FACIAL EXPRESSION DECODING DEFICITS AMONG
PSYCHIATRIC PATIENTS: ATTENTION,
ENCODING, AND PROCESSING

DISSERTATION

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By

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Psychiatric patients, particularly schizophrenics, tend to be less accurate decoders of facial expressions than normals. The involvement of three basic information processing stages in this deficit was investigated: attention; encoding; and processing. Psychiatric inpatients, classified by diagnosis and severity of pathology, and nonpatient controls were administered seven facial cue decoding tasks. Orientation of attention was assessed through rate of diversion of gaze from the stimuli. Encoding was assessed using simple tasks, requiring one contrast of two facial stimuli and selection from two response alternatives. Processing was assessed using a more complex task, requiring several contrasts between stimulus faces and selection from numerous response alternatives. Residualized error scores were used to statistically control for effects of attention on task performance. Processing task performance was evaluated using ANCOVA to control for effects of encoding.

Schizophrenics were characterized by generalized information processing deficit while affective disorder...
subjects evidenced impairment only in attending. Attention impairments in both groups were related to severity of psychopathology. Problems in encoding and processing were related only to a schizophrenic diagnosis. Their decoding deficits appeared attributable to general visuospatial discrimination impairment rather than repression-sensitization defenses or the affective connotation of cues.

Adequacy of interpersonal functioning was associated with measures of attending and processing but not encoding. The measures of encoding, however, may have lacked adequate discriminating power due to low difficulty.
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# FACIAL EXPRESSION DECODING DEFICITS AMONG PSYCHIATRIC PATIENTS: ATTENTION, ENCODING, AND PROCESSING

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CHAPTER I

INTRODUCTION

Current evidence suggests that psychiatric populations may be impaired in their ability to accurately perceive emotional states or attitudes in others (Morrison & Bellack, 1981). Rosenthal, Hall, DiMattes, Rogers and Archer (1979) found a group of psychiatric patients with mixed diagnoses to be less accurate in decoding nonverbal, visual, and vocal stimuli than a group of normal controls. Schizophrenics were poorer decoders than were neurotics who were, in turn, less accurate decoders than normals. Shannon (1970) found that hospitalized schizophrenic subjects were poorer in recognizing emotions from photographs of facial expressions than hospitalized depressive subjects, and the depressives were less accurate than a group of hospitalized medical patients. Walker (1981) noted that anxious-depressed children showed a less pronounced emotion recognition deficit than schizophrenic children, but were significantly less accurate than normal children in recognizing emotions from facial photographs.

Each of the above studies involved the perception of affective facial cues, a skill which is extremely important for a number of reasons. First, these stimuli are generally the first, and often the only, cues available to indicate
how others are responding to us. Also, social conventions may minimize positive, and especially negative, verbal feedback outside of fairly close relationships. Secondly, as noted by Rosenthal et al. (1979), facial cues provide more information, or at least permit more accurate judgments of another's internal affective state, than do cues from any of the other nonverbal channels. These findings lead to the visual primacy hypothesis of De Paulo, Rosenthal, Eisenstat, Rogers, and Finkelstein (1978). This hypothesis contends that visual channel input is weighted more heavily by perceivers in evaluating the emotional tone of a communication than are verbal or vocal cues. Subsequent research has supported this hypothesis, in regard to adult subjects attempting to assess the attitudes or feelings of another during a very brief communication.

Thus, accurate perception of affective facial cues seems important to adequate social functioning, because these cues provide more information about the communicator's affective state than do cues from any of the other nonverbal channels. Deficits in this area of social perception deserve further study.

Facial Expression Decoding Literature

The overall process of identifying and interpreting social cues is referred to as decoding. Several studies have provided evidence that various psychiatric groups,
particularly schizophrenics, are less accurate than normals in reporting the positiveness of facial expressions and less accurate in identifying the particular emotion or attitude communicated by affective facial cues.

Iscoe and Veldman (1963) asked schizophrenic adult, normal adult, and normal children subjects to arrange nine pre-graded "moonfaces" from unhappiest to happiest. The schizophrenic group produced more incorrect arrangements and more arrangements which contained large inaccuracies than either of the other groups.

Cutting (1981) asked various psychiatric patient groups to select the friendlier or meaner of pairs of photographs of faces. In selecting the friendlier faces, only the acute schizophrenic group made a significant number of choices which differed from those of a standardizing control group. Forty percent of an acute schizophrenic group, 30 percent of a major depression group, and 28 percent of a psychiatric patient control group disagreed with standardizers on at least one-fourth of the pairs of expressions.

In selecting the meaner from another set of facial photograph pairs, again only the acute schizophrenic group significantly differed from controls. Sixty-five percent of the acute schizophrenic subjects, 10 percent of the psychotic depressive subjects, and 20 percent of psychiatric control subjects disagreed with the standardizers on more
than one-fourth of the pairs of photographs. The reported data suggested that the acute schizophrenic group may have been more likely to agree with the standardizers in judging the friendlier of two faces than in judging the meaner of two faces. The major depression subjects may have been more likely to agree with the standardizers on judgments of meaner than on judgments of friendlier. Differences in rates of agreement by type of judgment, however, were not tested for statistical significance.

In an effort to assess attention to experimental stimuli, Cutting included a control task which required subjects to select the older of two faces. No significant differences between groups were found for this task. He concluded that the differences between groups, in judgments of friendlier or meaner, were not related to differences in attention to the stimuli.

Dougherty, Bartlett, and Izard (1974) asked a group of chronic schizophrenic patients and a group of normals to sort photographs of facial expressions, produced by trained communicators, into eight defined emotional categories. Normal subjects sorted 78 percent of the photographs correctly, while schizophrenics sorted only 44 percent correctly. Schizophrenic subjects were significantly poorer in discriminating between types of emotional expressions. They had particular difficulty in recognizing shame-humiliation and disgust-contempt. They
placed more facial expressions in the enjoyment-joy category than was appropriate, and fewer in the disgust-contempt and shame-humiliation categories than was appropriate. The authors concluded that the schizophrenic subjects exhibited a positive response bias because they made significantly more errors due to placing neutral or negative expressions in more positive facial expression categories, than due to erroneously placing neutral or positive expressions in negative categories.

In a similar study, reported by Walker (1981), schizophrenic children categorized affective facial expressions less accurately than anxious-depressed children. Anxious-depressed children categorized expressions less accurately than normal children. With regard to discriminating specific types of emotions, the only significant finding was that anxious-depressed children placed more positive or neutral expressions in negative categories than either of the other two groups. The author concluded that the anxious-depressed children exhibited a negative response bias. The errors of this group, however, were more evenly divided among the eight emotions than were the errors of the schizophrenic children. The latter subjects had particular difficulty in identifying shame, disgust, anger, fear, and sadness, but they showed no tendencies toward erroneously placing expressions into particular emotion categories. Walker
pointed out that the deficits exhibited in this study may have been related to labeling deficits rather than to difficulties with discrimination, recognition, or unbiased responding.

Rosenthal et al. (1979) reported data on a group of psychiatric patients with a mixture of diagnoses who were asked to identify which of two affective situations were portrayed in the stimuli presented. The scenes were varied along two dimensions, positiveness and dominance, with two levels in each dimension and five scenes in each of the four quadrants. Regardless of the type of stimuli, visual (face, body, or full view) or vocal (verbal content removed), the psychiatric patient group was consistently less accurate than controls in identifying the correct situation being depicted. The psychiatric patient group was found to be least different from the control group when making discriminations from auditory cues alone. On the other hand the deficits, evidenced by the psychiatric group, were most pronounced when facial expressions were included in the stimuli.

Walker, McGuire, and Bettes (1984) administered a series of four facial stimuli tasks to a schizophrenic group, an affective disorder group, and a nonpatient control group. The four tasks included an identity discrimination task, an emotion discrimination task, a multiple choice emotion identification task, and a facial expression sorting
task. Schizophrenic subjects performed significantly worse than controls on all tasks, except the identity discrimination task. The performance of the affective disorder group was consistently superior to that of the schizophrenic group, but the two groups differed significantly on the emotion discrimination task only. The affective disorder group and the control group did not differ on any of the four tasks. The investigators concluded that the decoding deficits exhibited by schizophrenic subjects were not solely attributable to labeling deficits. The lack of significant differences between groups on the identity discrimination task was interpreted as indicating that the affective cue decoding deficits were not attributable to a generalized deficit in visuospatial discriminating ability.

The above studies suggest that schizophrenic patients tend to be less accurate than normals in reporting the attitudes and emotions displayed by others through facial expressions. It appears that schizophrenics may be less accurate decoders than anxious-depressed patients and anxious-depressed patients may be less accurate than normals. There is also some evidence to indicate that schizophrenics may have more difficulty in decoding negative affective cues, while affective disorder subjects may have more difficulty in decoding positive affective cues.
An Information Processing Model

Perception of affective facial cues involves several underlying processes. The deficits in facial cue decoding observed among psychiatric patient subjects may have resulted from impairments in one or more of these processes. Literature in related areas suggests that perceptual deficits could result from failure to consistently attend to available cues (Cromwell, 1968), problems in selecting and encoding relevant cues (Caudrey, Kirk, Thomas, & Ng, 1980), problems in processing the available data (Erdelyi & Blumenthal, 1973), and/or response biases which over-rule the results of processing (Erdelyi, 1974).

No research has been reported indicating which of the various elements of the facial cue decoding process contribute to the affective cue decoding deficits observed among psychiatric patients. A more precise assessment of the decoding problems among psychiatric patient subjects could improve understanding of the effects of psychopathology on social perception and facilitate the development of more efficacious remediation procedures. This might be accomplished by employing an information processing model as a basis for developing assessment procedures.

Erdelyi (1974) outlined a five stage information processing model during his discussion of research in the area of perceptual distortions. These stages included:
attending, cue selection, iconic processing, processing of data transferred into short-term storage, and response selection.

Attending involves orienting one's perceptual apparatus toward the stimulus to be decoded and focusing this apparatus to provide adequate resolution for efficient cue selection. Encoding deficits may originate at this stage if the individual does not orient toward the salient stimuli, or because the perceiver does not efficiently utilize his visual capacity. For example, if he avoids looking at the communicator's facial expression, or looks but does not focus, accurate cues will not be available for processing.

The second stage, cue selection, involves scanning the stimulus field and inputting relevant cues, while filtering out irrelevant stimuli. Here the perceiver may attend to the communicator's face and focus accurately, but be over-inclusive or under-inclusive with regard to the cues admitted for processing. The perceiver might focus on background cues as well as facial cues, or he/she might focus on only one facial area. Thus, the system may be overwhelmed with irrelevant data or have insufficient data for efficient processing.

The third stage of processing involves the selection and organization of information in iconic storage for encoding into short-term memory. Iconic storage is a high capacity, brief duration information buffer. Here degraded
replicas of stimuli are stored for up to two seconds, while information is selected and organized for encoding into the very limited capacity short-term storage. During iconic processing full and accurate information may be available, but in selecting and organizing information for further processing, pertinent data may be excluded and/or irrelevant data included. Internal cues, such as the perceiver's current emotional state, may bias the organization of the data to be processed. Early research by Harris and Haber (1963) and Haber (1964; 1966) suggests that instruction-produced selective sets and chronic sets may have a major effect at this stage by biasing the selection of data for further processing.

The fourth stage is the processing of information encoded into short-term memory. It involves relating the current data to information stored in long-term memory and includes the processes of analyzing, interpreting, and transferring information from short-term storage to long-term memory. It may involve a certain amount of rehearsing or conceptualizing of possibilities. Conscious awareness of stimuli is assumed to occur during this stage. Selectivity or distortion of perception may occur here due to systematic biases in the order in which cues and possibilities will be considered, or because the system may rehearse or compare on a trial and error basis.
The fifth stage in the decoding process involves the selection of responses, based on criteria derived from current and past experiences. It involves a comparison of the results of processing against previously developed internal criteria for selections from the repertoire of response possibilities. Distortions may occur at this stage due to a lack of appropriate responses in the repertoire or due to the stringency of the criteria for various classes of responses. One individual may readily emit negative responses and be said to have lenient negative response criteria. Another individual, who is inclined to develop guilt feelings or who fears retaliation, may exhibit stringent negative response criteria, so that the stimulus would have to be markedly negative before a negative response would be emitted.

The model, proposed by Erdelyi (1974), includes multiple feedback loops which provide controlling mechanisms. These allow the later stages of processing to control and direct the earlier stages prior to response selection. The individual may rescan the stimulus field for additional cues or reorganize data in iconic storage if unexpected or questionable results are obtained during processing.

Despite these feedback loops, inappropriate responses to affective cues can derive from problems in any one, or a combination, of the five stages. Also, these five stages are intended only as a rudimentary listing of possible loci
of biasing or distortion. Processes connected with the organization and retrieval of information from long-term memory, for example, could also be a source of bias.

Erdelyi's (1974) postulation of three interrelated variables intervening between attending and responding, creates difficulties which limit the model's utility for generating research data. Of the five stages, only attending and response selection can be measured with any degree of directness. The functioning of the other three elements must be inferred from attending and response data. A model with only two intervening variables would be considerably more workable.

Such a model might be obtained by combining Erdelyi's cue selection and iconic processing stages into a single encoding stage which would include all of the functions of the two original stages. Erdelyi may, in fact, have recognized the need to combine these two stages. In his review of research findings relating to perceptual defense and vigilence phenomena, studies were grouped by looking strategies, encoding from iconic to short-term storage, transfer from short-term to long-term storage, and response strategies. In discussing research issues relating to selectivity of perception, he states "...the focus is clearly on the question of whether selectivity occurs relatively early or relatively late in the information processing sequence" (p. 11). "Relatively early" appeared
to refer to the process of encoding data, beginning after orienting to the stimuli and ending with the transfer of a small portion of the available data into short-term storage. "Relatively late" seemed to refer to the processing of information after transfer into short-term storage.

Therefore, Erdelyi's (1974) five information processing stages may be reduced to four stages which have functional significance, even if they are less representative of the information processing system. The four stages are: (a) looking at or orienting to the stimulus, (b) encoding, (c) processing, and (d) response selection. Encoding may be regarded as the earlier stage of perception and includes fine tuning the perceptual apparatus as well as the selecting, organizing, and transferring information from the high capacity iconic storage into the low capacity short-term storage. Processing may be regarded as the latter stage of perception and involves interpreting or construing the encoded data. It typically requires some comparison against information stored in long-term memory.

With the addition of responding, these stages correspond well with the processes referred to by Cromwell (1968) in his discussion of size estimates by schizophrenic subjects. He included the stages of orienting to the stimulus, recognizing patterns, and interpreting or construing these patterns. The four stages also appear consistent with Alloy and Abramson (1979) who referred to
the perception-response process in terms of input selection, organization of the incoming data, and motivation to initiate responses.

The four information processing variables described above are inter-dependent and not entirely distinguishable. However, they are potentially assessable by regarding encoding and processing as the relatively early and relatively late phases of the perception-response process, respectively. Clinically, identified problems in any of the four areas might suggest remediation procedures specific for that area of difficulty.

Of the four stages, only attending and response selection can be assessed somewhat directly. Accuracy of encoding and processing must be inferred through statistical and/or procedural controls of the other variables.

If attending is defined as orienting one's perceptual apparatus toward the relevant cues, it could be reliably assessed by observing the subject directing his gaze at, or away from, the facial stimuli and counting the frequency with which he looks away from the stimuli before a response is initiated. These frequency counts could be used as a measure of attending and to statistically adjust performance on tasks assessing encoding and/or processing for obvious nonattending.

The effects of the response selection variable could be minimized by utilizing tasks which require selection
from very simple and very limited response alternatives. Further, possible biases toward making approving/accepting or disapproving/rejecting responses to social stimuli could be eliminated by using a forced choice procedure which does not permit these alternatives. The tasks employed by Cutting (1981), and the least complex task employed by Walker et al. (1984), provided these types of controls over the response selection variable.

With controls for attending and response selection, the two more central aspects of decoding (encoding and processing) could be assessed by manipulating task requirements. Erdelyi's discussion suggests that simple tasks, permitting an immediate response, may be more dependent on encoding while more complex tasks may be more dependent on efficiency of processing information after transfer into short-term memory. If distortions occur early in the sequence, during encoding, the effects would be evidenced by errors on both simple and complex tasks. If distortions occur relatively late, during processing, performance of simple tasks may be relatively unaffected, but performance would deteriorate as task complexity increased.

Treisman's (1969) description of the functions performed by analyzers during encoding also suggests that the intervening variables may be separated by manipulating task complexity. She suggests that sets of habitual,
automatic analyzers organize input during iconic storage into functional units which facilitate transfer of information into short-term storage. These organizers develop because of their frequent utility. Each analyzer provides a set of mutually exclusive descriptions for a stimulus. Sets of analyzers operate together, in hierarchies, to label stimulus input. The organization of straight lines and curves into letters, words, and phrases, which are immediately recognized, is an example of the functions performed by these analyzer sets. Their operations permit immediate responses to relatively non-complex tasks with little involvement of the processing stage, such as occurs with competent readers and automobile drivers.

Detection of positive or negative changes in the affective tone of facial expressions may also be based on a hierarchy of analyzers which operate automatically. This is a frequently occurring task with functional significance since early childhood. As long as contradictory cues are not present such a task is relatively non-complex. Detecting the direction of change in affective facial cues, and identifying which of two facial expressions is the more positive, seem also to be non-complex tasks requiring simple responses. Encoding should be the primary element in each of these tasks.
From the above, it appears that efficacy of encoding may be measured using tasks having the following characteristics: relatively familiar and non-contradictory stimuli; only one comparison or contrast of two stimuli sets is required; the required comparisons frequently occur in social interactions; a relatively immediate response is required; response alternatives are simple and limited. The more a task diverges from these characteristics, the more complex it becomes, and the more likely it is that processing will have a prominent role in task performance.

Processing of information transferred into short-term storage is regarded as a higher level activity that may involve some manipulation of information in short-term memory and/or interaction with long-term memory. Tasks which require more than a relatively automatic response appear likely to involve a significant amount of processing. Tasks which require multiple comparisons, a series of comparisons, or higher order comparisons (contrasts of comparisons), may be considered more complex. Tasks which are infrequently encountered, and tasks which involve contradictory cues, may also be classified as more complex tasks. Such tasks may be assumed to involve significant processing of encoded data.

Interpreting the Results of Decoding Studies

In each of the facial cue decoding studies reported above, the source or sources of deficit are unclear,
principally, because the tasks employed were so complex that all stages of information processing were heavily involved. No separation of attending, encoding, processing, and response selection was possible.

The complex ordering task employed by Iscoe and Veldman (1963) does not seem to be subject to response bias, but apparently involved rather complex processing, due to the fairly large number of stimuli and the unusual nature of the task. Also, because there was no assessment of attention to the task, attending was confounded with encoding and processing.

The Rosenthal et al. (1979) data were derived from a task which required subjects to select a situation description based on a two second video tape of an interaction. Task performance was clearly susceptible to contamination by response biases and poor attending to the stimulus. Also, due to the complexity of the task, no separation of encoding and processing is possible.

