than that of a man.

Accepting the fact that a multitude of variables may affect the relative weightings of channels, the most important initial question is: Can consistent preferences be established? The research to this point would seem to indicate that, with some qualifications, the answer is yes. Yes, because trends have been recognized. Qualifications, because the assortment of materials, age groups, methods and situations used to answer these questions has, in no way, been consistent.

In two earlier studies (Mehrabian and Ferris, 1967 and Mehrabian and Wiener, 1967) only two channels were compared. Using adult females as both models and subjects, Mehrabian and Ferris presented taped messages, independently judged to be neutral in content, and posed photographs of females' neutral,



friendly or hostile facial expressions. In assessing the encoder's message, subjects weighted facial expression more than vocal tone in a 3:2 ratio. Mehrabian and Wiener contrasted the importance of vocal tone against verbal message using adult females as encoders and adult males and females as subjects. A collection of words was independently rated as positive, neutral or negative affect communicating words, tape recorded in differing emotional tones and presented to subjects. It was found that assessment of encoder emotion was based mainly on vocal tone. Thus it would seem that, for this adult sample, the more "subtle" cues of tone, rather than verbal content, were most attended to in this conflict situation. Summing results across both studies, the order of preferred channel selection for adults was visual over vocal, with verbal being the least preferred. This order of preference may be due to the assumption, in our culture, that non-verbal expressions of emotion are less intentional, less controllable and, therefore, genuine. Because of this perceived lack of intentionality, we attribute these non-verbal expressions to reactions to external stimuli. Therefore, more interest is centered on what caused a particular facial expression rather than on what purpose that facial expression serves (Schneider, Hastorf and Ellsworth, 1979, p.124).

Obviously, in attempting to generalize from the findings of Mehrabian and his co-workers to developmental concerns regarding emotion processing, the paradigm should be extended to include

child subjects and child encoders. This is one of the objectives of the present study. In addition, a paradigm that incorporates facial expression, vocal tone and verbal message in one procedure will be examined. This permits testing of whether the visual over vocal over verbal preference order, found for adults (Mehrabian and Ferris, 1967, Mehrabian and Wiener, 1967) holds up when three channels are simultaneously compared. If not, the simple additive model is not supported. Furthermore, instead of using static photographs with accompanying tape recordings, the use of filmed sequences with soundtrack should be more realistic. These considerations led to the present study. Several previous studies support the procedure decided upon in the present work, and indicate further research questions that are of immediate interest.

One of the first experiments incorporating some of the procedural elements just discussed has already been cited (Bugental, Kaswan, Love and Fox, 1970). Using 12 adult non-professional actors, four positive scripts were delivered by means of televised scenes in all combinations of positive or neutral picture and voice. In addition, four negative scripts were delivered in all combinations of negative or neutral picture and voice, and eight neutral scripts were delivered in positive, negative or neutral picture and voice. There were five subject groups: 5-8 year olds, 9-12 year olds, 13-18 year olds, as well as the subjects' mothers and fathers. A consistent, but statistically non-significant trend was noted with children,

especially in the youngest age groups, being influenced by verbal message or vocal tone more than by facial expression. Preference for the verbal channel could be based on cognitive immaturity which causes young children to focus on the channel requiring the least inference or interpretation. Preference for the vocal channel over the visual channel is more puzzling considering that vocal tone would appear to comprise the more "subtle" cue. However, the age-span within each group of the study cited may have been too large to detect developmental changes in processing of emotion information. In contrast to results reported above (1970), in pilot work for this study, five 5 year old children, while showing most preference for the verbal channel, uniformly chose the visual channel over the vocal channel in those few trials where one of these channels was preferred. This preference for visual above vocal channel cues is expected for the youngest age group in the present study.

An additional question of developmental interest is whether previous results illustrate the operation of an interest component rather than subjects' competence. In support of this preference/competence distinction, Savitsky and Izard (1970) found that although children seem capable of decoding facial expressions of emotion at a young age, 4 year olds are more likely to assess similarity of facial photographs on the basis of accessories, such as a hat, than on the basis of emotional expression. These findings suggest that young children can

decode emotional expressions if these comprise the only information but will select more concrete cues, such as clothing, as the basis for categorization if the latter cues are available in a comparison situation. Along similar lines, children may be able, but not choose to weight vocal tone unless it is the one variable factor in a choice situation. For example, Bugental (1974) found that verbal content was given higher weighting if delivered in a sincere tone.

Another related issue, but one not specifically investigated in the present study, concerns the correlates and possible determinants of children's emotion decoding abilities. Daly, Abramovitch and Pliner (1980) found children's decoding abilities to be positively related to their mothers' facial encoding abilities. Brooks, Brandt and Wiener (1969) found that low socioeconomic status children, especially, were more responsive to verbal message than to vocal tone when receiving conflicting messages. Whereas these findings should be considered in designing a study of the salience of different channels in conveying emotion, other studies, cited previously, suggest that there are no main effects for race of child perceiver or of adult encoder (Gitter, Mostofsky and Quincy Jr., 1971). In addition, main effects for sex of decoder have not been found (Bugental, Kaswan, Love and Fox, 1970; Camras, 1980; Gitter, Mostofsky and Quincy Jr., 1971).

A final issue, germane to the present study and previous related research, is that, in any study of the salience of

competing channels in conveying differing emotions, there is the assumption that at least one of the messages must be false. From work done with high school students, Friedman (1978) has come to question this assumption and suggests that different channels may serve different functions for the observer. For example, he suggests that facial cues may be used to infer the affective component of attitudes and verbal cues to infer the cognitive component. Alternatively, one channel may reflect the momentary emotion and another predict subsequent behaviour. While such ideas are challenging, it remains important to discover if there are developmental changes in the salience of these different channels for observers.

The present study was designed to see whether there are consistent and age-related preferences in channel selection amongst children when perceiving a stimulus child simultaneously expressing emotions via three channels: facial, vocal and verbal. The design avoids some interpretative difficulties in earlier research since there are no contextual influences, no inter-actor variables such as sex, race or encoder performance and no use of authority or maternal figures. The messages, spoken by a 12 year old girl, are either congruent e.g., "I'm really happy", delivered with a smiling face and a happy vocal tone or incongruent e.g., "I'm really happy" delivered with a frown and a sad vocal tone. The expectation is that young children, faced with incongruent emotional messages, will weight the verbal channel and disregard the visual and vocal channels.

Specifically, the hypotheses are as follows. When single channel information is used, there will be an initial preference for the verbal channel and a developmental shift from verbal to either visual or vocal in the channel chosen as a function of age. This hypothesis is based on present pilot study as well as published findings indicating that young children show a preference for the verbal channel, interpreted as reflecting young children's limited understanding of emotional control and/or dissimulation, i.e., that the verbal channel is the least subtle of the three and is the easiest to regulate voluntarily, thus requiring the least cognitive maturity for interpretation in this context.

An age-related decrease is expected in the use of a single, incongruent communication channel for decoding the actor's emotion. In other words, as children get older they more often identify the actor's emotion as that portrayed by two channels (in whatever combination) rather than by one channel. This hypothesis is also based on pilot study findings in which young children were found to utilize single channel messages more often than did adult subjects. Consistent with both Piagetian notions of cognitive decentration and information processing notions, the consideration and coordination of multiple viewpoints (or channels of information) is more cognitively advanced than is the use of a single, incongruent channel that captures one's attention.

In order to investigate the preference/competence distinction, half of the subjects in each age group will , before being presented with the emotional messages, be prompted with instructions as to the importance of vocal tone in indicating a model's true emotion. The vocal channel was chosen based on pilot findings that young children report relative ignorance of the vocal channel. Hopefully, this condition will indicate whether neglect of vocal cues constitutes an inability to use vocal emotional information in the presence of contradictory verbal or visual information (a competence variable) or a more conscious discounting process which may be altered by experimenter prompting (a performance variable). The expectation is that all subjects will increase selection of the vocal channel under prompt conditions with young children more likely to change to vocal channel selection than older children and adults due to ceiling effects predicted for the older subjects who already use the vocal channel as emotional information without benefit of the experimenter's prompt.

## B. METHOD

### Stimulus Person

The actor in the present study was a 12 year old female in the 7th grade, who had professional acting experience. In a study by Feldman, Jenkins and Popoola (1979), 7th graders were found to be particularly good actors irrespective of whether they were being verbally truthful or deceptive. By contrast, 1st graders seemed unable to pretend convincingly that an unpleasant experience was actually pleasant and adults tended to be more positive after an unpleasant experience than after a pleasant one. It was anticipated, therefore, that the present actor had a good facility for simulating emotions.