The deficits reported by Dougherty et al. (1974) and Walker (1981), both of which were strongly affected by errors in classifying the more complex emotions of shame-humiliation and disgust-contempt, might best be interpreted in terms of processing difficulties or labeling deficits, due to the complexity of both stimuli and responses. The response bias explanation offered by these authors, however, is also tenable. Attention to the task probably was not a
contributing factor due to a liberal time limit for each item. Encoding difficulties, however, were confounded with processing and response selection variables.

The studies by Cutting (1981) and Walker et al. (1984) included some of the controls needed to identify sources of decoding deficits. Cutting (1981) prevented confounding due to response biases and response generating ability by using a two-option, forced choice procedure which did not allow subjects to avoid classifying one face as more positive or more negative than the other. Also, a relatively non-threatening control task was included in an attempt to measure attention to the task. This task, however, did not provide a control for attending because subjects could have easily attended to the control task, but not to the experimental task. The control task was probably more a measure of general discriminating ability for facial cues and/or a measure of motivation to respond appropriately. Still, the use of simple, forced choice type responses, which were not subject to biases, and the use of a non-affective task to control for facial cue discriminating ability, provided controls which had not been present in earlier studies.

The major flaw in Cutting's procedure was in the stimuli used in the experimental tasks. These stimuli were pairs of facial photographs of an unspecified number of actors assuming neutral poses. Because there was presumably
no affect being communicated, the task of choosing the
dlier or meaner in each pair seems to have been one of
either associating the stimuli with identity related
formation stored in long-term memory, or detecting minimal
affective cues. In either case, the stimuli employed
resulted in tasks which required more than the encoding
of affective facial cues.

Walker et al. (1984) included procedures which could
have eliminated, controlled, or assessed the effects of at
least three of the four stages of affective facial cue
decoding. The effects of attention deficits were minimized
by using a lengthy stimulus exposure time. Encoding was
potentially assessable with a non-complex task involving
one comparison of two sets of affective facial cues and
choosing between two simple response alternatives. Response
generation was potentially assessable through two virtually
identical tasks with different levels of response complexity.
One task required a pointing response with four response
alternatives; the other required a verbal response with six
alternatives. Also, a control for general facial cue
discriminating ability was available through an identity
discrimination task.

These investigators, however, failed to include a task
involving multiple comparisons or manipulations which would
be clearly dependent on processing of encoded data rather
than simple recognition. Also, their use of a very long
stimulus exposure time, though eliminating the effects of attending, permitted extensive involvement of processing in tasks which would otherwise be expected to be primarily dependent on encoding.

The major flaw in the study, however, again lies in the experimental stimuli employed. The experimental stimuli were photographs of at least six different individuals posing six different types of emotional expressions, with no control for intensity of affective expression employed. Responses on all of the affective tasks were potentially affected, not only by the complexity of the emotion portrayed and subjects' familiarity with the emotion, but also by differences in intensity of the affect displayed, problems in filtering out irrelevant identity cues, and idiosyncratic responses to identity cues.

Laser and Mathie (1982) have presented evidence that physiognomic changes alone, such as changes in the width of the face or heaviness of the eyebrows, may lead to significantly different judgments of the same facial expression. Also, Shapiro and Mark (1983) found that differences in shading or contrast between facial cues significantly effected ratings of the expressiveness of facial stimuli.

The difficulties, cited in each of the above decoding studies, severely limit the conclusions that can be reached, regarding the effects of psychopathology on the ability to
decode affective facial cues, or changes in affective facial cues. It can be concluded that subjects diagnosed as schizophrenic tend to be impaired in their response to affective facial cue tasks, while subjects with affective disorder diagnoses tend to be less significantly impaired in this area. The observed impairments in decoding affective cues seem to involve more than poor attending or poor motivation to respond appropriately to the stimuli. They also seem to involve more than problems with response bias or response generation. The possibility that the impairments noted are the result of a more generalized impairment in facial cue discriminating ability, rather than problems specific to affective cues, can not be ruled out. Finally, no conclusions can be reached, about the role of perceptual defenses in decoding errors, or whether deficits are related to problems occurring during encoding, problems occurring during processing, or problems occurring during both encoding and processing.

General or Affect Specific Disruptions of Cue Discrimination

As noted above, both Cutting (1981) and Walker et al. (1984) found significant group differences on affective cue discrimination tasks, but not on a non-affective facial cue discrimination task. Walker et al. (1984) concluded that their schizophrenic subjects were impaired in their ability to extract salient emotional cues from faces, but not in general visuospatial discriminating ability. This
conclusion does not seem entirely warranted, because their affective cue discrimination task was contaminated with differences in identity cues. Adding the identity cue filtering requirement to the affective task may have created a difference in the complexity of the two tasks and caused factors, other than cue encoding and discrimination, to be involved. The schizophrenic subjects may have differed from control subjects on the affective task, because they were less proficient at filtering out identity cues, or because more processing was required on that task.

No conclusion could be reached from Cutting's (1981) results because no information was given about the relative difficulty of the affective and the non-affective tasks, and because the affective content of his affective tasks was questionable.

From the above two studies, it is not clear that there is any real difference in psychiatric patients' ability to discriminate changes in affective versus non-affective cues. Further, Novic, Luchins, and Perline (1984), in a study very similar to that of Walker et al. (1984), found that the significant difference between schizophrenic subjects and control subjects on an affective cue discrimination task was eliminated when performance on a facial identity recognition task was entered as a covariate. Also, Hansch and Pirozzolo (1980) concluded, from their study of visual field advantages for recognition of facial emotions and
facial identities, that facial recognition and facial affect discrimination could not be separated as independent factors. These findings suggest that the facial expression decoding deficits observed in psychiatric patient subjects may be a function of a pervasive impairment in visuospatial discriminating ability.

Etcoff (1984), working with brain lesion subjects, found that while subjects with right hemisphere brain lesions were significantly impaired in discriminating both facial identity and emotion cues, they were less impaired in discriminating geometric figures. Also, the results reported by Cutting (1981) and Walker et al. (1984) suggest that affective cue discrimination may be more impaired in schizophrenic subjects than non-affective cue discrimination, even if performance on the two tasks is dependent on the same or closely related factors. It may be that in subjects with significant mental pathology, the affective content or connotation of cues somehow interferes with the encoding of these cues, and that this interference increases with the intensity of affective content or connotation of the cues.

An alternative explanation of the above findings, however, is that pathology interferes with the organization of cues into gestalts during iconic processing. Discriminating changes in affective facial cues and discriminating differences in identities may be more related
to gestalt formations, while discriminating changes in geometric figures, may be more specifically related to comparisons of spatial relationships.

The relative merits of the three explanations of research findings might be assessed using a non-affective facial cue discrimination task and an affective facial cue discrimination task, both of which employ artificially created facial stimuli which vary with regard to one to three spatial relationships. Discriminating changes on the affective task may involve gestalt formation but discriminating changes in facial feature stimuli would be more related to discriminating changes in spatial relationships. Also, the affective connotation of the facial feature task would be less than that of the facial expression discrimination task. Thus, a comparison of performance of psychiatric patients and control subjects on these two tasks, might suggest whether encoding deficits are related to impairments in organizing cues into gestalts, impairments in recognizing changes in spatial relationships, or problems related to encoding cues with affective connotations. If discrimination impairments are specifically associated with impaired gestalt formations, psychiatric patients would be expected to evidence a significant impairment relative to controls on the affective task but not on the non-affective task. If discrimination impairments are related to impairments in the encoding of
cues with affective connotations, then the performance of psychiatric patient subjects would be expected to be impaired, relative to controls, on both tasks but to a lesser extent on the non-affective discrimination task. If discrimination impairments are related to detecting changes in spatial relationships, then psychiatric patient subjects would be expected to be equally impaired relative to controls on both tasks.

**Contribution of Defensive Perceptual Distortions to Decoding Deficits**

Prior research regarding facial expression decoding deficits among psychiatric patient subjects suggests there is a disruption of the information processing sequence which increases with severity of psychopathology, and probably involves some impairments in the encoding and/or processing of information after transfer into short-term storage. Several findings, however, indicate that there is some within group variance which may be specific to types of pathology. Schizophrenics may tend to judge facial expressions more positively than normals, while depressives may tend to judge them more negatively than normals.

Cutting (1981) reported data indicating that schizophrenic subjects were most likely to disagree with standardizers in judging the meaner of two faces, while depressive subjects were most likely to disagree with standardizers when asked to choose the friendlier of two
faces. Dougherty et al. (1974) noted that schizophrenic subjects placed significantly more facial expressions in positive categories than was appropriate and fewer in negative categories than was appropriate. Walker (1981) found that anxious-depressed children placed significantly more positive or neutral expressions in negative categories than either schizophrenic or normal children.

Some portion of these differences between schizophrenics and depressives may be related to perceptual defense and perceptual vigilance phenomena which have been described from an information processing perspective by Erdelyi (1974). Perceptual defense may have been more common among schizophrenics, and perceptual vigilance may have been more characteristic of affective disorder subjects.

Perceptual vigilance refers to the relative lowering of the recognition threshold for threatening stimuli, while perceptual defense refers to a relative elevation of this threshold. These phenomena appear to be synonymous with the perceptual defenses of sensitization and desensitization discussed by Maddi (1968). Maddi concluded that there were two broad categories of perceptual defenses which probably operate at a peripheral level by selectively tuning or detuning the sensory systems. He contended that there was empirical support that extends across learning, perceptual, and memory research for two main types of defenses, namely desensitization and sensitization.
Desensitization was described as an automatic process which protects the individual from stress by filtering out stressful incoming stimuli, so that the individual is less responsive to and less able to recognize certain cues. If desensitization is most characteristic of an individual's defense strategies, he/she might have greater difficulties in recognizing negative affective expressions, or negative changes in affective expressions. Sensitization, on the other hand, is an automatic process which allows an individual to avoid or cope with stress by increasing his/her sensitivity to, or ability to recognize, potentially threatening stimuli. People characterized by sensitization strategies more thoroughly scan their perceptual field for potentially threatening stimuli and more readily recognize and respond to threatening stimuli, such as negative changes in affective facial expressions.

The existence of perceptual defense and perceptual vigilance phenomena has been documented in a large body of research published in the 1950's and 1960's related to the view of perception referred to as the "New Look". This view held that the perception of external events is influenced by internal attitudes, values, expectancies, needs, and psychodynamic defenses (Erdelyi, 1974).

Along with the evidence for perceptual defense and perceptual vigilance, a number of studies have demonstrated that individuals tend to be consistent in using one or the
other of these selective perception strategies across a variety of situations (Byrne, 1961), so that the use of sensitization or desensitization strategies can be predicted from one situation to another. Further, it has been demonstrated that the preferred mode of perceptual selectivity is accentuated when stress is increased by external procedures such as by suggesting that a perceptual task will provide information regarding the individual's interpersonal competency (Stein, 1953).

Although the decoding of facial expressions was not used in earlier demonstrations of perceptual defense and perceptual vigilance, there appears to be no reason to suspect that these phenomena would not extend into this area. Negative facial expressions can be very stressful stimuli, particularly if they represent the reactions of an important other to the perceiver.

The data from facial expression decoding studies, suggesting that systematic perceptual distortions may be involved in the decoding deficits exhibited by subjects with significant pathology, are clearly weak. It is quite possible, however, that the weakness of these findings are the result of a lack of homogeneity in characteristic defensive styles within diagnostic groups. It seems reasonable to expect that perceptual desensitization or defense would be more characteristic of schizophrenic subjects who are frequently described as withdrawn and
affectively flat. It also seems reasonable to expect that depressive subjects might be more often inclined toward perceptual sensitization, since they are often described as having negative expectations. However, there is likely to be considerable heterogeneity within both diagnostic groups, with regard to characteristic defensive style. Subjects classified by a more specific measure of defensive style might be expected to more consistently differ in their characteristic type of decoding errors, provided the defensive perceptual distortion phenomena translates into affective facial cue decoding.

The possibility that perceptual defenses contribute to decoding deficits among psychiatric patient subjects seems worthy of investigation. Questions regarding the effects of perceptual defenses on affective facial cue decoding remain unresolved and pertinent to theories of both psychopathology and personality.

Objectively Defined Facial Expression Stimuli

The stimulus problems noted earlier in reviewing the studies reported by Cutting (1981) and Walker et al. (1984) point to the potential advantages of using artificially created facial stimuli. With artificially created stimuli, identity and intensity cues can be rather easily controlled. Such stimuli have not been used before in the study of facial expression decoding, but there seems to be sufficient data to assume that drawings of facial expressions can be
constructed and varied in affective expression intensity along a simple positive-negative dimension by manipulating a small number of parameters, such as eyebrow shapes and location, vividness of certain skin wrinkles, and lip curvature (Ekman & Friesen, 1978; Ekman, Friesen, & Ancoli, 1980).

The use of a positive/approving - negative/disapproving continuum for facial expression decoding studies, rather than a variety of different emotional expressions, is suggested by the apparent importance of making discriminations along this dimension in a wide variety of interpersonal situations, as well as by evidence indicating that some facial expressions are more readily recognized than others (Kirouac & Dore, 1983; Thompson, 1983; Walden & Field, 1982). Also, Bullock and Russell (1984), using a multidimensional scaling procedure for the word/facial expression associations of groups of children and college age adults, found that a two dimensional structure was able to account for the interrelationship among emotions. This structure was the same for all age groups and consisted of pleasure-displeasure and arousal-sleep. These dimensions appear easily translatable into a positive/approving - negative/disapproving continuum with intensity/arousal increasing in both directions away from a neutral facial expression.
Ekman and Friesen (1978) have described facial patterns hypothesized to be associated with various affective states and have developed a system of objectively classifying facial movement units associated with particular emotions. Research regarding the communication of attitudinal states through facial cues has supported several of their predictions, concerning the parameters of muscle activity characterizing various affective facial expressions (Izard, 1977; Schwartz, Ahern, & Brown, 1979; Schwartz, Brown, & Ahern, 1980; Schwartz, Fair, Salt, Mandel, & Klerman, 1976; Sirota & Schwartz, 1982; Teasdale & Bancroft, 1977).

Hypotheses, regarding the characteristic muscle activity associated with happiness and anger have been supported in studies which presented naive subjects with experimental stimuli which were expected to elicit these emotions (Ekman, Friesen, O'Sullivan & Scherer, 1980). Further, Wiggers (1982) has presented evidence indicating that ratings of the intensity of facial expressions of these emotions agree with Ekman and Friesen's (1978) predictions, regarding the action units involved in creating variations in intensity of emotional expression.

According to Ekman and Friesen (1975), anger expressions are characterized by (a) eyebrows that are drawn down and together, usually producing wrinkles between the eyebrow, (b) eyelids that are tense with the upper eyelids lowered, and (c) a mouth that is either closed with the lips pressed
tightly together or opened and squared. The anger
expression, regardless of intensity, always involves all
three parameters to some extent but intensity of expression
may vary from one area to another, varying the intensity of
the overall anger expression. The intensity of the anger
expression may also be varied by combining it with other
negative emotions, particularly disgust. The anger and
disgust expressions combine to produce contempt.

The disgust expression is the most complex of the five
basic expressions, being manifested in four facial areas.
"The upper lip is raised, while the lower lip may be
slightly forward and raised or lowered. The nose is
wrinkled, the lower eyelids are pushed up, and the eyebrow
is lowered" (Ekman & Friesen, 1975, p. 68). The more
intense the disgust expression, the more likely it is that
the nose wrinkling will be apparent. The pushing up of the
lower eyelid is produced by raising the cheeks which may
also produce lines and folds below the eyes. The lowered
eyebrow characteristic of anger is also common in
expressions of disgust.

Happiness expressions typically involve only two
parameters, the eyelids and the mouth. The corners of the
lips are drawn back and slightly up. The lips may come
together in a relaxed fashion, or be slightly parted, to
form a grin or smile. This is typically accompanied by
wrinkle lines running from the nose out and down to the
area beyond the corner of the mouth. The skin below the lower eyelid is pushed up and lines are formed below the eyes, while crows' feet wrinkling is formed at the outer corners of the eyes. The intensity of the happy expression is determined by the position of the lips, which is associated with the deepening of the naso-labial fold and more pronounced lines under the lower eyelid.

From the above, it can be seen that a positive/accepting-negative/rejecting expression continuum can be created through variations in four facial areas: the eyebrows, the eyelids, the mouth, and the nose. These parameters are defined with sufficient precision to permit the artificial creation of schematic drawings of various intensities of positive and negative affective expressions, as well as, a neutral expression. A progression of objectively defined facial expressions from quite negative/disapproving to neutral to quite positive/approving can be created artificially for use in investigations of affective facial cue decoding.

Purpose of the Investigation

The purpose of this investigation was to assess the effects of type and severity of psychopathology on three hypothesized stages of affective facial cue decoding: attending, encoding and processing. These three stages were derived from a simplified version of the information processing model described by Erdelyi (1974). A fourth
variable in the model, response selection, was not included as a variable to be investigated, but rather its importance was minimized through the use of tasks with very simple and very few response alternatives.

Two additional factors, regarded as subfactors associated with the encoding stage, were investigated: defensive perceptual distortions and proficiency in discriminating changes in affective versus non-affective facial cues. Evidence suggests that these factors may be involved in, or related to, decoding problems originating during the encoding.

It was assumed that deficits in attending could be assessed by simply counting the frequency with which subjects directed their gaze away from the experimental stimuli prior to initiating a response. It was also assumed that this count of gaze diversions could be used to statistically control for the effects of nonattending on tasks intended to measure other elements of the information processing sequence.

Four affective facial expression decoding tasks were designed to assess the encoding and processing variables. All used artificially created facial stimuli to prevent confounding by irrelevant stimulus variables. Two of these tasks were assumed to be primarily dependent on encoding. These encoding tasks were regarded as relatively non-complex, because they required subjects to make only one comparison
between only two facial stimuli and to select from only two response alternatives. One of these encoding tasks required subjects to choose the more positive/approving of two facial stimuli. The other asked subjects to determine if two facial stimuli were alike or different in positiveness of affect.

The two tasks used to assess processing of information transferred into short-term storage contained four affective facial stimuli and required multiple comparisons between stimuli. Also, the most complex task had 2⁴ response alternatives. This task required subjects to order four facial stimuli from least to most positive/approving. It required a minimum of seven comparisons between stimulus sets and could have necessitated as many as 2⁴ comparisons. The less complex task required only three comparisons and afforded only two response alternatives. This task required subjects to determine which of two pairs of facial expressions evidenced the larger, or more extensive, affective change from one member of the pair to the other. Because this task was assumed to involve less processing than the most complex tasks, but contained the same stimulus complexity, performance on this task was used in statistical analyses to control for the effects of encoding on the most complex task.

Performance on these four facial expressions decoding tasks (detecting change, selecting the more approving of
two expressions, selecting the more affectively changed pair of expressions, and facial expression ordering) was expected to provide an index of the relative earliness or lateness of disruptions in the perceptual process. If decoding deficits exist and are the result of decreased processing efficiency, performance deficits would be evidenced on the most complex task when the effects of attending and encoding are statistically controlled. Little, if any, impairment would be expected on the more simple, automatic tasks. On the other hand, if decoding deficits are largely attributable to poor or biased encoding, significantly impaired performance would be expected to be evident at the more simple levels of decoding task complexity. Further, no significant impairment would be expected on the most complex task, when encoding is statistically controlled by using performance on the less complex four facial stimuli task as a covariate.

Decoding deficits associated with perceptual defense-perceptual vigilance phenomena were assessed by examining decoding errors by stimulus characteristics, that is, by looking for evidence of systematic errors due to failures to recognize negative changes or positive changes in affective facial cues. It was expected that subjects characterized by repressive defensive strategies would make more errors on items depicting negative affective changes than on items depicting positive affective
changes. Conversely, subjects characterized by sensitization
defensive strategies were expected to make more errors on
items depicting positive affective changes than on items
depicting negative affective changes. Maddi's (1968)
conceptualization of these phenomena suggests that these
distortions are most likely to occur during the early
stages of perception and were, therefore, expected to be
evident on tasks more dependent on encoding.

A special task, expected to more readily elicit
defensive distortions, was also created. This task was
intended as a non-complex task which more closely resembled
a real interpersonal interaction than the other non-complex
tasks. It consisted of a series of single facial expressions
presented briefly in rapid succession. It purposely allowed
positive-negative response biases to influence results by
requiring subjects to determine if the stimulus became more
approving or less approving. The brief exposure times and
rapid succession of expressions were seen as more closely
approximating an actual interpersonal interaction and were
expected to increase the ambiguity of the stimuli, thereby
facilitating defensive distortions.

Finally, a non-affective facial cue discrimination
task was constructed which involved only one or two changes
in spatial relationships between facial feature cues. This
task required subjects to determine if two facial stimuli
differed with regard to facial features. It was identical
to the task requiring subjects to determine if two facial stimuli were the same or different in affective cues, except that facial feature cues were varied rather than facial affective cues. Performance on these two tasks were compared to evaluate the effects of cue type on decoding.

Thus, attention to the task was assessed by collecting rates of diversion of gaze away from the facial stimuli prior to initiating a response. Two levels of task complexity were used to assess the relatively earliness or lateness of disruptions of the perceptual process. A forced choice procedure, which did not imply good-bad evaluations, was used to eliminate positive-negative response biases. Decoding errors, on the less complex tasks, and an additional task intended to more readily allow defensively motivated distortions, were analyzed for systematic patterns of perceptual defense or perceptual vigilance type errors. A non-affective facial cue discrimination task was included to assess the degree of stimulus generalization involved in encoding deficits among psychiatric patient subjects. Finally, due to the lack of objective evidence to support the assumed relationship between proficiency in decoding affective facial cues and adequacy of interpersonal functioning, ratings of interpersonal adequacy were obtained for patient subjects and correlated with the various decoding variables.
Hypotheses

1. Rates of gaze diversions during stimulus presentations would differ significantly across groups, with the groups displaying more psychopathology evidencing the most diversions of attention per second of stimulus exposure.

2. Total affective decoding errors would increase with increasing severity of psychopathology when attending to the stimuli is controlled statistically.

3. With statistical control for group differences in rates of nonattending, subjects rated high in pathology would evidence more decoding errors than nonpsychiatric controls on the affective tasks expected to be primarily dependent on encoding, specifically Task 1 and Task 2.

4. More severely psychopathological subjects would evidence more decoding errors than less pathological subjects on the affective task expected to be most dependent on processing of information after transfer into short-term memory, when nonattending and encoding are statistically controlled.

5. Accuracy in discriminating changes in affective facial cues would be significantly effected by severity of psychopathology, but accuracy in discriminating changes in non-affective cues would not be significantly effected by severity of psychopathology. Further, more severely pathological subjects would evidence impaired discriminating
ability specific to affective cues when performance on the non-affective discrimination task is used to statistically control for general visuospatial discriminating ability.

6. Patient subjects, identified as repressors and patient subjects identified as sensitizers via the Byrne R-S Scale, would differ in total perceptual distortion scores. Perceptual distortion scores were difference scores derived by subtracting errors on items depicting positive affective changes from errors on items depicting negative affective changes.

7. On a task requiring subjects to determine if a series of facial stimuli become more approving or less approving, some subjects would show a tendency toward perceptual defense type errors and others would show a tendency toward perceptual vigilance type errors. It was further hypothesized that these distortion tendencies would be significantly associated with scores on the Byrne R-S Scale. Perceptual defense errors were errors due to failures to recognize negative affective changes in facial expressions and were expected to characterize subjects scoring toward the repressor (low) end of the R-S Scale. Perceptual vigilance errors were errors due to failures to recognize positive affective changes and were expected to characterize subjects scoring toward the sensitizer (high) end of the R-S Scale.
8. Repressor-sensitizer error patterns exhibited on the Detection of Direction of Affective Change Task (see Hypothesis 7) would be related to diagnostic category, Psychoticism scores, and depression scores.

9. Ratings of adequacy of interpersonal functioning would be predicted by performance on the five affective decoding tasks with the effects of frequency of gaze diversions partialled out.

10. Scores on measures of severity of psychopathology could be predicted from error frequencies on the four complexity level affective tasks and the non-affective discrimination task, plus frequency of gaze diversions during stimulus presentations. In addition, it was hypothesized that decoding scores would continue to account for a significant portion of the variance in Psychoticism scores and Brief Psychiatric Rating Scale scores when the variance, attributable to frequency of gaze diversions, was partialled out.
Subjects

Subjects for this study consisted of 44 paid male in-patient volunteers from a state psychiatric facility in Northeast Texas, plus a nonpsychiatric group of 22 paid volunteers from the nonprofessional staff of the same facility.

Volunteer psychiatric patient and employee subjects were recruited with posted notices and with professional staff assistance. All potential subjects were informed that the purpose of the investigation was to study the process by which individuals perceive other peoples' reaction to them. They were further informed that all participants would remain anonymous.

Inclusion criteria for psychiatric patient subjects were as follows: (a) schizophrenic or major affective disorder diagnosis, (b) no evidence suggesting significant brain damage or mental retardation, (c) no major uncorrected vision impairment, (d) adequate participation in treatment activities off the ward of residence (suggesting that the patient would be able to remain on task and follow simple instructions), and (e) Brief Psychiatric Rating Scale (BPRS) scores above 35 or below 30. These restrictions in
subject eligibility were intended to exclude acutely disturbed or grossly psychotic patients who, it was suspected, might not be able to follow instructions adequately or to remain on task for long enough periods to complete the procedure at one sitting.

The BPRS cut-off scores used in the present investigation had been found in an earlier survey of patients at the same institution to identify the lower and upper third in severity of psychopathology. In the present study, BPRS scores were obtained by averaging BPRS ratings assigned by the psychiatrist and the psychologist from the subject's treatment team. A correlation of .76 (p < .001) was obtained between the independent ratings by these judges.

BPRS ratings were obtained no more than 21 days prior to subjects' initial participation in this study. Patient subjects with average BPRS scores above 35 were assigned to the high pathology group and patient subjects with BPRS scores below 30 were assigned to the low psychopathology group. The high pathology patient group contained 15 subjects with schizophrenic diagnoses and seven with major affective disorder diagnoses. The low pathology group consisted of 10 schizophrenic and 12 major affective disorder patients.

Nonpsychiatric subjects were required to have no history of psychiatric treatment resulting in the
prescription of either anti-psychotic or anti-depressant medications. This restriction was intended to minimize hidden psychopathology in this group.

Descriptive statistics for the four psychiatric patient groups and the nonpatient control group are presented in Table 1. Differences between groups, with regard to these descriptive variables, were tested using two factor ANOVA's (plus a control group when data was available) for interval or ratio scale data and Chi Square analyses for independent groups for nominal scale data. Statistically significant differences between subject groups were obtained on 6 of the 12 descriptive variables: (a) Brief Psychiatric Rating Scale scores, (b) Psychoticism Scale scores, (c) Beck Depression Inventory scores, (d) R-S Scale scores, (e) length of hospitalization, and (f) rated adequacy of interpersonal functioning.

The 2 X 2 (Severity of pathology X Psychiatric diagnosis) ANOVA on BPRS score produced a significant main effect for severity of psychopathology, $F(1, 40) = 73.46$, which was significant beyond the .001 level. Both the main effect for diagnosis [$F(1, 40) = 0.00]$ and the interaction effect [$F(1, 40) = 0.21$] were nonsignificant. Since the patient subject groups were defined as high and low pathology on the basis of Brief Psychiatric Rating Scale scores, the finding of a significant differences between severity of psychopathology groups, with respect to this
variable, was expected. More important is the lack of
difference in severity of pathology between the schizophrenic
and the affective disorder groups.

Separate, 2 X 2 (Severity of pathology X Psychiatric
diagnosis) plus a single control group ANOVA's (Winer, 1971)
were performed on Psychoticism scores and Beck Depression
Inventory scores. The analysis on Psychoticism (P) scores
yielded a significant interaction effect \[ F(1, 61) = 5.20, \ p < .05 \]. The main effect for severity of pathology
\[ F(1, 61) = 0.19 \], and the main effect for diagnosis
\[ F(1, 61) = 1.35 \] were nonsignificant, as was the control
group versus all other groups effect \[ F(1, 61) = 1.50 \].
The post hoc analysis using the Dunnett t statistic
indicated that the mean P score of the high pathology-
schizophrenic group was greater than that of the high
pathology-affective disorder group. There were no other
significant differences between groups for this variable.

The analysis on Beck Depression Inventory scores
yielded a significant F for the control group versus all
other groups effect \[ F(1, 61) = 7.25, \ p < .01 \]. The post
hoc analysis using the Dunnett t statistic indicated that
the mean depression score of the high pathology-affective
disorder group was higher than that of the control group.
None of the other individual groups significantly differed
from the control group. The main effect for psychiatric
diagnosis also reached significance \[ F(1, 61) = 4.00, \]
The post hoc analysis using the Newman-Keuls procedure indicated that the combined affective disorder groups had higher depression scores than the control group. The main effect for severity of pathology \([F(1, 61) = 2.23]\) and the interaction effect \([F(1, 61) = 0.04]\) were nonsignificant.

With regard to R-S Scale scores, the 2 X 2 (Severity of pathology X Psychiatric diagnosis) plus a single control group ANOVA obtained a significant control group versus all other groups effect \([F(1, 61) = 16.42, p < .001]\). The post hoc analysis using the Dunnett t statistic indicated that the mean R-S Scale scores of all four patient groups were significantly higher than that of the control group. The main effect for severity of pathology \([F(1, 61) = 0.86]\), the main effect for diagnosis \([F(1, 61) = 2.44]\), and the interaction effect \([F(1, 61) = 0.06]\) were all nonsignificant. Thus, all patient groups scored higher in the use of sensitization defenses than did controls, but they did not differ from each other.

The 2 X 2 (Severity of pathology X Psychiatric diagnosis) ANOVA on length of hospitalization yielded a significant main effect for diagnosis \([F(1, 40) = 5.71, p < .01]\), indicating that subjects in the schizophrenic groups had been hospitalized for a significantly longer period of time than had members of the affective disorder groups. The main effect for severity of psychopathology
\[ F(1, 40) = 0.03 \] and the interaction effect \[ F(1, 40) = 2.56 \] were nonsignificant.

A similar analysis performed on ratings of the adequacy of interpersonal functioning of patient subjects yielded a significant main effect for psychiatric diagnosis \[ F(1, 40) = 10.94, p < .01 \]. Affective disorder subjects were rated as significantly more adequate in their interpersonal functioning than were schizophrenic subjects. The main effect for severity of pathology \[ F(1, 40) = 0.58 \] and the interaction effect \[ F(1, 40) = 0.20 \] were again nonsignificant.

All of the above differences between subject groups seem to be readily attributable to differences between groups in severity or type of psychopathology. The high pathology groups were expected to have higher BPRS scores. The affective disorder groups were expected to have higher depression scores. Patient subjects were expected to have higher R-S Scale scores because scores on this instrument are affected by real pathology as well as defensive style. The longer hospitalization of the schizophrenic subjects was expected because such patients tend to have poorer prognoses. High P scores were to be expected among schizophrenic subjects who tend to have more aberrant thought processes. Poorer interpersonal functioning was expected among schizophrenic subjects who tend to be more isolated and more preoccupied with autistic material.
Table 1
Descriptive Statistics for Subject Groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>High Pathology (Schiz. Affec. Dis.)</th>
<th>Low Pathology (Schiz. Affec. Dis.)</th>
<th>Controls</th>
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<tbody>
<tr>
<td>Shipleys IQ</td>
<td>103.1 14.7</td>
<td>103.5 8.8</td>
<td>108.4 10.9</td>
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<tr>
<td></td>
<td>109.5 7.0</td>
<td>111.2 8.9</td>
<td></td>
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<td>BDI</td>
<td>14.7 9.9</td>
<td>11.8 10.7</td>
<td>9.1 9.0</td>
</tr>
<tr>
<td></td>
<td>23.3 12.7</td>
<td>10.7 10.0</td>
<td></td>
</tr>
<tr>
<td>R-S Scale (S scores)</td>
<td>56.9 27.8</td>
<td>48.6 29.5</td>
<td>31.1 14.5</td>
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<tr>
<td></td>
<td>66.6 19.4</td>
<td>61.6 24.3</td>
<td></td>
</tr>
<tr>
<td>P</td>
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<td>5.6 3.8</td>
<td>4.3 2.9</td>
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<tr>
<td></td>
<td>3.9 2.1</td>
<td>5.5 2.7</td>
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<td>Age</td>
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<td>33.1 6.4</td>
<td>33.5 13.2</td>
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<tr>
<td></td>
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<td>12.3 2.1</td>
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<td>3.7 2.7</td>
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<td>5.9 1.6</td>
<td>6.5 1.4</td>
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</table>

Note. Affec. Dis. = Affective Disorder Patients
BDI = Beck Depression Inventory
S scores = Sensitization scores
P = Psychoticism Scale
SEC = Socio-economic Status
BPRS = Brief Psychiatric Rating Scale
Materials

Byrne Revised Repression-Sensitization Scale (Byrne, Barry, & Nelson, 1963). The R-S scale is a self-report questionnaire consisting of 127 items from the MMPI. Byrne and his coworkers (1963) reported reliability coefficients above .80. High scores on this scale are intended to indicate a tendency toward the use of sensitization defenses. High scores have been associated with more frequent use of negative self-descriptions, more ready disclosure of personal history material, a lower threshold for recognition of failure words (Byrne et al. 1963), more exaggerated reports of personal pain and fear (Rofe, Lewin, & Paden, 1981), higher ratings of the pain experienced by others (von Baeyer, 1982) and higher trait anxiety (Gard, Gard, Dossett, & Turone, 1982). Low scores on this test are intended to indicate a tendency toward the use of repressive defenses. They have been found to be associated with a defensive denial of symptomatology or a genuine absence of symptoms (Carlson, 1979), less reported fear of possible negative events (Rofe et al. 1981), less trait anxiety (Gard et al. 1982), and fewer negative self-descriptions (Byrne et al. 1963). High scores seem to suggest an increased awareness of, or sensitivity to, negative internal and external stimuli while low scores may suggest a decreased awareness of, or sensitivity to, such stimuli. R-S Scale scores also
seem to be positively correlated with amount of admitted symptomatology.

Psychoticism Scale (Eysenck & Eysenck, 1976). This scale was constructed on a factor-analytic basis with P independent of Extraversion (E), Neuroticism (N), and Tendency to Lie (L). Individuals scoring high on the P Scale tend to be non-cooperative, to have poor vigilance, and to be anti-authority. Clinically, high P Scores have been found most often among psychotics (particularly schizophrenics), psychopaths, and criminals. Men score higher on the P Scale than women. Psychoticism is highly correlated with ratings of symptomatology, with high P scores being associated with a florid clinical state. In addition, clinical improvement in individuals who initially presented major psychiatric symptoms, is associated with a drop in P Scores (Eysenck & Eysenck, 1976).

Brief Psychiatric Rating Scale (Overall & Gorham, 1962). This scale provides a total psychopathology score derived from ratings on 16 symptom constellations. Each constellation is rated on a seven point scale ranging from "not present" to "extremely severe." Inter-rater reliability for the various symptom clusters, as reported by the authors, ranged from .56 to .87, with reliability coefficients for eleven of the sixteen clusters above .75.

Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). This is a 21 item self-report measure
of depression severity. It is reputed to be one of the most commonly used, practical, and well validated measures of depression available (Bumberry, Oliver, & McClure, 1978). Scores of five or less indicate an absence of significant depression while scores between 10 and 27 indicate mild to moderate depression.

**Shipley Institute of Living Scale (Shipley, 1962).**
The Shipley scale is a self-administered, paper and pencil, screening-type measure of general intellectual ability. It is exclusively verbal in content, composed of a vocabulary test and an abstraction test. A correlation coefficient between the Shipley score and WAIS full scale IQ scores of .90 was obtained along with a standard error of estimate in predicting WAIS IQ scores of 6.33 in a population of hospitalized, adult, psychiatric patients (Sines & Simmons, 1959). More recently, Retzlaff, Slicner, and Gibertini (1986), found that maximally reliable and valid estimates of WAIS-R Full Scale IQ could be obtained by simply subtracting 11 points from standard Shipley IQ's.

**Ratings of the Interpersonal Adequacy of Patient Subjects.** Ratings of adequacy of interpersonal function in the ward milieu were obtained, from professional staff, for each psychiatric subject within five days of their participation in the study. Interpersonal appropriateness was defined as a composite of (a) appropriateness with which the subject responds to the needs of others,
(b) extent to which the subject appears to be accepted by his peer group, and (c) frequency and targets of interpersonal interactions. The rating scale gave examples of behaviors characteristic of various points on a ten point scale (See Appendix A). Professional staff were instructed to arrive at a consensus rating for each patient subject. An average interrater reliability coefficient of .63 ($p < .01$) was obtained on a separate sample of 15 patient subjects whose interpersonal adequacy was rated independently by four professional staff members using the above scale. These professional staff were the psychiatrist, the psychologist, the social worker, and the registered nurse with whom the patient had most frequent contact.

**Stimulus Materials**

The facial expression stimuli employed in this study were 35 mm black and white slides showing schematic faces (see Appendix B). The faces were front views, varying along three dimensions: (a) the shape of the eyebrows, (b) the shape of the mouth, and (c) the vividness of wrinkles around the eyes, nose, and mouth. There were seven affective expressions with three levels of positive expressions and three levels of negative expressions, plus a neutral expression. The positive expressions had: (a) normally arched eyebrows, (b) varying widths of smiling mouths, and (c) varying vividness of crow's feet wrinkles at the corner of, and under, the eyes, along with varying...
vividness of the naso-labial fold. The negative expressions varied (a) in the extent of straightening and drawing together of the eyebrows, (b) in the thinness of lips and the downturn of the corners of the lips, and (c) in the vividness of wrinkles at the bridge of the nose. Variations in both positive and negative expressions included some change in all three parameters.