### Subjects

Subjects in four age groups (5 year olds, 7 year olds, 9 year olds and adults) were obtained by circulating requests both in Simon Fraser University undergraduate psychology classes and in two campus newspapers. Most of the child subjects were, accordingly, the children of university faculty or students and all were, on the basis of parental report, known to be functioning adequately in school and peer relations. The adults



were also drawn from a university population. Each group was likely, therefore, to be relatively homogeneous in terms of cultural background and socioeconomic level. All subjects were paid \$5 for participating in the study. A total of 74 subjects participated in two experimental conditions. The adult and 7 year old groups each comprised 10 females and 10 males. Due to difficulties in obtaining 9 year old and 5 year old subjects, each of these groups had only 17 subjects. The mean ages of subjects within experimental conditions is shown in Table 1.

Table 1. Mean and standard deviation of subject age by condition.

<u>Age</u>	<u>Condition</u>			
	<u>No Prompt</u>		<u>Prompt</u>	
<u>Group</u>	<u>N</u>	<u><math>\bar{X}</math> Age(S.D.)</u>	<u>N</u>	<u><math>\bar{X}</math> Age(S.D.)</u>
5 Years	5m,5f	5.39(.30)	3m,4f	5.47(.23)
7 Years	5m,5f	7.27(.38)	5m,5f	7.33(.37)
9 Years	5m,5f	9.55(.28)	3m,4f	9.40(.42)
Adults	5m,5f	26.06(7.00)	5m,5f	26.94(5.68)

m-male;f-female.

The age groups were chosen on the basis of pilot findings that the experimental choice behaviour of 5 year olds was consistent but different from 10 year olds who were similar to adults in their experimental choices. The 7 and 9 year olds were,

therefore, included to assess possible transition points in selective uses of information studied in this experiment

### Experimental Materials

A video film was presented comprising two different randomized orders of 12 trials presenting a 12 year old female actor conveying basic, simple emotions (i.e., happiness, sadness, anger) in three communication channels: facial expression, vocal tone and verbal message (i.e., statements of "I'm really happy", "I'm really sad", "I'm really angry"). All emotions were congruent in three trials. In nine trials, one emotional message was discrepant from those displayed in the other two channels. For example, sad facial expression and sad vocal tone were paired with happy verbal content. The incongruent trials aimed at maximum discriminability by pairing one positive and one negative emotion. Sad-angry combinations were not portrayed in order to limit possible confusion arising between the two negative emotions. The emotional combinations which were actually portrayed in the video film are as listed in Table 2 with "H" representing happiness, "S" representing sadness and "A" representing anger.

Table 2. Emotional combinations portrayed in the stimulus film.

	<u>Facial Expression</u>	<u>Vocal Tone</u>	<u>Verbal Message</u>
Congruent trials:	H	H	H
	S	S	S
	A	A	A
Incongruent trials:	H	H	S
	S	S	H
	S	H	H
	H	S	H
	H	S	S
	S	H	S
	H	H	A
	A	H	A
	H	A	A

H - happy  
 S - sad  
 A - angry

Of the 27 possible permutations from the three different emotions and three different channels, 12 were not filmed as they violated the requirement of at least two congruent channels or of no sad-angry combinations. Three other combinations were lost in the editing process and it was impossible to recall the actor to retape these scenes. The combinations in question were happy face and happy message and angry tone, happy tone and

happy message and angry face, and angry face and and angry tone and happy message. Despite the omission of these combinations, the 12 trials used were balanced with respect to the number of times one channel was incongruent with the other two congruent channels.

The stimulus film was produced at the television studios of Simon Fraser University using a professional director, cameraman and editor. To assess the veridicality of emotional messages, for every trial each channel was independently rated as to the emotion portrayed by three adults familiar with the procedure. Only when all raters agreed on the veridicality of the message in each channel was the trial accepted for the final film. This required an average of three takes for each trial.

On two trials, namely happy face, sad voice and sad words and happy face, sad voice and happy words, agreement could not be reached on veridicality in all channels. The actor could not convincingly portray these mixed messages and dubbing was, therefore, employed in these trials to achieve a believable mixture of happy visual content and sad vocal content.

### Procedure and Design

There were four groups in each of the two conditions (adults, 9 year olds, 7 year olds, 5 year olds) with each "no prompt" group comprising 5 males and 5 females. In the "prompt" condition, the adult and 7 year old groups comprised 5 males and

5 females but the 9 year old and 5 year old groups each comprised 3 males and 4 females. Both conditions took approximately 20 minutes to run per subject, with small time variations being due to such variations as subject age and richness of answers. The overall design required repeated measures for four age groups, with two conditions as the between group variable and three channels as the within group variable.