Seven affective facial stimuli were selected from 10 expressions created by varying each of the above parameters. The 10 expressions were presented to a scaling group of 25 professionals from the institution where the experimental subjects were recruited. They were asked to report which expression in each pair was more positive-approving in affective tone. All possible pairs of stimulus faces were presented in random order to the scaling group. Each pair was exposed for three seconds using a slide projector.

This pair comparisons scaling method was employed to derive scale values for each of the ten expressions (Nunnally, 1967). In addition to the neutral expression, the three positive and three negative expressions, which yielded the most nearly equivalent increases in scale values on each side of the neutral expression were selected for use as the experimental stimuli. The scale values obtained for the ten original stimulus faces are presented in Table 2, along with the recalculated scale values for the seven faces selected for use in the study.
Table 2

Scale Values of Affective Facial Expression Stimuli

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orig. Set</td>
<td>-2.06</td>
<td>-1.01</td>
<td>-.95</td>
<td>-.24</td>
<td>-.38</td>
<td>0.00</td>
<td>.12</td>
<td>1.01</td>
<td>1.24</td>
<td>1.57</td>
</tr>
<tr>
<td>Final Set</td>
<td>-.88</td>
<td>-.78</td>
<td>-.39</td>
<td>0.00</td>
<td>.56</td>
<td>1.19</td>
<td>1.41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Scale values were obtained via the pair comparison scaling method. This method is based on Thurstone's law of comparative judgments. The scale values were derived from the proportions of subjects who judged one expression to be more positive than another. Scale values are the normal deviates of these proportions with a constant added to make the scale value of the most neutral stimulus zero.

It might be noted that the intervals between the recalculated scale values are smaller at both ends of the scale and smaller on the negative side of neutral than on the positive side. This lack of equality of intervals between stimuli resulted in some variability in item difficulty within each of the affective facial cue decoding tasks described below. No effort was made to weight items in order to control for differences in item difficulty, since it was not necessary to assume that all items within a task were equal in difficulty. Also, no assumption was made that all tasks would have equal discriminating power.
Dependent Measures

Six affective expression stimulus sets were prepared. Four were intended to assess and/or separate the effects of encoding and processing stages of decoding. These four tasks varied in complexity as defined by the number of comparisons between facial stimuli required by the task and the number of response alternatives. A fifth task was intended to assess perceptual defense-perceptual sensitization effects. A sixth task was intended to assess overall accuracy in judging intensity of affective facial cues.

In addition to the above, a non-affective facial cue discrimination task was constructed based on the neutral affective facial stimuli with changes in the spatial relationships of facial feature cues. This task was used with one of the affective tasks to evaluate the effect of affective content on facial cue discriminating ability.

Complexity Level Task 1 (Detection of Change in Facial Expression). This task required subjects to classify pairs as alike or different in terms of positiveness or negativeness of facial expression. The stimuli for this task were 19 randomly selected pairs of facial expressions whose component faces were one or two steps apart in scale values, plus 11 randomly selected identical pairs of facial expressions (two identical pairs for four of the seven expressions, plus one identical pair of each of the three
remaining expressions). This resulted in 30 pairs of expressions with 19 known to be perceptively different in terms of affective intensity, and 11 known to be affectively identical.

Complexity Level Task 2 (Selection of the More Approving Expression). This task required subjects to identify which expression in the pairs of facial expressions was more positive in affective expression. The stimuli for this task were the 21 possible pairs of affective expressions created by pairing faces which were one or two steps apart in scale values. Nine of these pairs were randomly selected to be presented twice to make a total of 30 items in the set.

Complexity Level Task 3 (Selection of the More Affectively Changed Pair). This task required subjects to identify which of two pairs of expressions represented the greater change in affective cues from the first to the second component of each pair. The more changed pairs consisted of expressions which were one or two steps apart in scale values, while less changed pairs were zero or one step apart. Thirty items consisting of two pairs of stimulus faces were created by taking the 19 possible pairs of expressions, which were zero or one step apart, plus an additional eleven randomly selected and repeated from this first 19. Each of these pairs was then randomly paired with another randomly selected pair that was one step
further apart than the first pair but contained neither of the expressions present in the first pair. Thus, the stimulus set for this task consisted of 30 pairs of stimulus pairs, in which none of the seven standard expressions appeared more than once, and in which one pair depicted a slightly more dramatic change in facial expression than that in the other pair.

Complexity Level Task 4 (Facial Expression Ordering). This task requires subjects to order a set of four facial expressions along the positive-negative affective continuum from most positive to most negative. The stimulus sets for this level were 30 groups of four adjacent expressions on the seven point positive-negative facial expression continuum. The four expressions presented were randomly arranged.

Task 5 (Direction of Affective Change). This task required subjects to identify the direction of change in affective expression of a series of facial expressions. The stimuli for this task were 30 series of three individual facial expressions presented in rapid succession. The components of the 30 stimulus pairs used in Task 2 were the first and last expressions in these series. An intermediate expression was added which fell exactly half-way between the two end point expressions, with respect to all relevant parameters. This task was expected to be more susceptible to defensive distortions because it required positive and
negative responses and, therefore, permitted response biases to affect results. It also more closely resembled actual facial expression decoding in interpersonal interactions.

**Task 6 (Affect Rating).** This task requires subjects to rate, on a seven point scale, the positiveness of the seven facial expressions used as experimental stimuli on complexity level Tasks 1 - 4. The rating scale, bounded by a very happy-accepting expression stimulus at zero and a very angry-rejecting stimulus at eight, was shown continuously. The seven individual experimental facial expressions were presented randomly above the scale. Each expression remained visible until a response was made.

**Non-affective Task (Detection of Change in Facial Features).** This task requires subjects to determine if two faces were alike or different in facial features. Seven facial stimuli were constructed based on the neutral expression used in the above tasks. These stimuli varied from the neutral face on one of four facial feature dimensions: (a) the width of the chin, (b) width of the nose, (c) the distance between the eyes, and (d) the distance from eyebrow to hairline (see Appendix C). For dimension variables (a) through (c), two faces were created; one in which the feature was wider than that of the neutral expression and one in which the feature was more narrow than that of the neutral expression. For the fourth dimension variable only one face was created. In this face
the height of the forehead was less than that of the standard neutral face. From these seven faces and a standard neutral face, nineteen pairs of faces, which differed on one or two facial features, were created by randomly selecting two of the eight faces. Eleven pairs of identical faces were formed by pairing a randomly selected face from the eight with its duplicate. During standardization with the same individuals as those used in obtaining scale values for affective stimuli, the error rates on each of the 30 pairs, presented for four seconds each, were less than fifty percent. The mean error rate for all pairs was 17 percent.

Seven stimuli from the non-affective discrimination task were placed at the end of each complexity level task. This arrangement of non-affective task items was chosen because it was similar to the control procedure used by Cutting (1981). The two remaining non-affective discrimination items were presented after the five major decoding tasks but before the Affect Rating Task.

**Gaze Diversions.** Nonattending to facial expression stimuli was assessed by counting the number of times that each subject diverted his gaze from the experimental stimuli other than to initiate responses. Gaze diversions were counted only while stimulus faces were visible to the subjects and only on timed tasks. Counting was begun after the subject began looking at the stimulus. If the subject
did not look at the stimulus at all, a gaze diversion count of one was assigned. This was a very rare occurrence, however, occurring on less than 0.1 percent of all items administered. Gaze diversions to initiate a response were not counted, even if the subject returned his attention to the stimulus before completing the response. Inter-rater reliability in counting frequency of gaze diversions during stimulus presentations was assessed on a subsample of six randomly selected subjects from each of the three levels of severity of psychopathology. These data were obtained using a second independent observer seated approximately one meter from the experimenter at the same table but on the opposite side of the subject. Observers were unable to see the each other's gaze diversion count. The inter-rater agreement for total frequency of gaze diversions was 87 percent. The percent of agreement on individual tasks ranged from 76 percent (Task 4) to 97 percent (Task 2).

Procedure

Client and staff volunteers who met the inclusion criteria described previously completed the Beck Depression Inventory, the Byrne R-S Scale, the Psychoticism Scale, and the Shipley Institute of Living Scale, at least one day prior to beginning the experimental tasks. Also, staff ratings of the interpersonal adequacy of patient subjects were obtained prior to their beginning the experimental tasks.
All subjects were administered the experimental procedures individually. All psychiatric patient and nonpatient subjects were run over an eight week period in essentially random order. Subjects were seated at a desk two meters from the projection screen. The experimenter sat facing the subject at another desk about half-way between the subject and the screen and off to the subject's left approximately one-half meter. From this position, the experimenter operated the carousel slide projector and recorded subjects' gaze diversions. A readily audible electronic timer was used to standardize duration of stimulus presentations.

The first slide presented was a simple eye sight chart. Each subject was asked to adjust his seating until he could read the bottom line on the chart. The subject was instructed to copy that line on his answer sheet. All subjects copied this line correctly.

Subjects were informed that the purpose of the study was to investigate the process of social perception and that of particular interest was how a person perceives the reactions of persons with whom he/she is interacting. In an effort to induce some degree of stress and, thereby, accentuate perceptual selectivity, it was suggested that the tasks would provide a measure of interpersonal sensitivity (Stein, 1953).
Subjects were told that they were about to see a series of slides showing facial drawings and they would be asked to perform six different types of task: (a) determining if faces are alike or different in facial features, (b) determining if facial expressions are alike or different in positiveness or negativeness of feeling conveyed, (c) determining which of two expressions is more positive or more negative, (d) determining which pair of two pairs of expressions shows the most change in feeling from one member of the pairs to the other, (e) ordering a set of four expressions, with regard to level of positiveness, and (f) determining if a series of facial expressions show a positive or a negative change in feeling.

The order of presentation of the six stimulus sets to the subjects was randomized. Subjects were given a five minute break after each task presentation.

Prior to giving instructions for the first stimulus set subjects were informed that, at the end of each set of slides, several slides would be shown for which they were to tell only if the two faces were alike or different in facial features. They were instructed to circle "A" if they thought the faces are alike or "B" if they thought the faces were different. They were then shown clear examples of faces which differed in each of the relevant facial feature parameters. Subjects were then told that before these items were presented, the experimenter would say,
"On the next several items, circle 'A' if you think the two faces are alike, or circle 'B' if you think their features are different."

The experimenter then gave instructions for the first stimulus set. The introduction of each stimulus set included presentations of three relatively easy examples and instructions regarding how to mark the answer sheet. Subjects were given an opportunity to ask questions after each set of instructions but responses to these questions contained no new information and specifically avoided any mention of the physical parameters on which the expressions differed. At the end of instructions for each task, subjects were reminded that several items were included at the end of the set in which they would be asked if the faces were alike or different in facial features. To minimize confusion, answer sheets had brief task instructions at the top. Also, the "A" and "B" columns had explanatory headings such as "alike", "different", "face A", "face B", etc. Instructions for each task are included in Appendix D.

Each facial stimuli as it appeared on the projection screen was 30 cm high and 22 cm across. Stimulus pairs for Task 1, Task 2 and the Non-affective Task were presented for four seconds. Stimuli for Task 3 were presented for eight seconds. Stimuli for Task 4 were presented for 12 seconds. Each stimuli in Task 5 was presented for one second with an inter-stimulus interval of about one-half second.
Overview of the Statistical Analyses

As previously described, four groups of psychiatric patient subjects, representing two levels of severity of psychopathology and two major psychiatric diagnoses and one group of nonpatient control subjects were administered seven facial cue decoding tasks. Dependent measures were error rates for each task and number of gaze diversions per second during stimulus presentations for the five timed tasks involving affective facial expression cues. Two additional dependent measures were derived from the original data for use in some analyses: residual error scores and perceptual distortion scores.

Residual error scores are the amount of raw error scores not linearly associated with gaze diversions. These scores were derived by subtracting from raw error scores the estimated error scores computed from regression equations predicting errors from gaze diversions. These residual error scores were used as the dependent variable in the ANOVA's when analysis of covariance could not be used to statistically control for attending because the relationship between the variate and the covariate, across
groups, was found to be significantly non-linear. The distorting effects of the non-linear relationships were avoided in computing residual scores by deriving separate regression equations for each subject group by decoding task combination.

Perceptual distortion scores were computed for the three affective tasks in which type of misperception could be assumed from the known characteristics of the stimulus items. All three of these tasks were tasks assumed to be primarily dependent on the encoding of affective facial cues. Distortion scores were obtained by subtracting perceptual sensitization errors from perceptual defense errors. Perceptual sensitization errors were defined as those due to a failure to recognize expression changes in the positive more approving direction. Perceptual defense errors were defined as those due to a failure to recognize expression changes in the negative, less approving direction.

The seven facial cue decoding tasks were: The Detection of Change in Facial Features Task (Non-affective Task), The Detection of Change in Facial Expression Task (Task 1), The Selection of the More Approving Expression Task (Task 2), The Selection of the More Affectively Changed Pair of Expressions Task (Task 3), The Facial Expression Ordering Task (Task 4), The Identification of Direction of Affective Change Task (Task 5), and The Positiveness of Affect Rating Task (Task 6).
Progression of task complexity. Tasks 1 through 4 were originally expected to represent a progressive increase in task complexity and difficulty. Performance on the hypothetically less difficult tasks (Tasks 1 and 2) was assumed to be more dependent on encoding while performance on the hypothetically most difficult task (Task 4) was assumed to be more dependent on processing of the encoded data. The data analysis revealed a progression in task difficulty only from Task 2 through Task 4. Task 1 produced unexpected results.

A 3 X 4 (Severity of pathology groups X Complexity level tasks) ANOVA with repeated measures on residual error scores yielded a significant main effect for groups, F(2, 63) = 5.36 (p < .01); a significant main effect for tasks, F(3, 189) = 36.12 (p < .001); and a significant interaction effect, F(6, 189) = 2.58 (p < .05). Tests on simple main effects for tasks were significant beyond the .01 level for each of the three subject groups [high pathology, F(3, 189) = 23.52; low pathology, F(3, 189) = 10.49; controls F(3, 189) = 7.31]. Post hoc analyses using the Newman-Keuls procedure indicated that error scores for each of the three subject groups increased significantly from Task 2 to Task 3 and from Task 3 to Task 4.

Residual error score rates on Task 1 did not fall into the progression of task difficulty in any way which was consistent for all levels of severity of pathology. In the
control group, the mean residual error score for Task 1 was greater than that for Task 2, and did not differ from that for Tasks 3 or 4. In the low pathology group, the mean residual error score from Task 1 did not differ from that for Task 2 but was less than that for Task 3 and Task 4. In the high pathology group, the mean residual error score for Task 1 was greater than that for Task 2, did not differ from that for Task 3, and was less than that for Task 4. These findings, revealing unexpectedly poor performance on Task 1 by both the control group and the high pathology group, suggest that performance on Task 1 may involve factors not present on Tasks 2 and 3.

Similar results were obtained when the data were analyzed for diagnostic groups. The 3 X 4 (Diagnostic groups X Task complexity) ANOVA for repeated measures on residual error scores yielded significant main effects for both groups \( [F(2, 63) = 22.76, p < .001] \) and tasks \( [F(3, 189) = 56.39, p < .001] \) and a significant interaction effect \( [F(6, 189) = 5.88, p < .01] \). The post hoc analyses using the Newman-Keuls procedure indicated that for all subject groups Task 2 was less difficult than Task 3 which was less difficult than Task 4. In the schizophrenic group and in the affective disorder group, error scores on Task 1 were larger than on Task 2 and less than on Task 4, but did not significantly differ from error rates on Task 3. In the control group, the mean residual error score from
Task 1 was greater than that for Task 2, but did not differ significantly from that for Tasks 3 and 4. Again Task 1 did not fit into an order of increasing task difficulty in a way which was consistent across all groups. It was, however, retained as a measure of encoding, along with Task 2, because the task requirements involved in Task 1 were consistent with the definition of a task primarily dependent on encoding. It may have been a more difficult encoding task than Task 2 because the task instructions were less specific in identifying which affective cues were relevant.

Removing Task 1 from the set of complexity level tasks resulted in three remaining tasks that clearly represented a progressive increase in task difficulty and complexity. The progressive increase in task difficulty is reflected in the increases in error rates from Tasks 2 through 4. The progressive increase in task complexity is evident in the increase in stimulus complexity from Task 2 to Task 3 and 4 (two faces to four faces) and the increase in response complexity from Task 3 to Task 4 (one response to four responses).

In all statistical analyses a $p$ less than .05 was regarded as significant, and unless otherwise stated, significance of results are based on two-tailed tests. One-tailed tests were used only when a directional difference had been hypothesized.
Effects of psychopathology and task complexity on attending. Attending to, or at least orienting one's visual apparatus toward, the facial stimulus was assumed to be the initial element in the process of encoding facial expression cues. Rates of gaze diversions during stimulus presentations were collected for all timed facial expression decoding tasks. It was hypothesized that the frequency of gaze diversions during stimulus presentations would increase with severity of psychopathology (Hypothesis 2). It was also expected that schizophrenic subjects would evidence more gaze diversions than either affective disorder subjects or controls, and that gaze diversions rates would increase with task complexity, at least within the more pathological subject groups.

The effects of severity and type of psychopathology on attending were evaluated using a 2 X 2 (Severity of psychopathology groups X Psychiatric diagnosis groups), plus a single control group ANOVA (Winer, 1971) on total gaze diversions per second of stimulus exposure (gaze diversion rates summed across Tasks 1 through 4). The factorial part of this analysis yielded a significant main effect for diagnostic groups \( F(1, 40) = 6.92, p < .01 \) and a significant interaction effect \( F(1, 40) = 5.29, p < .05 \). The main effect for severity of pathology was nonsignificant \( F(1, 40) = 1.42 \). Post hoc analysis using the Newman-Keuls procedure to test for significant
differences between group means indicated that the gaze
diversion rate of the high pathology-schizophrenic group was
greater than that of all other patient groups. The gaze
diversion rates of the other three patient groups did not
differ.

A significant control group versus all other groups
effect \( F(1, 61) = 18.09, p < .001 \) was obtained. Post hoc
analyses using the Dunnett \( t \) statistic indicated that the
gaze diversion rates for the high pathology-schizophrenic
group, the low pathology-schizophrenic group, and the low
pathology-affective disorder group were all greater than
that for the control group. Finally, tests of the main
effects for severity of pathology and psychiatric diagnosis
with the control group serving as the zero level for both
factors were statistically significant \( F(2, 61) = 14.06,
p < .001 \) and \( F(2, 61) = 19.26, p < .001 \), respectively. Post
hoc analyses using the Newman-Keuls procedure revealed a
significant progressive increase in gaze diversion rates
from control group to low pathology group to high pathology
group and from control group to affective disorder group to
schizophrenic group. The relationships between the gaze
diversion rates of the various subject groups may be more
readily seen in Table 3.

In order to evaluate the effects of task complexity on
attending for severity of pathology and type of pathology
groups, two separate 3 X 3 ANOVA's with repeated measures
on gaze diversion rates were computed. The 3 X 3
(Psychopathology level groups X Complexity level Tasks 2
through 4) ANOVA with repeated measures on gaze diversions
rates yielded a significant main effect for groups,
\[ F(2, 63) = 4.09 \ (p < .05) \], but both the main effect for
tasks and the interaction effect were nonsignificant
[\[ F(2, 126) = 2.60, \ p = .08; F(4, 126) = 2.16, \ p = .08 \]
respectively]. As indicated previously, overall attending
was adversely affected by increasing severity of
psychopathology. Attending was not significantly effected
by task complexity and the effects of severity of pathology

Table 3

Means and Standard Deviations for Rates of Gaze Diversion

<table>
<thead>
<tr>
<th>Groups</th>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
<th>Task 4</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Path Schiz</td>
<td>( \bar{X} )</td>
<td>0.60</td>
<td>0.78</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.88</td>
<td>1.18</td>
<td>0.37</td>
<td>0.55</td>
</tr>
<tr>
<td>High Path Affective</td>
<td>( \bar{X} )</td>
<td>0.29</td>
<td>0.32</td>
<td>0.16</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.36</td>
<td>0.59</td>
<td>0.11</td>
<td>0.19</td>
</tr>
<tr>
<td>Low Path Schiz</td>
<td>( \bar{X} )</td>
<td>0.40</td>
<td>0.35</td>
<td>0.28</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.34</td>
<td>0.44</td>
<td>0.30</td>
<td>0.18</td>
</tr>
<tr>
<td>Low Path Affective</td>
<td>( \bar{X} )</td>
<td>0.48</td>
<td>0.25</td>
<td>0.27</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.36</td>
<td>0.29</td>
<td>0.43</td>
<td>0.18</td>
</tr>
<tr>
<td>Controls</td>
<td>( \bar{X} )</td>
<td>0.16</td>
<td>0.08</td>
<td>0.14</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.22</td>
<td>0.14</td>
<td>0.18</td>
<td>0.17</td>
</tr>
</tbody>
</table>

1X5 ANOVA F's \[ F(2, 63) = 2.55 \ (p = 3.94* \ (p = 1.72 \ (p = 1.70 \ (p = 4.14**

* = p < .05. ** = p < .01.
Figure 1. Mean gaze diversion rates by tasks for groups (gaze diversion per second of stimulus exposure, prior to response initiation).
and task complexity did not significantly interact. It is worth noting, however, that both the interaction effect and the main effect for tasks approached significance. Inspection of the gaze diversions rates data in Table 3 and Figure 1 suggests that gaze diversions/sec. tended to decrease with increases in task complexity and that the largest difference between groups in gaze diversion rates occurred on Task 2, the task with the lowest residual error rate. The high psychopathology group had an unusually high rate of gaze diversions on this task while the control group had an unusually low rate.

The 3 X 3 (Psychiatric diagnosis groups X Complexity level tasks) ANOVA with repeated measures on gaze diversions per second of stimulus exposure also yielded a significant main effect for groups \( F(2, 63) = 4.55, p<.05 \). The main effect for tasks \( F(2, 126) = 1.12 \) and the interaction effect \( F(4, 126) = 1.47 \) were not statistically significant. Again, attending was not affected by task complexity and the interaction between type of pathology and task complexity was not significant.

Effects of pathology and task complexity on error rates with the effects of attending statistically controlled. Decoding of facial expression cues was assumed to involve attending to facial cues, encoding relevant cues, and processing the encoded data. With statistical control for attending available through gaze diversion rates, the
effects of psychopathology on encoding was assessed by examining group differences in performance on the relatively non-complex tasks. These tasks required only one comparison of two facial stimuli, involved types of comparisons that are frequently occurring in interpersonal interactions, and required an immediate selection from two response alternatives.

Performance on Task 2 was expected to be primarily a function of encoding accuracy and efficiency because it met the above criteria. Task 1 also met these criteria and was retained as a measure of encoding, despite its failure to yield expected error rates. The unexpected difficulty of Task 1, may have been related to the task's instructions. Subjects were asked to determine if facial expressions changed from one face to the other. The instructions did not specify that positive/approving - negative/disapproving was the only affective dimension to be considered. The dimension of change was specified for all other complexity level tasks. Task 1, therefore, may have been a more complex encoding problem and may have evoked more processing involvement in more achievement motivated subjects. Still, Task 1 meets all of the criteria for an encoding dominated task, and the relationships between error rates and diagnostic groups was similar to those obtained for other tasks.
Performance on Task 4 relative to Task 3 was expected to primarily represent an increase in processing requirements, since the stimulus complexity was unchanged from Task 3 to Task 4, but more comparisons were required and a series of responses were required rather than just one response. Thus, processing was assessed by examining performance on Task 4 with Task 3 serving as a covariate to control for encoding.

It was hypothesized that total decoding errors, summed across the three complexity level tasks, would increase with severity of pathology (Hypothesis 2), and that more pathological subjects would make more errors on tasks primarily dependent on encoding of affective facial cues (Hypothesis 3). It also was hypothesized that more pathological subjects would make more errors on the task assumed to be largely dependent on processing of encoded data, when attending and encoding were statistically controlled (Hypothesis 4). Finally, it was expected that overall accuracy, encoding proficiency, and processing of encoded data would be significantly affected by type of psychopathology (psychiatric diagnosis).

All three of the above hypotheses were tested using residual error scores to provide a statistical control for differences in attending across subject groups and tasks. Analyses of covariance were not used to provide this control because statistical tests indicated that the data
violated the assumption of homogeneity of within class regression coefficients.

A 2 X 2 (Severity of psychopathology X Psychiatric diagnosis), plus a single control group ANOVA was performed on residual error scores, summed across Tasks 2 through 4, to test Hypothesis 2. The factorial part of this analysis yielded a significant main effect for diagnosis \[F(1, 40) = 23.64, p<.001\] indicating that the mean total error score of the schizophrenic group was significantly greater than that of the affective disorder group. The main effect for severity of psychopathology \[F(1, 40) = 0.04\] and the interaction effect \[F(1, 40) = 2.19\] were not statistically significant. The control group versus all other groups \[F\] was significant beyond the .01 level \[F(1, 61) = 8.78\]. The post hoc analysis using the Dunnett \(t\) statistic indicated that the total error scores of both schizophrenic groups were higher than that of the control group, but neither of the affective disorder groups had total error scores which were greater than that of the control group. Tests on main effects of severity of psychopathology and psychiatric diagnosis, with the control group as the zero level for both factors, were statistically significant \[F(2, 61) = 5.80\] and \[F(2, 61) = 18.53\], respectively] beyond the .01 level.

Post hoc analyses using the Newman-Keuls procedure indicated that the mean total error score of the
schizophrenic group was greater than those of both the affective disorder group and the control group, and the mean total error score of both the high and low pathology groups, were greater than that of the control group.

The above analysis indicates that, although total decoding errors appeared to increase with severity of psychopathology, this effect was due almost exclusively to schizophrenic subjects. The errors rate of affective disorder subject did not differ from that of control subjects.

Hypothesis 3 stated that pathological subjects would evidence more errors on tasks primarily dependent on encoding. To test this hypothesis 2 X 2 (Severity of pathology X Psychiatric diagnosis), plus a single control group, ANOVAs were performed first on residual error scores from Task 1 and then residual error scores from Task 2.

The factorial part of the analysis of Task 1 residual error scores yielded a significant main effect for severity of psychopathology [$F(1, 40) = 13.02, p<.01$], indicating that the high pathology group scored significantly higher than the low pathology group on Task 1. The main effect for psychiatric diagnosis [$F(1, 40) = 2.00$] and the interaction effect [$F(1, 40) = 0.60$] were nonsignificant.
The control group versus all other groups was nonsignificant \[ F(1, 61) = 0.20 \]. Tests on main effects of severity of psychopathology and psychiatric diagnosis, with the control group as the zero level for both factors, were both significant when one-tailed tests were used \[ F(2, 61) = 9.05, p < .01 \] and \[ F(2, 61) = 2.78, p < .05; \] respectively. The post hoc analyses, using the Newman-Keuls procedure, indicated that the mean error score of the high pathology group was greater than that of both the low pathology group and the control group. Also, using a one-tailed test, the mean error score of the schizophrenic group was greater than that of the affective disorder group and the control group. A contrast of all group means using the Newman-Keuls procedure showed that the high pathology-schizophrenic group was the only individual group which evidenced significant impairment, relative to the control group, on this task.

The 2 X 2 (Severity of pathology X Psychiatric diagnosis) ANOVA portion of the analysis of Task 2 residual error scores obtained a significant main effect for psychiatric diagnosis \[ F(1, 40) = 10.54, p < .001 \], indicating that the schizophrenic subjects had higher error scores than affective disorder subjects. The severity X type of psychopathology interaction effect \[ F(1, 40) = 3.62, p < .05 \] was also statistically significant. The post hoc analysis using the Newman-Keuls procedure indicated
that the mean error score of the low pathology-schizophrenia group was larger than those of both affective disorder groups. The main effect for severity of pathology $F(1, 40) = 0.60$ was nonsignificant. The control group versus all other groups $F$ also was nonsignificant $F(1, 61) = 2.20$, as was the main effect for severity of pathology, with the control group representing the zero level of that factor $F(2, 61) = 1.17$. The main effect for psychiatric diagnosis, with the control group as the zero level of the diagnosis factor, however, was statistically significant $F(2, 61) = 8.05, p < .01$. The post hoc analysis using the Newman-Keuls procedure indicated that the mean error score on Task 2 of the schizophrenic group was larger than those of both the affective disorder group and the control group.

Subjects with a schizophrenic diagnosis evidenced significant impairment relative to controls in their performance on both tasks hypothetically more dependent on encoding of affective facial cues. Affective disorder subjects evidenced no impairment on either task. Severity of psychopathology seems to have been a significant factor, in addition to diagnosis, on Task 1, but only psychiatric diagnosis was a significant factor in performance on both tasks.

A 2 X 2 (Severity of pathology X Psychiatric diagnosis) ANCOVA and a 1 X 5 (Subject groups) ANCOVA
performed on residual error scores from Task 4 with residual error scores from Task 3 serving as the covariate, were used to test Hypothesis 4. This hypothesis stated that more severely pathological subjects would evidence significant impairment on an affective facial cue decoding task dependent primarily on processing of information after transfer into short-term memory, when attending and encoding are statistically controlled. Task 3 error scores were used as the covariate in these ANCOVA's to provide a statistical control for encoding. Task 3 was assumed to be more dependent on encoding than Task 4 because, although both tasks had equal stimulus complexity, Task 3 required fewer comparisons of stimulus sets, and a less complex response. The use of residual error scores on both tasks provided measures with the variance linearly associated with attending removed.

The factorial ANCOVA on Task 4 residual error scores produced a significant main effect for diagnosis \( [F(1, 39) = 20.36, p < .001] \), indicating that the adjusted error rate of the schizophrenic group on Task 4 was significantly greater than that of the affective disorder group. The main effect for severity of psychopathology, \( [F(1, 39) = 0.24] \), and the severity of pathology by type of pathology interaction effect, \( [F(1, 39) = 0.29] \), were both nonsignificant.
The 1 X 5 ANCOVA on Task 4 residual error scores provided a control group versus all other groups contrast. This statistic yielded a $F(4, 60)$ of 7.18 ($p < .01$). The post hoc analysis using the Dunnett two-tailed $t$ statistic indicated that the mean adjusted error scores of the control group and the two affective disorder groups, on Task 4, were significantly less than those of both schizophrenic groups. The adjusted means of the two affective disorder groups and the control did not differ significantly. Neither did the adjusted means of the two schizophrenic groups.

All tests for violations of the assumptions underlying the above analyses of covariance were nonsignificant.

The above analyses suggest that processing of encoded data is adversely effected in schizophrenia. As can be seen in Table 4, the impairments evidenced are almost exclusively attributable to schizophrenic subjects and seems to have no relationship to severity of psychopathology.

Effects of psychopathology on discriminating changes in affective and non-affective cues. It was hypothesized that accuracy in discriminating changes in affective facial stimuli would be more impaired by increasing psychopathology than would accuracy in discriminating changes in non-affective facial stimuli (Hypothesis 5). This hypothesis was tested by comparing the effects of severity and type of pathology on performance of discrimination tasks involving either affective or non-affective facial cues.
Task 1 and the Non-affective Task were identical in every respect other than the type of cue changes to be detected. Task 1 required detection of changes in affective facial expression cues, while the Non-affective Task required detection of changes in non-affective facial feature cues.

Table 4

Means and Standard Deviations for Error Scores

<table>
<thead>
<tr>
<th>Groups</th>
<th>Tasks</th>
<th>11</th>
<th>21</th>
<th>31</th>
<th>41</th>
<th>Totals1</th>
<th>N-A</th>
<th>1</th>
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</thead>
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<tr>
<td>High Path. Schiz.</td>
<td>X</td>
<td>8.60</td>
<td>3.01</td>
<td>7.54</td>
<td>13.85</td>
<td>33.01</td>
<td>8.67</td>
<td>8.20</td>
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<tr>
<td></td>
<td>SD</td>
<td>3.52</td>
<td>2.79</td>
<td>3.28</td>
<td>5.82</td>
<td>9.85</td>
<td>4.06</td>
<td>3.49</td>
</tr>
<tr>
<td>High Path. Affective</td>
<td>X</td>
<td>6.54</td>
<td>1.90</td>
<td>6.84</td>
<td>7.21</td>
<td>22.50</td>
<td>6.86</td>
<td>7.29</td>
</tr>
<tr>
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<td>SD</td>
<td>1.82</td>
<td>3.02</td>
<td>2.05</td>
<td>4.29</td>
<td>7.34</td>
<td>3.40</td>
<td>2.05</td>
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<tr>
<td>Low Path. Schiz.</td>
<td>X</td>
<td>4.37</td>
<td>5.07</td>
<td>6.97</td>
<td>15.33</td>
<td>31.33</td>
<td>11.90</td>
<td>8.30</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.73</td>
<td>2.40</td>
<td>3.42</td>
<td>4.42</td>
<td>8.17</td>
<td>6.27</td>
<td>5.00</td>
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<td>Low Path. Affective</td>
<td>X</td>
<td>3.77</td>
<td>0.83</td>
<td>4.51</td>
<td>6.45</td>
<td>14.58</td>
<td>7.50</td>
<td>6.25</td>
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<td>SD</td>
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<td>8.30</td>
<td>4.89</td>
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<td>Controls</td>
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<td>6.39</td>
<td>19.02</td>
<td>5.95</td>
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<td>1.53</td>
<td>3.33</td>
<td>4.79</td>
<td>9.19</td>
<td>3.99</td>
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<tr>
<td>Totals</td>
<td>X</td>
<td>5.81</td>
<td>2.40</td>
<td>5.94</td>
<td>9.71</td>
<td>23.86</td>
<td>7.85</td>
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<tr>
<td></td>
<td>SD</td>
<td>3.42</td>
<td>2.60</td>
<td>3.37</td>
<td>6.43</td>
<td>11.23</td>
<td>5.21</td>
<td>3.61</td>
</tr>
<tr>
<td>1X5 ANOVA P's (df = 4, 61)</td>
<td>9.54**</td>
<td>0.43</td>
<td>1.05</td>
<td>3.48*</td>
<td>6.22**</td>
<td>2.93*</td>
<td>2.25</td>
<td></td>
</tr>
</tbody>
</table>

Note. 1 = residual error scores, derived by subtracting from raw error scores the errors linearly associated with gaze diversions by that group on that task.

N-A = Non-affective Task.

* = p < .0. ** = p < .01.
Figure 2. Mean residual error scores.
A 2 X 2 (Severity of pathology X Psychiatric diagnosis) plus a single control group ANOVA was performed on raw error scores from Task 1. The factorial part of this analysis obtained only nonsignificant results. The main effect for severity of psychopathology \( [F(1, 40) = 0.19] \), the main effect for diagnosis \( [F(1, 40) = 1.85] \), and the interaction effect \( [F(1, 40) = 2.31] \) were all nonsignificant. The control group versus all other groups' contrast, however, was statistically significant \( [F(1, 61) = 5.92, p < .05] \). The post hoc analysis with the Dunnett \( t \) statistic indicated that the Task 1 error rates of both schizophrenic groups were greater than that of the control group. The control group did not differ significantly from either of the affective disorder groups.

A 2 X 2 (Severity of pathology X Psychiatric diagnosis) plus a single control group ANOVA was also performed on raw error scores from the Non-affective Task. The factorial part of this analysis obtained nonsignificant results. The main effect for diagnosis \( [F(1, 40) = 3.85, p = .07] \), the main effect for severity of psychopathology \( [F(1, 40) = 1.51] \), and the interaction effect \( [F(1, 40) = 0.68] \) were all nonsignificant. The control group versus all other groups' contrast was statistically significant \( [F(1, 61) = 5.10, p < .01] \) and the post hoc analysis using the Dunnett \( t \) statistic indicated that the mean error score of the control group differed only from that of the low pathology-
schizophrenic group ($\bar{X} = 5.95$ and $\bar{X} = 11.9$, respectively). The test on the main effect of diagnosis, with the control group as the zero level of diagnosis, produced a $F(2, 62) = 4.42$, $p < .05$. The post hoc analysis using the Newman-Keuls procedure indicates that the mean error score of the schizophrenic group was greater than that of the control group, but not that of the affective disorder group. Finally, the test on the main effect for severity of pathology, with the control group as the zero level for severity of psychopathology, was nonsignificant [$F(2, 61) = 2.89$].

The above analyses of Task 1 and the Non-affective Task raw error scores indicate that the schizophrenic subjects had more errors than controls on both tasks. In contrasting individual groups on Task 1, both schizophrenic groups had higher error scores than the control group while on the Non-affective Task only the low pathology-schizophrenic group scored significantly higher than controls. Apparently, there was very little, if any, differential effect for discriminating changes in affective versus non-affective facial cues attributable to either type or severity of pathology.

To further test this conclusion a $2 \times 2$ (Severity of pathology X Psychiatric Diagnosis) ANCOVA was computed on Task 1 error scores, with Non-affective Task scores as the covariate. This analysis obtained only nonsignificant
results. The main effect for severity of psychopathology \([F(1, 39) = 1.95]\), the main effect for diagnosis \([F(1, 39) = 0.02]\), and the interaction effect \([F(1, 39) = 0.01]\) were statistically nonsignificant.

In order to include a contrast between the control group and the patient groups, a 1 X 5 (Subject groups) ANCOVA was computed on raw error scores from Task 1, with raw error scores from the Non-affective Task as the covariate. This analysis yielded an \(F(4, 60)\) of 1.13 which also was nonsignificant, thus confirming the above conclusion that encoding of affective and non-affective facial cues was not differentially effected by either type or severity of pathology. The relationships between performance on the two tasks for the various individual groups may been seen in Figure 3. In both of the above ANCOVAs, all tests for violations of the assumptions of the covariate analysis model were nonsignificant. It might be noted, however, that the variance for total error from the Non-affective Task was significantly greater than the variance for total errors from Task 1 \([F(65, 65) = 2.08, p < .01]\).

It should be noted, that no control for attending was available for the above analyses of encoding by cue type, because gaze diversions rates were not recorded for Non-affective Task items. If such a control had been available, a significant differential effect for cue type
might have been obtained provided attending was more adversely affected by affective cues.