Condition 1. No prompting: the experimenter gave the following instructions to each subject before running the videotape. "I have a film of a girl to show you. I want you to figure out how she feels, like if she is happy, sad or mad. Sometimes it will be really simple but sometimes it will be hard to figure out how she feels. It's o.k. if you are not sure because sometimes it is hard to tell. Each part is very short so pay close attention." After each trial, the tape was stopped and the subject was asked: "How does the girl feel?" In situations where the emotion portrayed in two channels was selected, the subject was also asked: "How do you know?" or "How can you tell?" With this question, it was possible to discover whether, when a two channel message was chosen, one channel (e.g., "She was smiling") or both (e.g., "She sounded happy and she was smiling") of the two congruent channels were salient.

Condition 2. Prompting of the vocal channel: The same procedures and instructions as Condition 1 were followed. However, before showing the videotape, the question was put to a subject: "Is there anything in the sound of a person's voice

apart from the words they use that tells you how they feel? Like if I say: We're having ice-cream for dinner, how do I feel? (This statement was conveyed in both a happy and a sad tone of voice.) That's right, the sound of a person's voice can tell us how they feel. Now when you watch the film, remember that." Provisions were made to drop from further testing subjects who could not, even when given the "ice-cream" prompt, answer the above question. This eventuality did not arise, however, as no subject was unable to answer the question. The videotape was then run, as in the first condition, but the experimenter, at three to five trial intervals, with decreasing frequency, reminded the subject of the importance of vocal tone with the words: "Remember how important the sound of her voice is."

Under both conditions, when a subject's responses reflected only the verbal content channel, the subject was asked, at the conclusion of testing, to identify still photographs of a happy face, a sad face and an angry face, extracted from the videotape. No subject failed to identify accurately facial expressions of the subject emotions.

### C. RESULTS

Initial sex (two) x channel (three) repeated measures analyses of variance were conducted for each age group to see if present results supported earlier findings of no observer sex differences on this kind of task. As expected, there were no significant main effects for sex or sex x channel interactions in any of the four age groups. For all further analyses, therefore, sex was excluded as a variable in the calculations.

Initial results concern age-related findings for channel preferences in the unprompted condition, i.e., when subjects were not prompted as to the importance of vocal tone in indicating emotion. The first dependent variable used for assessing changes in use of different communication channels was the number of times a subject chose an emotion which was conveyed in the single, incongruent channel. In every 24 trial experimental session each channel was presented as the single, incongruent channel on six occasions. Accordingly, given 10 subjects per age group, the maximum score is 60 for any channel. There was a very obvious and expected developmental increase across the age span in the selection of the visual channel as illustrated by Table 3 which indicates the number of times that subjects chose messages which were portrayed in the one channel that differed from content conveyed in the remaining two. A complementary and expected developmental decrease was also

obvious with older subjects essentially ignoring the verbal channel when it was not supported by other channels. The two youngest age groups never chose the vocal channel and it was chosen only 1.7% and 5% of the time by the two older groups. It should be stated here that the two younger subject groups were heterogeneous in that subjects chose either the single visual channel or the single verbal channel but not both.

Table 3. Number and percent of times unprompted observers chose the emotion message in a single, non-congruent channel (Maximum-60).

<u>Channel</u>	<u>Age</u>			
	<u>Adults</u>	<u>9 Years</u>	<u>7 Years</u>	<u>5 Years</u>
Visual	56(93.3%)	53(88.3%)	39(65.0%)	18(30.0%)
Vocal	3( 5.0%)	1( 1.7%)	-	-
Verbal	1( 1.7%)	-	13(21.7%)	34(56.7%)

A two-way, repeated measures analysis of variance (four age groups x three channels) was performed to assess the significance of findings reported in Table 3. The results are presented in Table 4. As predicted, there was both a highly significant main effect for channel usage,  $F(2,72)=52.06$ ,  $p<.001$  and a highly significant interaction between age and channel



usage,  $F(6,72)=8.12$ ,  $p<.001$ . No support was obtained for the hypothesis that reliance on a single, incongruent channel would decrease with age since there was no significant main effect for the number of times different age groups used single channel information,  $F(3,36)=1.66$ ,  $p>.10$ .

Table 4. Two-way, repeated measures analysis of variance of channel usage across age groups.