Figure 3. Non-affective vs. affective discrimination tasks (HP-S = High pathology-schizophrenics; HP-A = High pathology-affective disorders; LP-S = Low pathology-schizophrenics; LP-A = Low pathology-affective disorders; NP-C = Nonpatient Control group).

Relationship of perceptual distortion scores to measures of defensive style and characteristics of psychopathology. It was hypothesized (Hypothesis 6) that patients evidencing a tendency toward the use of sensitizer defenses and patients evidencing a tendency toward the use of represser
defenses would differ in their most prevalent type of decoding errors. Patient subjects were classified as sensitizers or repressers on the basis of Byrne R-S Scale scores. Only the one-third of the patients (15) scoring highest in the use of sensitizer defenses (sensitizers) and the one-third (15) scoring lowest in the use of sensitizer defenses (repressers), were employed in testing this hypothesis.

Perceptual distortion scores, for the two defensive style groups, were derived for Task 1, Task 2, Task 3, and Task 5. Distortion scores from each task and total distortion scores were compared independently using the Student t procedures. All t's were nonsignificant: [Task 1, \( t(28) = 1.09 \); Task 2, \( t(28) = 0.97 \); Task 3, \( t(28) = 1.04 \); Task 5, \( t(28) = 0.57 \); total distortion scores, \( t(28) = 0.20 \)]. Further, Byrne R-S Scale scores were not significantly correlated with total distortion scores, \( r = .23 \) [\( t(28) = 1.25, p > .10 \)].

It was also hypothesized, that perceptual distortion scores from Task 5, would be significantly related to scores on the Byrne R-S Scale (Hypothesis 7). Task 5, the Identification of Direction of Affective Change Task, was expected to be more susceptible to defensive distortions than the other tasks, because it involved the most brief stimulus presentations and consisted of a series of facial expressions presented in rapid succession, so that it more
closely resembled a real interaction. Also, this task required subjects to make positive or negative responses and was, therefore, more susceptible to positive-negative response biases. The correlation between perceptual distortion scores from Task 5 and R-S Scale scores, however, was nonsignificant \[ r = 0.09 \].

Finally, it was hypothesized that patient subjects evidencing a predominance of perceptual defense errors on Task 5 (more perceptual defense errors than perceptual sensitization errors), would differ from those evidencing a predominance of perceptual sensitization errors with regard to psychiatric diagnosis, Psychoticism scores, and depression scores (Hypothesis 8). T tests on Beck Depression Inventory Scores and Psychoticism Scale scores for the two predominant error type groups were non-significant, \( t(18) = 0.78 \) and \( t(18) = 0.04 \), respectively. Also, a 2 X 2 (Error type X Psychiatric diagnosis) Chi Square analysis revealed no significant differences between subjects with sensitizer error patterns and subjects with repressor error patterns, with respect to the proportion who had been diagnosed schizophrenic and the proportion who had been given major affective disorder diagnoses \[ \chi^2(2) = .62 \].

In summary, patients classified as sensitizers and repressers, on the basis of R-S Scale scores, did not evidence significantly different perceptual distortion
scores on any task. Distortion scores on Task 5 were not significantly correlated with R-3 scores. Subjects, evidencing repressor perceptual distortion scores on Task 5, did not significantly differ from those evidencing sensitizer distortion scores on Task 5, with regard to psychoticism, depression, or psychiatric diagnoses.

Effects of psychopathology on accuracy in rating the positiveness-negativeness of facial expressions. It was expected that accuracy in rating the positiveness-negativeness of facial expression stimuli on Task 6 would significantly differ across severity of psychopathology groups, with accuracy decreasing as severity of pathology increased. The seven facial expression stimuli used throughout this investigation were assigned ranks from one to seven based on their position in the progression from least to most positive/approving. The dependent variables used to test the assumed decrease in rating accuracy with increase in psychopathology was the absolute sums of the differences between the rating assigned by the subject and the rank of the expression in the ordered series of expressions. A 2 X 2 (Severity of pathology X Psychiatric diagnosis) plus a single control group ANOVA was performed on these summed absolute difference scores. The results for the factorial part of this analysis were nonsignificant [main effect for severity of pathology, $F(1, 27) = 0.03$; main effect for diagnosis, $F(1, 27) = 0.03$; interaction
effect, $F(1, 27) = 0.17$. The control group versus all other groups effect was significant beyond the .05 level $F(1,40) = 6.07$. The post hoc analysis using the Dunnett $t$ statistic indicated that the high pathology-schizophrenic group and the low pathology-affective disorder groups had larger absolute difference scores than the control group.

Relationship between ratings of adequacy of interpersonal functioning and decoding variables. It was hypothesized that ratings of adequacy of interpersonal functioning could be predicted by performance on the three complexity level tasks, plus the affective cue discrimination task (Task 1) and the direction of affective change task (Task 5), after variance attributable to non-attending had been removed (Hypothesis 9). This hypothesis was based on the commonly held, but relatively untested, assumption that accurate decoding of facial cues and changes in facial cues is essential to effective interpersonal functioning. A hierarchial multiple regression analysis was used to estimate the relative contribution of the various information processing elements to ratings of adequacy of interpersonal functioning.

The reliability of the ratings of adequacy of interpersonal functioning appeared adequate, based on an examination of inter-rater agreement, for a separate sample of 15 patients rated independently by four professional staff members. Using the same rating instrument as employed
in this study, a coefficient of agreement of .71 (p < .01) was obtained.

The ratings of interpersonal adequacy for the patient subjects were found to be significantly correlated with Brief Psychiatric Rating Scale scores (r = -.31, p < .05), length of current hospitalization (r = - .23, p < .05), and age (r = .33, p < .05). Subjects rated as more adequate in their interpersonal functioning tended to be older, less pathological, and hospitalized for a shorter period of time. These associations appear consistent with general expectations regarding interpersonal adequacy. Unfortunately, no other validity data were available.

The independent variables used in the multiple regression analysis to predict interpersonal adequacy were: (a) total gaze diversion frequencies; (b) error scores from the two tasks thought to be primarily dependent on encoding, Tasks 1 and 2; (c) error scores from a task which seemed to be a mixture of both encoding and processing, Task 3; (d) error scores from the task thought to be primarily dependent on processing Task 4; (e) error scores from the task expected to elicit defensive perceptual distortions, Task 5. Raw error scores were used as the independent variables in the regression analysis because by entering gaze diversion frequencies into the regression equation first, the effects of this variable were partialled from all subsequent variables entered in the analysis.
All of the above variables, except Task 1 errors, were found to be negatively and significantly correlated with ratings of adequacy of interpersonal functioning (see Table 5). Error scores on Task 4 were most significantly correlated with the interpersonal adequacy ratings. When the correlations between the various independent variables and ratings of adequacy of interpersonal functioning were compared, using $t$ tests for differences between dependent r's, only two significant differences emerged. The correlations between total gaze diversions and ratings of adequacy of interpersonal functioning and between Task 4 errors and ratings of adequacy of interpersonal functioning were significantly greater than the correlation of Task 1 scores with ratings of interpersonal functioning [$t(41) = 2.21$, $p < .05$ and $t(41) = 2.08$, $p < .05$, respectively].

Thus, Task 1 errors was the only variable found to be significantly less predictive of interpersonal adequacy ratings. All other independent variables were about equally correlated with the ratings of adequacy of interpersonal functioning. Also, all were positively and significantly correlated with each other.

The facial expression decoding model underlying the present investigation, assumes a general sequence of events in the perceptual process. Therefore, a hierarchical regression analysis was employed.
Table 5
Correlation Matrix for Ratings of Interpersonal Adequacy
and Task Variables¹

<table>
<thead>
<tr>
<th></th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gaze Div.</td>
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<tr>
<td>Interpersonal Adequacy</td>
<td></td>
</tr>
<tr>
<td>Gaze Div.</td>
<td></td>
</tr>
<tr>
<td>Task 1</td>
<td></td>
</tr>
<tr>
<td>Task 2</td>
<td></td>
</tr>
<tr>
<td>Task 3</td>
<td></td>
</tr>
<tr>
<td>Task 4</td>
<td></td>
</tr>
</tbody>
</table>

Note. Gaze Div. = Gaze diversions summed across Tasks 1 - 5.

¹ All correlations based on raw scores

* p < .05    ** p < .01

This procedure permits variables to be entered into the regression equation in their theoretical order of occurrence: attending, then encoding, and then processing (Cohen & Cohen, 1975). Attending, represented by total gaze diversions, was entered as the first variable in the regression analysis. This variable yielded an R of .17, which was statistically significant [F(1, 38) = 3.56, p < .05 for a one-tailed test]. Encoding was measured by Tasks 1 and 2 error scores. These two variables were,
therefore, entered simultaneously in the second step of the regression analysis. The resulting, increase in $R^2$ to .19 ($F(2,37) = 0.60$), was not statistically significant.

Task 3 error scores were entered in the third stage of the regression analysis because this task was assumed to be substantially dependent on both encoding and processing and because this task was used as the covariate in the analysis of Task 4 error scores to control for the effects of encoding. Entering Task 3 error scores resulted in a nonsignificant increase in $R^2$ to .197 ($F(1, 37) = 0.30$).

Task 4 error scores, representing the effects of processing, were entered in the fourth step of the regression analysis. This variable produced a significant increase in $R^2$ to .253 ($F(1, 37) = 2.85$, $p = .05$ for a one-tailed test). Finally, adding Task 5 in step five resulted in no further significant increase in $R^2$, $F(1, 37) = 0.00$. The total $R^2$ was .253.

The regression analysis indicated that 17 percent of the variance in ratings of interpersonal adequacy could be attributed to gaze diversion frequencies (nonattending). An additional eight percent could be attributed to measures of the more central elements of perception. Only the measures of attending and processing, however, significantly contributed to the final $R^2$.

Relationships between the decoding variables and Psychoticism Scale scores. It was hypothesized that scores
on the Psychoticism Scale could be predicted by error frequencies on the five (timed) affective facial expression decoding tasks, plus errors on the non-affective discrimination task and frequencies of gaze diversions (Hypothesis 10). Also of interest was an estimation of the extent to which impairments in the various elements of the perceptual process were associated with severity of psychopathology.

Data from all 66 subjects were used in the regression analysis predicting Psychoticism Scale scores. The correlations of the various independent variables with Psychoticism Scale scores are presented in Table 6.

Table 6
Correlations Between Measures of Severity of Psychopathology and Task Variables

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Gaze Div.</th>
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<th>4</th>
<th>5</th>
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<td>.20</td>
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<td>.19</td>
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</table>


* p < .05. ** p < .01.
The first step in the hierarchical regression analysis, with Psychoticism Scale scores as the dependent variable, was to enter total gaze diversion frequencies into the regression equation. An initial $r^2$ of .09 [$F(1, 58) = 6.95, p < .01$] was obtained. Errors scores from Tasks 1 and 2, plus the Non-affective Discrimination Tasks were expected to represent efficacy of encoding. These variables were entered simultaneously in the second step, resulting in a nonsignificant increase in $R^2$ to .15 [$F(3, 58) = 1.49$].

Error scores from Task 3 were entered in the third step of the regression analysis to provide a complete representation of all encoding related variables. Adding Task 3 errors to the regression equation increased $R^2$ to .19 [$F(1, 58) = 2.98$]. This increase was significant on a one-tailed test.

Task 4 errors were entered in the fourth step of the regression analysis to include the relationship between Psychoticism scores and processing. $R^2$ increased to .22 [$F(1, 58) = 2.23$], which was nonsignificant. Finally, no significant increase in $R^2$ was obtained when the remaining variable, Task 5 errors, was entered into the regression equation [$F(1, 58) = 0.14$]. The final $R^2$ was .221.

This regression analysis indicated that nine percent of the variance in Psychoticism scores could be predicted from gaze diversions, and an additional 13 percent could be accounted for by the variables measuring more central aspects of the decoding process. Only the measure of
attending and a measure representing both encoding and processing (Task 3) significantly contributed to the final \( R^2 \).

**Relationship between decoding variables and Brief Psychiatric Rating Scale scores.** Of the seven task variables, only total gaze diversion frequencies, Task 2 error scores, and Task 5 error scores were significantly correlated with BPRS scores (Table 6). Contrasts between these three correlations using \( t \) tests for differences between dependent r's indicated that the correlations of gaze diversions with BPRS scores and Task 2 errors with BPRS scores were significantly greater than the correlation between Task 5 scores and BPRS scores, \( [t(41) = 2.14, p < .05] \).

The hierarchical regression analysis, with BPRS scores as the dependent variable, progressed by entering total gaze diversion frequencies into the regression equation first \([r = .11, F(1,42) = 5.21, p < .01]\), followed by errors from Non-affective Task along with errors from Tasks 1 and 2. The addition of these encoding variables simultaneously resulted in a significant increase in \( R^2 \) to .27 \([F(3, 37) = 2.95, p < .05 \) for a one-tailed test].

Entering Task 3 errors in the third step of the regression analysis produced a nonsignificant increase in \( R^2 \) to .28 \([F(1, 36) = 0.46]\). The addition of Task 4 error scores in the fourth step also resulted in a nonsignificant
increase in $R^2$ to .30 [$F(1, 36) = 0.63$]. Finally, adding Task 5 scores to the regression equation resulted in a total $R^2$ of .304. This final increase in $R^2$ was also nonsignificant [$F(1, 36) = 0.31$].

The regression analyses found BPRS scores to be significantly related to impairments in the early stages of the perceptual process, during attending and encoding. With the variance linearly associated with these variables removed, the processing variable was not significantly related to severity of psychopathology.
CHAPTER IV

DISCUSSION

The present investigation extends previous work, assessing the effect of severity and type of psychopathology on facial expression decoding, by examining three general processes involved in such tasks: attending, encoding, and processing. Attending was defined as orienting one's perceptual apparatus toward the stimulus to be decoded. It was assessed by frequency counts of diversions of gaze away from the facial stimuli, other than to initiate a response.

Encoding was defined as the processes involved in taking in and organizing data for processing. Encoding was assessed by performance on three relatively simple tasks which required a commonly occurring comparison of two stimulus faces and selection from only two simple response alternatives. These three tasks included a task requiring detection of changes in non-affective facial features (Non-affective Facial Feature Discrimination Task), a task requiring detection of changes in affective facial cues (Detection of Change in Facial Expression Task), and a task requiring selection of the more positive/approving of two facial expressions (Selection of the More Approving Expression Task).
It was assumed that the recognition of positive and negative changes in affective facial cues is such an overlearned skill that, in normal adults, automatic analyzers have developed which organize the incoming data during iconic processing to permit immediate recognition of affective cue changes. Recognition of facial feature changes may be less automatic, but remains primarily dependent on complete and accurate data input; little, or no analysis of data is required.

A non-affective facial cue discrimination task and a facial expression change task were used to investigate the effects of pathology on encoding non-affective versus affective facial cues. A fourth task, the Direction of Affective Change Task (Task 5), also met the criteria for an encoding dependent task, despite requiring one more comparison and involving one more facial stimuli, than the above tasks. This task and two affective cue encoding tasks were used to assess the effects of interpersonal defensive styles on decoding as evidenced by the types of affective cue changes eliciting the more errors.

Processing was defined as the manipulation of data, data interpretation, and/or contrast of current data with information stored in long-term memory. Processing was assumed to occur after data transfer into short-term memory. It was further assumed that processing would become a more dominant factor in task performance as task complexity
increased. Task complexity was defined in terms of the number of comparisons of facial stimuli required by the task, the likelihood that a similar task would be encountered in daily interactions, and both the number and complexity of response alternatives.

Processing was assessed in the present investigation using a facial expression ordering task, together with a somewhat less complex task with equal stimulus complexity to provide a control for encoding proficiency. The facial expression rating task (Task 6) also met the criteria for a task primarily dependent on processing because it (a) involved multiple comparisons, (b) was an infrequently occurring task for most subjects, (c) permitted seven response alternatives, and (d) did not require an immediate response.

Effects of psychopathology on the above decoding elements were examined using subjects grouped according to severity (BPRS scores) and type of pathology (psychiatric diagnosis). Significant differences between subject groups were obtained for BPRS scores, Psychoticism scores, Depression Inventory scores, R-3 Scale scores, length of hospitalization, and adequacy of interpersonal functioning.

As expected, subjects in the high psychopathology groups received higher BPRS scores than those in the low psychopathology group, but schizophrenic subjects and affective disorder subjects did not differ. Subjects in
the affective disorder group scored significantly higher than control subjects on the Beck Depression Inventory. The depression scores of the schizophrenic group fell between those of the other two groups, but did not differ from either to a statistically significant extent. These results suggest that subject groups differed as intended in severity of pathology and affective involvement.

High pathology-schizophrenic subjects also obtained higher Psychoticism scores than high pathology-affective disorder subjects. Also, schizophrenic subjects were found to have been hospitalized for a significantly longer period of time than subjects in the affective disorder groups. High Psychoticism scores have been found in patients with non-integrated delusions, thought disorder, and emotional flattening, all of which are more characteristic of schizophrenia (Claridge, 1981). Also, the presence of affective symptoms has been found to be a favorable prognostic indicator (Tsuang & Dempsey, 1979) and, therefore, likely to be associated with more rapid improvement and shorter hospitalizations. Thus, the above significant differences between subject groups appear consistent with expectations regarding differences between major diagnostic groups and support the assumed relative independence of diagnosis and severity of psychopathology.

Schizophrenic subjects were rated as significantly less adequate in their interpersonal functioning than were
affective disorder subjects and all patient groups scored higher than the control group on the R-S Scale. The latter finding seems to be related to the fact that high R-S Scale scores may result from either a greater sensitivity to symptomatology or more actual symptomatology (Carlson, 1979). The former may be related to the findings in the present investigation that affective disorder subjects evidence significantly less disruption in ability to accurately decode affective facial cues.

Attending. Attending to social stimuli was assessed by counting the frequency with which subjects looked away from the facial expression stimuli prior to initiating a response. The subjects rated highest in severity of psychopathology and subjects with schizophrenic diagnoses showed more such diversions than did the nonpatient controls. The low psychopathology patients fell between the high pathology and the control subjects in total gaze diversions, but did not significantly differ from either. Similarly, subjects diagnosed as having major affective disorders fell between the schizophrenic and controls in total gaze diversion rates, but did not significantly differ from either. Interestingly, major affective disorder subjects consistently differed more from controls in rates of nonattending than in rates of decoding errors (see Figures 1 and 2). This finding suggests that affective disorders may be a less encompassing forms of psychopathology.
Schizophrenic subjects who were also rated high in severity of psychopathology evidenced significantly more diversions of attention than any of the other groups, but both the high and the low pathology-schizophrenic groups and the low pathology-affective disorder group evidenced significant impairments of attention relative to the controls. The high pathology-affective disorder group was the only patient group which did not significantly differ from controls in total attention diversions.

Rates of attention diversions during stimulus presentations seemed to be a function of both diagnosis and severity of pathology. Severity of pathology was positively related to total distractions among schizophrenic subjects, but not among affective disorder subjects. If there was a severity of pathology effect for the affective disorder subjects, it was in the direction of decreasing rate of distraction with increasing psychopathology.