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Age (A)	3	.48	1.66
Error	36	.29	
Channel (B)	2	175.44	52.06 *
A x B	6	27.38	8.12 *
Error	72	3.37	

\*  $p<.001$

An analysis of variance of the simple effects of channel selection at different ages was also carried out to examine the significance of channel selection preferences at each of these ages. At each age, there was a significant simple effect attributable to the predominance of one channel, with visual being the channel of choice for all except the youngest age groups:  $F(2,18)=118.66$ ,  $p<.001$  for adults,  $F(2,18)=459.50$ ,  $p<.001$  for 9 year olds,  $F(2,18)=7.21$ ,  $p<.01$  for 7 year olds. In

contrast, the verbal channel was the most salient choice for 5 year olds,  $F(2,18)=4.00$ ,  $p<.05$ . It must be taken into account, once again, that the results in the two younger age groups indicate that significantly more subjects consistently responded to one channel than to another with visual being the channel of choice for most 7 year olds and verbal being the channel chosen by most 5 year olds.

An analysis of the simple effects of age on each channel confirmed what also seems apparent in Table 3 regarding the simple effects of age. There was a significant developmental increase in the use of the visual channel,  $F(3,36)=9.75$ ,  $p<.001$  and a significant developmental decrease in the use of the verbal channel,  $F(3,36)=6.54$ ,  $p<.01$ . The lack of usage of the vocal channel, on its own, is well illustrated by Table 3 and this is reflected in a lack of a significant simple effect of age on the vocal channel usage,  $F(3,36)=1.43$ ,  $p>.25$ .

In looking at changes in the usage of two channel explanations (e.g., "She's happy because she looks it and says so"), Table 5 illustrates that spontaneous, two channel explanations were never given by 5 or 7 year old subjects. Such explanations were first noted in the 9 year old sample and increased in both frequency and proportion of total two channel responses with the adult sample. These results provide only partial confirmation of the hypothesis that use of convergent (two channel, congruent) information should increase with age. Whereas verbal report of awareness of two channel, congruent

information increases with age, actual use of such information in deciding how the stimulus child felt remains fairly constant across the age range sampled.

Table 5. Number of times that unprompted observers gave a two channel explanation when choosing a message portrayed in two congruent channels (Maximum-180).

	<u>Age</u>			
	<u>Adults</u>	<u>9 Years</u>	<u>7 Years</u>	<u>5 Years</u>
Total two channel selection	99(55.0%)	111(61.7%)	114(63.3%)	118(65.6%)
Total two channel explanations	28(28.3%)*	11(9.9%)*	-	-

\* Percentage of two channel selection

Given the two age groups that actually did report being influenced simultaneously by two channels, a one-way analysis of variance (Table 6) indicated that adults did, indeed, give significantly more two channel explanations than did 9 year olds when choosing a message portrayed in two congruent channels,  $F(3,36)=7.29$ ,  $p<.001$ . The important point to be made here is that the older age groups did not choose two channel explanations more often but did, when choosing two channel messages, spontaneously report being influenced by two channels more than did younger subjects.

Table 6. One-way analysis of variance of the use of two channel explanations.

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Age	3	17.49	7.29*
Error	36	2.40	

\*  $p < .001$

The following results concern channel selection under prompt conditions designed to direct attention to the vocal channel. Findings are based on full data from the 7 year old and adult groups, and additional inspection of data from a reduced sample in the 5 and 9 year old groups. Two separate measures were employed to assess possible increased usage of the vocal channel under conditions of prompt. Dependent measures were the choice of a message conveyed only in the vocal channel (Table 7) and the use of explanations incorporating the vocal channel when choosing a message conveyed in the vocal and one other congruent channel (Table 8).

Table 7. Number and percent of times prompted and unprompted observers chose the message in the single, non-congruent vocal channel (Maximum-60).

	<u>Age</u>	
	<u>Adults</u>	<u>7 Years</u>
No prompt	3(5.0%)	-
Prompt	7(11.7%)	7(11.7%)

Table 8. Number and percent of explanations given incorporating the vocal channel when choosing a message portrayed in the vocal and one other channel (Maximum-120).

	<u>Age</u>	
	<u>Adults</u>	<u>7 Years</u>
No prompt	28(23.3%)	-
Prompt	46(38.3%)	50(41.7%)

In order to assess whether explicit prompting of the vocal channel resulted in an increased use of single vocal channel messages, a two-way, between subjects analysis of variance was conducted on the data in Table 7. The results of this analysis (Table 9) illustrate a significant increase in the use of the single vocal channel under prompt conditions,  $F(1,36)=5.41$ ,  $p<.05$  but no significant difference between adults and 7 year olds in switching to the vocal channel under conditions of vocal prompt,  $F(1,36)=.41$ ,  $p>.25$ .

Table 9. Two-way analysis of variance of the use of a single vocal channel explanation under conditions of vocal prompt.

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Age (A)	1	.23	.41
Condition (B)	1	3.03	5.41*
A x B	1	.23	.41
Error	36	.56	

\*  $p<.05$

An additional two-way, between subjects analysis of variance was also carried out to discover whether increases occurred in explanations incorporating the vocal channel and whether these increases were age related (Table 10). As in the

previous analysis of vocal channel selection, there was a main effect for increased use of vocal channel explanations under the vocal prompt condition. This time, however, there was a significant age x condition interaction with a significantly greater shift to vocal channel explanations by 7 year olds than by adults,  $F(1,36)=6.31, p<.025$ .

Table 10. Two-way analysis of variance of the use of an explanation incorporating the vocal channel when choosing a message portrayed in the vocal and one other channel.

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Age (A)	1	14.40	3.55
Condition (B)	1	115.60	28.47*
A x B	1	25.60	6.31**
Error	36	4.06	

\*  $p<.001$

\*\*  $p<.025$

## D. DISCUSSION

The results of this study provide clear support for the first hypothesis concerning age-related changes in decoding emotion information presented across three communication channels. There was a clear developmental progression from a tendency to rely only on the verbal channel, even when this was incongruent with the visual and vocal channels, to an overwhelming reliance on the visual channel, even when this was incongruent with the verbal and vocal channels. The vocal channel did not appear spontaneously salient for any group. There was also a significant increase across the age span in the reported simultaneous use of cues from two channels. However, despite the statistically significant increase in verbally reported awareness of two channel information, there was no decrease in the use of a single, incongruent communication channel for decoding the actor's emotion. Furthermore even mature observers do not commonly report utilizing information from two communication channels when assessing another's emotional state. Adults, for instance, gave a two channel explanation for a two channel choice about a third of the time, 9 year olds on just over one in ten trials and 7 and 5 year olds not at all.

The intention of the prompt condition was to examine the distinction between a preference for a particular channel in



contrast to an inability to attend to information from another channel. During the prompt condition subjects were, therefore, directed to attend to the least "preferred" channel of emotion information which, in this context, was the vocal channel. In particular, it was expected that young children would have the most to gain from prompting and be more likely to increase their selection of single vocal channel messages under vocal prompt conditions than would be older children and adults. This hypothesis was only partially supported by a comparison of the performances of the 7 year olds and adults. Both groups showed only small increases in vocal channel selection under prompt conditions. However, an increased number of vocal information trials might provide a better test of the effects of explicit channelling or training of attention to vocal cues. That the relative neglect of the vocal channel is due to preference or selectivity of attention, rather than to inability to decode such information is supported by present findings that 7 year olds did exhibit a significantly greater increase than adults in explanations involving the vocal channel when choosing a message conveyed in both the vocal and one other channel. This finding provides partial support for the expectation that young children would have the most to gain by exposure to explicit prompting conditions.

## Developmental Shifts in Channel Usage

The seeming ignorance or dismissal of vocal and visual cues displayed by most 5 year olds would appear to have some important implications for the use of double messages with children of this age and younger. It is a common occurrence for a parent to use a negative verbal message and to attempt to moderate the impact by delivering the message in a positive vocal tone or with a smiling face. As an example of these mixed messages, Bugental, Kaswan and Love mention the "joking" message where both the verbal and vocal components are negative but the visual component is positive. Given the findings of this study, it is likely that most 5 year olds will misconstrue, by attending predominantly to the verbal message, communications in which interchannel incongruence is introduced, either intentionally, as in sarcastic or joking communications or perhaps unintentionally, as in verbal-bound, mixed messages.

By the age of 9 years, however, children generally seem to adhere to adult strategy which may reflect an understanding that the verbal channel is the least subtle and the easiest consciously to manipulate. From the age of 9 then, less credence may be given to verbal messages which disagree with accompanying visual messages. It might be speculated that the verbal channel becomes a less effective indicator of emotional state while continuing to function essentially as the primary cognitive communication channel. Such a change in channel function would

appear to fit in with findings on social perspective taking tasks (Selman, 1975) in which 5 and 6 year olds interpreted another's feelings on the basis of how that person said they felt. This impression is supported by the fact that, after participating, nearly all of the adult and 9 year old subjects reported that the words spoken by the actor had very little effect on their assessment of her emotional state.

It would seem, therefore, that sometime between the ages of 5 years and 9 years most children reliably learn that the easiest of the communication channels for an observer to interpret is also the easiest of the communication channels in which to be deceptive. Specifically when this change to a more mature mode of communication of emotion occurs would seem to vary even within a homogeneous child population all known, on the basis of parental report, to be in an age-appropriate school grade and to function adequately in social relations.