Attending was not adversely affected by increases in task difficulty in any subject group. All groups, in fact, showed a nonsignificant trend toward lower rates of gaze diversion as task difficulty increased. Thus, avoidance of more difficult tasks, or more complex stimuli, was not apparent in any group.

The largest difference between groups' gaze diversion rates occurred on the Selection of the More Approving Expression Task (Task 2) which seemed to have been the
least complex, as well as, the easiest of the complexity level tasks. All subject groups made fewer errors on this task than on any of the other tasks, except Task 5. Task 2 was less complex than the other tasks because, not only did it require only one comparison of two facial stimuli and selection from only two simple response alternatives, but the instructions for the task specified the class of affective cues to be encoded. Schizophrenic subjects rated high in severity of pathology evidenced significantly more diversions of attention than controls on this task. The smallest difference between groups in rates of distraction occurred on Tasks 3 and 4. Task 3 and Task 4 were the most difficult of the complexity level tasks (having the largest error rates) and the most complex (requiring multiple contrasts of four stimulus faces). Thus, increasing the scanning requirements by doubling the number of stimulus faces (Task 3 relative to Task 2) did not result in a significant increase in distractability. Reducing task difficulty (Task 2 vs Task 3 and 4), however, was associated with an increase in distractability, particularly among schizophrenic subjects rated high in severity of pathology. For these subjects, decreasing task difficulty/complexity may have increased the amount of filtering required to maintain attention to the experimental stimuli. The demand value of the experimental task may have been reduced to the point that it no longer greatly exceeded that of extraneous
stimuli, thus increasing the amount of filtering ability required to maintain attention to the task (avoid distraction).

This conclusion is consistent with that of Caudrey et al. (1980) who noted, in their examination of attention deficits of schizophrenic subjects, that such subjects were more impaired in their ability to filter-out irrelevant cues than in their ability to make use of redundant stimulus cues, or scan for relevant stimulus features. The performance of their patient subjects was less affected by changes in the complexity of stimulus than by the presence of irrelevant stimulus features.

Straube and Germer (1979) also point out that a reduced rate of stimulus presentation in a popular procedure for studying selective attention in the auditory channel (verbal shadowing/dichotic listening) tends to be associated with increased distraction. The low difficulty of Task 2, relative to the other tasks, may be essentially equivalent to a reduced rate of stimulus presentation.

Thus, it appears that the results obtained, with respect to nonattending on a relatively non-complex task, may be, in part, attributable to impairments in subjects' ability to filter-out extraneous stimuli. Such a deficit would be expected to be most evident among schizophrenic subjects. There was, however, evidence in the current data to indicate that the attention deficit may be related to
severity of pathology as much as to diagnosis. As noted earlier, the high psychopathology-schizophrenic group had an inordinately high rate of gaze diversions on Task 2. The high pathology-affective disorder group, however, also evidenced an increased rate of distractions on this task. The two low pathology groups and the control group had higher rates of gaze diversion on Task 1 than on Task 2 (see Figure 1). This increase in rate of nonattending, on the less difficult task, by the two high pathology groups suggests that impaired filtering ability may be more related to severity than type of pathology. It might also be noteworthy that only gaze diversion rates on Task 2 and Task 5 were significantly correlated with length of hospitalization ($r = .33$ and $r = .23$ respectively) and Brief Psychiatric Rating Scale scores ($r = .47$ and $r = .34$ respectively). Gaze diversion rates for Tasks 1, 3, and 4 were most highly correlated with other variables, such as social status and IQ.

In summary, the results obtained in prior research relating to attention deficits among psychiatric patient subjects have been largely dependent on the experimental procedures employed. The present results, however, are consistent with at least three general findings: (a) attention deficits are not specific to schizophrenia, but are also observed among subjects with affective disorders (Cornblatt, Lenzenweger, Dworkin & Erlenmeyer-
Kimling, 1985), (b) attention deficits are related to chronicity of the psychiatric disorder (Straube & Germer, 1979), and (c) distractability among psychiatric patient subjects is inversely related to the rate of item presentation and task difficulty (Straube & Germer, 1979).

Finally, the results obtained here, for predicting rated adequacy of interpersonal functioning from task performance variables, clearly indicate that impairments in attending are associated with less adequate interpersonal functioning. Total gaze diversion rates proved to be a better predictor of adequacy of interpersonal functioning ratings than any of the other task variables. This finding suggests that attending should be addressed in any effort to evaluate or improve the social functioning of psychiatric patient subjects.

**Encoding.** Impairments in selecting and encoding relevant affective facial cues were assessed by two related measures that required subjects to compare two facial expressions and choose one of two response alternatives. Attending was assumed to be a prerequisite for accurate encoding. Error scores for the measures of encoding of affective cues were, therefore, statistically adjusted to remove variance linearly associated with nonattending.

Task 1 required subjects to determine if two facial stimuli differed, in terms of emotional expression. Analyses of attention adjusted error rates on this task
indicated that performance was significantly affected by schizophrenia.

Subjects who had received a schizophrenic diagnosis performed significantly worse than affective disorder subjects and nonpatient control subjects. Also, subjects rated high in psychopathology performed significantly worse than both nonpatient controls and subjects rated low in pathology. Schizophrenics rated high in severity of pathology, however, were the only individual group to evidence significant impairment on this task, relative to controls.

Task 2 required subjects to select the more positive/approving of two facial stimuli. Analyses of attention adjusted error rates from this task found no significant differences between severity of psychopathology groups. Among diagnostic groups, the patients with schizophrenic diagnoses had significantly higher adjusted error rates than either affective disorder subjects or control subjects. Schizophrenics rated low in severity of psychopathology, however, were the only individual group to evidence significant impairment on this task relative to controls. Thus, impairments in encoding, as measured by these tasks, were a function of type, but not severity of pathology.

Both Task 1 and Task 2 were expected to be primarily dependent on encoding of affective facial cues and they obtained similar results. On both tasks, only schizophrenic
subjects evidenced significant impairment relative to controls, while affective disorder subjects performed at least as well as controls.

The above results are largely consistent with prior research relating to encoding deficits among psychiatric patient subjects. In the literature, recognition and recall tasks have generally been employed to assess encoding. The use of such tasks is based on the generally accepted definition of encoding, as those processes leading to the transfer of information into short-term memory and the recognition that simple tasks are required to avoid significant involvement of processing factors. Numerous investigators have, also utilized procedures fitting the definition of encoding tasks to study selective attention by examining the effects of irrelevant distraction stimuli on task performance. Unfortunately, none of these studies have involved decoding of facial expression cues.

Lifshitz, Kugelmass, and Karov (1985) found that children, at risk of developing schizophrenia due to familial factors, were significantly impaired, relative to control children, on mirror drawing tasks as simple as drawing a vertical line. These children also evidenced impairment on a task involving cancelling specified digits from a series of lines of random digits. These deficits were evident both when distracting stimuli were present and when they were not.
Cornblatt and Erlenmeyer-Kimling (1985) found that children, at risk for schizophrenia, evidenced significantly more errors than either children at risk of developing affective disorders, or control children on a continuous performance task. In this task, subjects were presented a series of visual stimuli in rapid succession, and were required to indicate when a stimuli was identical to the immediately preceding stimulus.

Knight, Youard, and Wooles (1985) observed that, relative to controls, the performance of schizophrenic subjects was impaired on a task requiring determination of which of two stimuli, presented simultaneously, had the greater number of letters. Again, the inclusion of irrelevant visual stimuli as distractors did not differentially effect the two groups.

Knight, Elliott and Freedman (1985), using a backward masking procedure, found that schizophrenic subjects with poor premorbid histories were significantly more effected by the interjection of a pattern mask between target stimulus presentation and response selection than were controls, non-schizophrenic psychotics, and good premorbid schizophrenics. The performance of the poor premorbid schizophrenic subjects on this recognition task was equivalent to their performance on an identical task, but which used a meaningful masking visual stimulus. The other groups evidenced significant deterioration in performance
only when the meaningful masking stimulus was used. The authors concluded that the integration of stimulus in the stimulus store (stimulus input) was intact in all groups, but poor premorbid schizophrenic subjects showed an impairment in transfer of information into short-term memory, possibly due to an inability to automatically determine the meaningfulness of stimuli (defective automatic analyzers).

Present and past results, therefore, consistently find encoding to be impaired among schizophrenics but not affective disorder subjects. There is some data both in the present investigation and in the study reported by Knight et al. (1985) to indicate that encoding impairments may not only be related to task variables but may also be limited to a particular subgroup of schizophrenics.

**Discriminating changes in affective versus non-affective cues.** Closely related to the evaluation of encoding impairments in psychiatric patient subjects is the issue of differential ability to detect changes in affective versus non-affective cues. Detecting changes in either type of cue seems to primarily depend on encoding, but different mechanisms may be involved. Two studies have found significant impairments in discriminating affective facial cues among psychiatric patient subjects without similar impairments in discriminating non-affective facial cues (Cutting, 1981; Walker et al. 1984).
It has been suggested that visuospatial discrimination tasks are managed by right hemisphere structures, and subjects with right hemisphere lesions have been found to be impaired in discriminating both affective facial expressions and identity (Cicone, Wapner & Gardner, 1980). It has also been suggested that decoding affective facial cues is related to gestalt formation or input organization (Knight et al. 1985) and ability to empathize (Safer, 1984).

In the present investigation, the two tasks employed to evaluate ability to discriminate changes in affective cues versus non-affective cues, Task 1 and the Non-affective Discrimination Task, were identical, except for the type of cue changes to be detected. Unlike previous investigations, potential confounding due to irrelevant stimulus differences was avoided by using experimental stimuli which were identical with respect to all nonsalient cues.

Only the low pathology-schizophrenic group was significantly less accurate than nonpatient controls in discriminating differences in facial feature cues. They also appear to be less accurate in performing this task than both affective disorder groups. Ability to accurately detect changes in facial feature cues did not appear to be related to severity of psychopathology.

With affective facial expression cues, both the high and the low pathology-schizophrenic groups were significantly less accurate discriminators than controls.
The two affective disorder groups fell between, but did not differ significantly from either schizophrenic or control groups.

In general evidence of impairment was more widespread on the Detection of Changes in Affective Facial Expressions Task, than on the Detection of Differences in Facial Feature Task. Also the variance in error scores was significantly greater on the Non-affective Task than on the Affective Task. However, when performance on the Facial Feature Discrimination Task was used as a covariate to control for visuospatial discriminating ability with facial cues, as suggested by Novic et al. (1984), the significant difference between groups in ability to discriminate changes in affective facial cues was eliminated.

Present results, regarding differential ability to discriminate changes in affective versus non-affective cues, indicate that both skills are adversely affected among schizophrenic subjects with no significant differential effect for type of cues. These findings suggest that the deficits in encoding observed among schizophrenics are due to impaired general visuospatial discriminating ability rather than a deficit specific to cues with affective connotation or difficulty in organizing cues into meaningful wholes. The latter two possible sources of impairment, however, can not be totally disregarded as possible contributors to encoding problems among schizophrenics.
The results obtained are contrary to those reported by Walker et al. (1984). They found that psychiatric patient subjects were not significantly less accurate than controls in discriminating differences in identity, but schizophrenic subjects were significantly less accurate than both affective disorder subjects and control subjects in discriminating changes in facial expressions. On the basis of these differential findings, Walker et al. (1984) concluded that their schizophrenics did not evidence a generalized impairment in visuospatial discriminating ability.

The facial expression discrimination task employed by Walker et al. (1984), however, may have inflated differences between groups because it used stimuli which were confounded by differences in facial features. Their affective task required that subjects filter out irrelevant identity cues which, as noted in the preceding discussion of attention deficits, constitutes a handicap for more pathological subjects. Also, they did not attempt to adjust subjects' performance on the affective facial expression discrimination task to control for general visuospatial discriminating ability. Thus, their conclusion that schizophrenic subjects evidenced a deficit specific to extracting affective cues from facial stimuli, seems unfounded.
The present conclusion, that the encoding deficits of schizophrenic subjects were a function of a generalized impairment in visuospatial discriminating ability, however, must remain tentative because the affective and non-affective cue change discrimination tasks may not have equal discriminating power. This is suggested by the finding of significantly greater variance in Non-affective Task scores than in Affective Task scores. Larger non-affective than affective error score variance was evident in all five subject groups but was significant only for the low pathology-affective disorder group. The reason for the larger variability among Non-affective Task error scores is unclear, but it appears that the difference in error variance was largest in the affective disorder groups.

Also, there is no evidence to support the subjective notion that the Affective Facial Cue Discrimination Task had greater affective connotation than the Facial Feature Cue Discrimination Task or that performance on the Affective Task was related to ability to organize facial expression cues into meaningful wholes.

It should be noted that the present results do, in one respect, correspond with those reported by Walker et al. (1984). Those authors found more significant differences between groups on the task involving more complex encoding. In the present investigation more wide-spread impairment was found on Task 1, which also seems to have been a more
difficult encoding task. In their investigation more wide-spread impairment was found on the emotion discrimination task which required more complex encoding because identity cues had to be filtered out. In both cases the more complex encoding task showed greater impairment among schizophrenic subjects.

There seems to be some consensus in the literature that accurate encoding of facial cues is dependent upon right hemisphere structures, particularly if the stimulus is only briefly available (Cicone et al. 1980), and that facial recognition and facial emotion recognition are not independent functions (Hansch & Pirozzolo, 1980). The present results seem to agree with this view and suggest that schizophrenia may involve some impairment in right hemisphere functioning. The performance of schizophrenic and right hemisphere lesion subjects on facial cue discrimination tasks, however, has not been directly compared. Such a comparison must be made before any definitive conclusion is drawn regarding their similarity.

**Systematic defensive perceptual distortions.**

Systematic perceptual distortions which serve to protect an individual from stressful stimuli also seem to be a function of encoding. Both Maddi (1968) and Erdelyi (1974) have concluded from a variety of data that these phenomena probably originate at the level of selecting, organizing, and encoding affect arousing cues. Erdelyi (1974) contended
that distortions or selectivity at, or before, this level would prevent potentially threatening or conflict arousing stimuli from reaching conscious awareness.

The present data provided no evidence to suggest that deficits in encoding affective facial expression cues are related to selective misperceptions associated with the mechanisms of perceptual defense and/or perceptual vigilance. Defensive style groups, formed on the basis of Byrne R-S Scale scores, did not significantly differ in distortion scores obtained from any of the three affective facial cue encoding tasks, considered individually or in combination. Also, the number of patients showing a consistent pattern of perceptual distortions was nonsignificant.

There are several possible reasons for these negative findings. It may have been that the facial expression stimuli employed were not sufficiently ambiguous to permit consistent distortions, or they were too artificial and, therefore, not threatening. Also, the expression may not have been viewed as personally relevant by the subjects and, therefore, were non-threatening. These difficulties could be rather easily corrected by using photographic slides of facial expressions taken from a video tape or film of an authority figure known to the subjects.

The possibility that the phenomena of perceptual defense and perceptual vigilance do not generalize, as hypothesized, into the decoding of facial expression stimuli
must also be considered. The present investigation assumed that negative changes in affective facial cues, that is, in the direction of becoming more disapproving, would be more anxiety provoking than changes in the positive, more approving, direction. There, however, was no direct evidence to support this assumption.

A reexamination of the literature reviewed by Erdelyi (1974) suggests a possible explanation for the nonsignificant results obtained in the present investigation. It appears that the control for perceptual accuracy typically employed in this literature was accuracy in perceiving "neutral" stimuli. Accuracy in perceiving neutral stimuli was contrasted against accuracy in perceiving "taboo" words or "unpleasantly toned" words. Pleasant, or positive, affect arousing stimuli were not typically used as controls for perceptual accuracy. It may be that individuals inclined toward the use of repressor defenses tend to have difficulty in perceiving both positive and negative affective stimuli while those inclined toward the use of sensitizer defenses tend to more accurately perceive all affective stimuli.

Some support for this interpretation of defensive style effects is provided by the relationship between R-S Scale scores and attention adjusted error rates obtained in the present study. Affective disorder subjects tended to score higher on the R-S Scale than did schizophrenic subjects
(though not to a significant extent, \( p = .07 \) for a one-tailed test), and they also were consistently more accurate on facial expression decoding tasks than were schizophrenic subjects. The greater use of sensitization defenses among affective disorder subjects might explain why these subjects performed better than the controls on most tasks.

Since defensive perceptual distortions seem to be well accepted phenomena in other areas of psychology, additional investigations into how such phenomena translate into the area of facial expression decoding seem worth while. The inclusion of measures to assess the extent to which interpersonal interactions constitute potentially threatening stimuli for subjects would provide further information regarding the effects of perceptual defenses on affective facial expression decoding.

**Processing.** Accuracy in processing encoded facial expression data and selecting appropriate responses was assessed by contrasting performance on the most complex affective decoding task (Facial Expression Ordering Task). A task with equal stimulus complexity, but which required fewer contrasts and comparisons and which required a less complex response, was used as a covariate in this analysis to control for differences in encoding accuracy. Also, error scores for both tasks were adjusted for differences in attending using simple regression to remove variance in error scores linearly associated with nonattending.
The covariate analysis of the adjusted error scores from the most complex task indicated that schizophrenic subjects, whether rated high or low in severity of pathology, evidenced significantly impaired processing relative to controls. The performance of the two affective disorder groups did not differ from that of the control group. The analyses suggest that an impairment in processing ability is characteristic of schizophrenics, but not of patients with major affective disorders.

This type of impairment might have been expected in schizophrenic subjects, since disorders of thought are regarded as a classical symptom of schizophrenia. The absence of impairment in processing functions among major affective disorder subjects is more surprising because it contradicts the conclusion of Miller (1975), and because most of the subjects in the affective disorder group had experienced psychotic symptoms within the previous two months. The finding of impairments in processing in schizophrenic subjects is consistent with earlier findings (Iscoe & Veldman, 1963; Shannon, 1970; Dougherty et al. 1974; Walker, 1981; Walker et al. 1984). As in previous research, however, the present procedures allows no distinction between processing ability and the ability to generate a fairly complex response. The present data suggest only that some deficits in one or both of these areas are associated with schizophrenia, above and beyond
deficits in attending to and encoding facial expression cues.

Severity of psychopathology groups versus diagnostic groups. A comparison of the results obtained for severity of pathology with those obtained for principle psychiatric diagnosis suggests that diagnosis is a more meaningful subject variable. Contrary to the contentions of Miller (1975) differences arose between diagnostic groups which were not attributable to severity of psychopathology. Severity of pathology and diagnosis seemed to be equally relevant in the present examination of attention deficits, but diagnosis was clearly the more relevant independent variable when encoding and processing were examined. When the effects of nonattending were statistically controlled, the performance of affective disorder subjects closely resembled that of controls on all tasks, except Task 1 and the Facial Feature Discrimination Task.

Encoding deficits were evident only when subjects were grouped by diagnosis. The absence of processing impairments among affective disorder subjects was also a significant finding which would have been hidden if subjects were grouped by severity of psychopathology alone.