The 7 year old subject group illustrates the above well as 20% of these children always selected the verbal message when conveyed in a single, incongruent channel and never selected the message conveyed by the incongruent visual channel. In contrast, 30% of the 7 year olds always selected the visual message when conveyed in a single, incongruent channel and never selected the incongruent verbal message and the remaining 50% of 7 year olds sometimes selected the visual channel but, at other times, selected a message carried simultaneously in both vocal and verbal channels. Like the 7 year olds, 5 year olds also were a

heterogeneous group in terms of channel selection with 50% of them always selecting the verbal message when conveyed in a single, incongruent channel and never selecting the message conveyed by the single, incongruent visual channel and 10% of them always selecting the visual message when conveyed in a single, incongruent channel and never selecting the single, incongruent verbal message. Of the remaining 40% of 5 year olds, 10% sometimes selected the incongruent verbal channel but at other times selected a message carried simultaneously in both visual and vocal channels and 30% sometimes selected the incongruent visual channel but at other times selected a message carried in both vocal and verbal channels. The pattern of results, amongst 7 and 5 year olds, suggests that children may first acquire a strategy discounting the message conveyed by an incongruent verbal channel and then selectively tune in to the visual channel.

#### Attention to Two Congruent Channels

Although there is a definite change in the specific channels selected and an increase across this age span in the spontaneous reporting of two channel messages, there is no increase in use of two channel messages (corresponding to the lack of decrease in the use of single channel messages). Thus the hypothesis of an age-related decrease in the use of a single, incongruent channel for decoding emotion was not

supported. What did appear to be evident was that, for mature subjects, facial expression was the most reliable emotional indicator irrespective of whether the visual channel was congruent or incongruent with the vocal and verbal channels. These data suggest, therefore, that the use of two congruent channels does not by itself reflect greater cognitive maturity than the use of a single, incongruent channel. It is rather the specific channel chosen which best reflects age-related changes.

The point to be borne in mind, however, is that subjects' verbal reports of their selective processing of information did reflect age-related changes in abilities to deliberate upon and verbally convey two-channel information. When subjects were asked how they knew how the girl felt, the older subjects did, indeed, report being influenced by two channels significantly more than did younger subjects. In fact, 7 year olds and 5 year olds never spontaneously reported being affected by two channels. Even the adults, though, reported being influenced simultaneously by two channels on only 28% of the two channel trials.

Inevitably the issue of assessing the role played by each channel in multichannel determination of emotion conveyed is problematic. Although each subject was asked what specific cues determined his or her identification of the actor's emotion, there is really no guarantee that a channel which was not cited as important did not, nevertheless, contribute to the overall assessment of the experienced emotion. It might be that a

non-cited channel strongly influences how the actor's emotional state is perceived, but that the observer is not consciously or verbally aware of this influence. What the present findings do tell us, however, is that these selection processes become more accessible with age to verbal report, suggesting that age-related developments in cognitive monitoring processes are responsible for these changes. Present results also indicate that, whether or not the selection process is reflected in subjects' verbal reports, there is age-related consistency in the channels selected as the most salient communicators of emotion.

#### Importance of Visual, Vocal Tone and Verbal Information Channels

One of the most obvious findings of this study was a somewhat unexpected and very strong visual bias of adults and 9 year olds when assessing the actor's emotional state. When considering the reasons for this bias or preference, the tendency to disregard an incongruent verbal message has already been explained in terms of the lack of subtlety or relative ease of control and dissimulation of emotion conveyed in this channel. Such an argument cannot, however, be applied to vocal tone. Vocal tone, with its capacity to transmit a multitude of delicate nuances, intuitively seems the most subtle of the three communication channels. Yet the present results support Mehrabian and Wiener's (1967) findings that tone was dominated

by vision in emotion judgment of the adult sample. One wonders why this channel should be so disregarded by cognitively mature assessors of emotion. Perhaps Ekman and Friesen (1975, p.19) ✓ have tapped the reason for this unwillingness to rely on the vocal channel when they indicate that whereas the face is a primary, clear and precise signal system for emotional expression, vocal tone can convey in only a general way whether the experienced emotion is positive or negative. For example, vocal tone might clearly indicate that the emotion is negative but lacks the ability to indicate, on either the encoding or decoding or both ends of the communication process, whether the specific emotion is sadness, anger, fear or disgust. It may be that in normal interactions the essential function of vocal tone is to cue the attention of the observer to a positive or negative emotion, at which stage the face will then specify what the particular emotion is.

One additional point which has not been made yet but which could be relevant to this ignorance of the vocal channel concerns the way in which intonation is, to a great extent, trained out of our speech. From earliest times, young children are exhorted not to whine when they speak and cultural pressures are applied throughout our lives to prevent us from revealing too much emotion in the tones of our voices. It might be, therefore, that by our methods of training speech, we ensure a deficit in the area of recognition of emotion from vocal tone.

Despite a statistically significant increase in the use of a single vocal channel, results obtained under conditions of vocal prompt reinforce a belief that observers of all ages do actually fail to attend or lack the competence to identify an emotion portrayed only in the vocal channel. In neither the statistically analysed adult and 7 year old data nor the visually inspected data from 9 and 5 year olds was an emotion chosen more than 20% of the time when it was conveyed only by the vocal channel. The finding that 7 year olds, under conditions of vocal prompt, were more likely than adults to change to a vocal explanation when choosing a message conveyed in the vocal and one other channel cannot really be interpreted as a similar trend was not observed in either the 9 year old or the 5 year old group.

#### Methodological Issues and Suggestions for Future Research

All trials, except for one, were identified by observers as conveying an emotion which was actually being portrayed in at least one of the channels. One of the trials (sad face, happy voice, sad verbal message) consistently failed to evoke recognition in older subjects of an emotion portrayed in any of the three channels. Instead, these older subjects most consistently perceived the actor as being angry whereas younger subjects typically chose sad as the emotion portrayed. Perhaps this finding should not be surprising when one considers that



older subjects relied mostly on visual and vocal channels. Both anger and sadness are manifested by negative facial expressions. In addition, the happy tone of the actor's voice is far more similar in terms of energy output to an angry vocal tone than to a sad vocal tone. If the strategy used, therefore, is essentially to discount the verbal channel it seems reasonable to perceive the visual and vocal channels as congruently angry rather than as sad and happy respectively.

It was not the intention of this study to investigate whether there are developmental changes in the ability to accurately identify specific emotions. The weight of research suggests that happiness is reliably recognized earlier and more easily than any other emotion. However, in testing the 5 year old subjects, the pattern of results suggest that these children were responding to a specific channel irrespective of which emotion was portrayed in that channel. Indeed, at no age was there evidence of subjects changing their response mode on the basis of a specific emotion being represented in different channels.

Whenever one conducts a study tapping an ecologically important concept, such as the salience of emotional cues, there arises the problem of defending the use of a laboratory setting to study a process which normally takes place against a rich contextual background. In other words, there is a requirement of ecological validity to consider. Mook (1983) gives, perhaps, one of the best defences applicable to present procedures and

findings. By controlling extraneous variables, it must be concluded that resultant findings may not be mirrored exactly in complex, real life settings. However, something very important can be derived from the laboratory experiment which is relevant and generalizable to a real world setting, and that is an understanding of a basic process which operates both in the laboratory and the real world but which is moderated in the latter by more varied contextual influences.

To get a better idea of how and when the obtained verbal bias shifts to a visual bias in emotional decoding, this study could be replicated, adding a 4 year, 6 year and 8 year age group. Present findings suggest that this change occurs for most children between the ages of 5 years and 7 years with a few already attending to the visual channel at 5 and a few others still attending to the verbal channel at 7. By the age of 9, however, children's selection of visual over verbal information seems to accord with adult findings. There is no suggestion from the existing literature that the developmental shift in channel bias is anything but linear. However, to account for the possibility of non-linear shifts in the use of emotion information channels, adolescent age groups might be included in future research.

Given that 9 year olds seem to respond to the same communication channels as do adults when given multi-channel information, it would be interesting to investigate the interpretations or attributions made, in addition to the

saliency already documented, for this favoured visual channel. For example, are 9 year olds more willing to accept that facial expression of emotion is a sincere, reactive rather than purposive, manipulable behaviour? One way to tap any differences in "face value" in the present study would be to present subject groups with some kind of sincerity scale on which they could indicate the extent to which they believed the actor's facial expression indicated the actor's true feelings. This procedure could, of course, also be applied to other channels in order to assess the perceived sincerity of verbal messages, for example.

Finally, what has been presented here is a study of how, in a population of normal and probably advantaged children, one communication channel is supplanted by another as the primary indicator of the emotional states of others. To the extent that present findings are generalizable for average samples along the age-range studied, a most interesting extension of the present paradigm would include a comparison of age-related developments in selective attention to processing of emotion information in selected psychopathological groups or in groups of children known to show difficulties or abnormalities in emotional functioning.

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