These findings suggest that psychiatric patient subjects may be most usefully grouped by principle psychiatric diagnosis, which is the common practice, unless factors related to attending are likely to effect results.
When attending is likely to be a significant factor, a measure of severity of psychopathology should probably be included as a control variable.

**Prediction of measures of severity of psychopathology.** Schizophrenia, seems to adversely effect all of the information processing elements examined. It was of interest, therefore, to estimate the degree of association between impairments in the elements of decoding and severity of psychopathology. Two measures of severity of psychopathology were available: Brief Psychiatric Rating Scale (BPRS) scores and Psychoticism Scale scores.

Gaze diversion frequencies and errors on the least complex decoding task (Task 2) were the only task variables significantly correlated with both measures of severity of pathology. Interestingly, error scores from the most complex decoding task was the only task variable which was not significantly correlated with either of the measures of the severity of psychopathology.

Hierarchical multiple regression analyses were conducted to test the hypothesis that scores on measures of severity of pathology could be predicted from performance on the various decoding tasks. Statistically significant multiple correlations were obtained in both cases. Total gaze diversions and error scores for the simplest decoding task, however, were the only variables to significantly contribute to either of these $R^2$'s. The latter variable was
a significant contributor only to the prediction of BPRS scores.

These results suggest that, of all the variables examined, attending is most related to severity of psychopathology. This conclusion was suggested earlier in the discussion of severity of pathology versus diagnostic classification effects.

Prediction of ratings of interpersonal adequacy. A significant relationship between adequate interpersonal functioning and ability to accurately decode changes in facial expressions, seems to be commonly assumed. This relationship, however, has not been formally tested. In the present investigation, staff's ratings of adequacy of patient subjects' interpersonal functionings were obtained. The interrater reliability obtained for these ratings was adequately significant but appropriate validity data were not available. Conclusions about the relationship of task variables to interpersonal adequacy must, therefore, be considered as only tentative.

All task variables, except Detection of Affective Change Task scores, were significantly correlated with adequacy of interpersonal functioning. Also, all variables significantly correlated with ratings of interpersonal adequacy were of approximately equal magnitude. Thus, four of the five measures of decoding stages (all except Task 1), when examined independently, were significantly
related to adequacy of interpersonal functioning to an approximately equal extent.

Since facial expression decoding was hypothesized to proceed from attending to encoding to processing, a hierarchical multiple regression analysis was performed. This procedure revealed that only the measures of attending and processing significantly contributed to the final significant $R^2$. The measures of encoding did not significantly add to the prediction of interpersonal adequacy beyond that contributed by attending.

It is not surprising that a measure of processing would be significantly related to interpersonal adequacy, since interpersonal function is a very complex process which surely requires some degree of efficient data processing.

Attending also can be easily seen as a critical element in interpersonal functioning. More surprising is the absence of a significant encoding contribution. This may have been related to the low discriminating power of the encoding tasks, particularly Task 2. The average error rate on this task for all subjects, after statistical correction for nonattending, was only seven percent. According to Lord (1952) maximum discriminating power for a two choice test is achieved with an average error rate of 15 percent. It is also possible that only a relatively low level of encoding proficiency is needed for effective interpersonal functioning.
Conclusions. From the above it appears that several conclusions are possible:

(a) The procedures used here to assess nonattending, encoding, and processing during facial expression decoding, although lacking in psychometric sophistication, obtained results comparable with those found by other researchers utilizing different methodologies to investigate the effects of pathology on various information processing elements. Further, the results obtained here, with regard to deficits in attending and encoding, extend previous findings to include deficits in attending to and encoding affective facial cues.

(b) Schizophrenia is characterized by a generalized impairment in information processing rather than impairments restricted to specific information processing elements. Schizophrenic subjects evidenced significantly poorer performance than both controls and affective disorder patients on encoding and processing tasks while also showing a higher rate of attention distraction than controls. This conclusion is consistent with that of Cornblatt and Erlenmeyer-Kimling (1985) and Nuechterlein and Dawson (1984) who found schizophrenia to be associated with a general "...lowering of processing capacity rather than a structural breakdown at a specific stage in the information processing chain" (Cornblatt & Erlenmeyer-Kimling, 1985, p.471). Further, the encoding impairments evidenced by schizophrenic subjects
were not solely a function of the affective connotation of the stimuli or an inability to organize cues into meaningful wholes. Instead, they seemed to be related to a more generalized impairment in visuospatial discriminating ability because these subjects evidenced inferior performance, relative to controls, on both affective and non-affective facial cue discriminating tasks. Also, the impairments observed among schizophrenic subjects did not appear related to severity of psychopathology. These conclusions imply an organic etiology of schizophrenia.

(c) Major affective disorder subjects evidenced a more specific information processing impairment. Their deficits appear restricted to attentional processes. There was no evidence of higher level processing impairments among these subjects. The major implication here is that poor attending to available social cues may significantly contribute to interpersonal problems among affective disorder subjects, and that social skills training efforts with such individuals should include some emphasis on attentional strategies, as well as expanding response repertoires.

(c) Principle psychiatric diagnosis is generally a more relevant subject classification variable for research into facial expression decoding than is severity of psychopathology. Measures of severity of pathology were related primarily to a measure of attention. Severity of pathology was not related to a measure of processing and
response generating ability. Severity of psychopathology, however, should probably be considered when rates of non-attending are likely to influence results.

(d) The encoding of facial expression cues by psychiatric patient subjects was not found to be significantly affected by systematic perceptual distortions, as predicted from a definition of sensitization and repression, which emphasizes the stress evoking potential of facial expression changes in the direction of becoming more angry/disapproving. This result, however, may be related to an organic etiology among schizophrenic subjects who were in the majority in the patient sample used in the present investigation, or to the artificialness of the stimuli and tasks employed.

(e) Adequacy of interpersonal functioning as measured by global ratings of frequency, variety, and appropriateness of peer interactions was significantly related to measures of attending and processing, but not to measures of encoding proficiency. This finding may be related to the poor discriminating power of the encoding tasks employed in the present investigation, or it may suggest that only some minimal level of encoding proficiency is required for adequate interpersonal functioning. Beyond this minimal proficiency only consistent attending and efficient higher level processing are significant information processing variables.
Limitations of the study and suggestions for further research. The purpose of the present investigation was to examine the effects of psychopathology on three very elementary information processing stages involved in the decoding of affective facial cues and to relate these three variables to a measure of interpersonal adequacy. This goal was achieved but there were several problems in the methodology which could be rather easily corrected, and thereby provide a more sound basis for generalizations. These difficulties include: (1) the artificiality of the stimuli, (2) the failure to evaluate attending on an item by item basis and to include the non-affective discrimination task in the evaluation of nonattending, (3) the lack of adequate and relatively equal discriminating power across tasks and items within tasks, (4) the failure to separate response generation from cognitive processing, and (5) the lack of data to support the reliability and validity of the ratings used to estimate subjects' interpersonal adequacy. None of these difficulties invalidate the results obtained but each, to some extent, limits the conclusions that can be reached on the basis of the present data.

The stimuli employed were facial drawings with minimal feature representations. Relative to other studies, such as Walker et al. (1984) which employed photographs of real people, the experimental stimuli used here were rather unrealistic. The use of artificially created stimuli
prevented the introduction of potentially confounding factors, such as differences in identity cue and differences in lighting and perspective. They also provided equality of spatial frequency of stimulus cues across tasks and items within tasks (Sergent, 1982b). Also, all of the experimental stimuli were relatively low in cue density and were easily distinguishable with unlimited exposure time. Therefore, they were more suitable for encoding by the right hemisphere, if Sergent's (1982a) formulation is correct. On the other hand, the artificiality of the stimuli may have been sufficient to prevent subjects from experiencing them as threatening and, thereby, failed to elicit defensive perceptual distortions. Artificiality of the stimuli may also have limited the differences observed between groups in ability to discriminate changes in affective versus non-affective stimuli by limiting the effective difference between the two types of stimuli.

These difficulties might have been rather easily overcome, without sacrificing the advantages outlined above, by using high speed motion picture film to photograph a real person (possibly someone known to the subjects) as his/her expression changed from very approving, to neutral, to very disapproving, and then back to very approving.

The failure to evaluate attending on an item-by-item basis may have reduced the probability of detecting defensive perceptual distortions in the present study.
Erdelyi (1974) concluded that defensive distortions occur prior to the transfer of data into short-term memory, where conscious awareness occurs. This implies that distortions or selectivity could occur during either attending or encoding. Systematic distortions due to selective non-attending may not have been evident in the obtained distortion scores. Future investigations of defensive perceptual distortion effects in the decoding of facial expression should probably include measures to assess selectivity through systematic nonattending.

The failure to evaluate nonattending on the Non-affective Discrimination Task prevented comparisons of the effect of pathology on attending to affective versus non-affective stimuli. It also may have contributed to the finding of no differential psychopathology effect for discriminating changes in affective versus non-affective stimuli. Clearly attending to available cues is an integral part of the decoding process with both types of cues.

The lack of equal discriminative power of all tasks prohibited comparisons of the magnitude of the effects of pathology on the various elements of the decoding process. This difficulty also limited the interpretation of the multiple regression analyses performed as part of this investigation. Chapman and Chapman (1973) have argued that tasks, used to evaluate differential deficits in abilities, must be matched for true score variance and for item
difficulty level. They also indicate that task matching should be based on the performance of a standardization group composed of normal subjects. Which information processing element is more affected by psychopathology, or more related to interpersonal functioning, can not be adequately evaluated, unless the measures of each element have equal discriminative power.

It appears that efforts to develop tasks with equal discriminating power would be worthwhile. This might be most readily accomplished by manipulating stimulus exposure time instead of the amount of resolution required for accurate discrimination of stimulus changes. Changes in resolution requirements may result in changes in the degree of involvement of the two hemispheres (Sergent, 1982a).

It is appropriate also to evaluate the contribution of individual items. The entire procedure employed in this study consisted of 187 items and required approximately one and one-half hours to administer to each subject. Reducing the time required to go through the procedure by eliminating noncontributing items would, alone, be worth-while, both in terms of reducing fatigue and in improving the discriminative power of individual tasks. Items with very low correlations with total task scores should be eliminated along with those which have an extremely high or extremely low failure rate (Nunnally, 1967).
The failure to separate processing and response generation on Task 4, resulted in a measure which was no less confounded than those used in previous research (Dougherty et al. 1974; Shannon, 1970). The logic of separating these two processes seems obvious. If pathology significantly impairs the accurate processing of encoded data, then social skills training programs which emphasize development of repertoires of appropriate responses, are likely to be of little value. If pathology does not impair processing, then they could be quite helpful, assuming that impairments in attending and encoding have been remediated. The separation of response generation and processing might be accomplished by having a second task, like Task 4, which would be a multiple choice task, in which the subject is given three response options and he is to choose the correct option: order 1, order 2, or neither. The third option is required to ensure that the subject processes the relationships between all four stimulus faces.

The lack of data, as to the validity of the ratings of subjects' interpersonal adequacy, limit the strength of conclusions about the relationship between facial expression decoding accuracy and adequacy of interpersonal functioning. A more powerful measure of interpersonal adequacy could have been obtained by assessing the sociometric status of patient subjects on their ward of residence. Such a measure of interpersonal adequacy was used by Edwards, Manstead, and
MacDonald (1984), who found ability to identify emotions from photographs significantly related to the sociometric status of children eight to ten years of age. This seems to be the only prior investigation to test the relationship between adequacy of interpersonal functioning and facial expression decoding ability. In light of the importance of the assumed relationship between facial expression decoding accuracy and interpersonal adequacy, validation of this assumption should be pursued. Additional investigations should be undertaken using adult subjects who may have more sophisticated response repertoires to compensate for poor interpersonal sensitivity.

The results of the present investigation clearly suggest that poor attending to available social cues is significantly related to impaired facial expression decoding, as well as severity of psychopathology, and possibly to adequacy of interpersonal functioning. These data alone seem to warrant some investigation of the results which might be achieved from training psychiatric patients to attend to facial expression cues. It appears that attention training should include instruction in strategies to facilitate filtering out of irrelevant cues. The results obtained from attention training alone might be compared with those obtained from various combinations of training in attending, facial expression cue recognition, cue interpretation, and response training.
CHAPTER V

SUMMARY

The accurate perception of affective facial cues seems to be important to adequate social functioning, and according to Rosenthal's (1979) data, facial expressions provide more information regarding the communicator's affective state than any of the other non-verbal channels of communication.

Several studies have been reported which provide fairly direct evidence that various psychiatric groups, particularly schizophrenics, are less accurate than normals in reporting the positiveness of facial expressions, and less accurate in identifying the particular emotion or attitude communicated by affective facial cues (Cutting, 1981; Dougherty et al., 1974; Iscoe & Veldman, 1963; Rosenthal et al., 1979; Walker, 1981; Walker et al., 1984).

These studies suggest that schizophrenic patients are less accurate than normals in reporting the attitudes and emotions displayed by others through facial expressions. Further, it appears that schizophrenics are less accurate decoders than anxious-depressed patients and anxious-depressed patients are less accurate than normals. There is some evidence to indicate that schizophrenic subjects
tended to judge expressions more positively than normals, while depressives tended to judge them more negatively than normals. There is also conflicting evidence suggesting that the impairments noted may be related to either a generalized impairment in facial cue discriminating ability or problems specific to decoding affective cues.

The present investigation extends previous work by assessing the effect of severity and type of psychopathology on three general stages involved in facial expression decoding: attending, encoding, and processing.

Attending was defined as orienting one's perceptual apparatus toward the stimulus to be decoded. It was measured by rates of diversions of gaze away from the facial stimuli, other than to initiate a response.

Encoding was defined as the processes involved in taking in and organizing data for processing. Encoding was assessed by performance on three relatively simple tasks which required a commonly occurring comparison of two stimulus faces and selection from only two simple response alternatives. The three encoding tasks employed included a task requiring detection of changes in non-affective facial features, a task requiring detection of changes in affective facial cues, and a task requiring selection of the more positive/approving of two facial expressions.

The Non-affective Task and the Facial Expression Change Task were also used to investigate the effects of pathology.
on encoding non-affective versus affective facial cues. A fourth task, the Direction of Affective Change Task, also met the criteria for an encoding dependent task despite requiring one more comparison, and involving one more facial stimuli, than the above tasks. Errors from this task were used, along with errors from the two affective cue encoding tasks described above, to assess the effects of repressor-sensitizer defensive styles on decoding as evidenced by the types of affective cue changes eliciting the more errors.

Processing was defined as the manipulation of data, data interpretation, and/or contrast of current data with information stored in long-term memory. Processing was assumed to occur after data transfer into short-term memory. It was further assumed that processing would become a more dominant factor in task performance as task complexity increased. Task complexity was defined in terms of the number of comparisons of facial stimuli required by the task, the likelihood that a similar task would be encountered in daily interactions, and both the number and complexity of response alternatives.

Analyses of demographic and trait variables for subject groups were consistent with expectations, regarding differences between major diagnostic groups, and support the assumed relative independence of diagnosis and severity of psychopathology.
Schizophrenic subjects were rated by professional staff as significantly less adequate in their interpersonal functioning than were affective disorder subjects. This may have been related to the findings in the present investigation that affective disorder subjects evidence significantly less disruption in ability to accurately decode affective facial cues.

From the results obtained it appears that several conclusions are possible. The procedures used to assess nonattending, encoding, and processing during facial expression decoding, although lacking in psychometric sophistication, obtained results which were consistent with expectations derived from the underlying information processing model. Also, the results of this study agree well with those reported by other researchers utilizing different methodologies to investigate the effects of pathology on various individual information processing elements. The measures used to assess attending and processing were more like those used in prior research and provided greater discrimination between subject groups than did the measures of encoding. The measure of attending could be readily improved by recording gaze diversions on an item-by-item basis and on non-affective as well as affective tasks. The measures of encoding could be most readily improved by conducting an item analysis to select items with sufficient difficulty and optimal correlation.
with total encoding scores. A simple recognition task might be added as an even more processing-free measure. Assessment of processing could be readily improved by adding a task which would require different levels of response generating ability in order to provide differentiation between response generation and higher level processing alone.

Schizophrenic subjects were characterized by a generalized impairment in information processing rather than impairments restricted to specific information processing elements. These subjects evidenced significantly poorer performance than both controls and affective disorder patients on encoding and processing tasks while also showing a higher rate of attention distraction than controls. This conclusion is consistent with that of Cornblatt and Erlenmeyer-Kimling (1985) and Nuechterlein and Dawson (1984) who found schizophrenia to be associated with a general "...lowering of processing capacity rather than a structural breakdown at a specific stage in the information processing chain" (Cornblatt & Erlenmeyer-Kimling, 1985, p.471). Also, the impairments observed among schizophrenic subjects did not appear related to severity of pathology. This conclusion implies an organic etiology of schizophrenia.

Major affective disorder subjects evidenced a more specific information processing impairment. Their deficits appeared restricted to attentional processes. There was no
evidence of higher level processing impairments or encoding impairments among these subjects. The major implication is that poor attending to available social cues may significantly contribute to interpersonal problems among affective disorder subjects and that social skills training efforts with such individuals should include some emphasis on attentional strategies, as well as the expansion of response repertoires.

Principal psychiatric diagnosis seems to be a more relevant subject classification variable for research into facial expression decoding than severity of psychopathology. Measures of severity of pathology were related primarily to the measure of attention. Severity of pathology was not related to a measure of processing and response generating ability. Severity of psychopathology, however, should probably be considered when rates of nonattending are likely to influence results.

Similar differences between subject groups were obtained on both affective cue and non-affective cue discrimination tasks, with schizophrenics evidencing significantly more errors than controls. No differences between groups, however, were obtained on the affective task when error scores from the non-affective task were used as a covariate to control for general visuospatial discrimination ability. It appears, therefore, that the encoding impairments evidenced by schizophrenic subjects
were not solely a function of the affective connotation of the stimuli or an inability to organize cues into meaningful wholes. Instead, they seemed to be related to a more generalized impairment in visuospatial discriminating ability.

The encoding of facial expression cues by psychiatric patient subjects was not found to be significantly affected by systematic perceptual distortions, as would have been predicted from the definition of sensitization and repression. Defensive style groups, formed on the basis of Byrne R-S Scale scores, did not significantly differ in distortion scores obtained from any of the three encoding tasks, considered individually or in combination. Also, the number of patients showing a consistent pattern of perceptual distortions across tasks was nonsignificant. The magnitude of these results, however, may have been minimized by the artificialness of the stimuli and the tasks and by the large percentage of schizophrenics in the sample and the greater probability of organic etiology among schizophrenic subjects.

Adequacy of interpersonal functioning as measured by global ratings of frequency, variety, and appropriateness of peer interactions were significantly related to measures of attending and processing but not to measures of encoding proficiency. This finding may be related to the poor discriminating power of the encoding tasks employed in the
present investigation. It is also possible that only some minimal level of encoding proficiency is required for adequate interpersonal functioning beyond which only consistent attending and efficient higher level processing are significant.

There were several significant problems in the methodology of this study which could be rather easily corrected, and thereby provide a more sound basis for generalizations. These difficulties include: (1) the artificiality of the stimuli, (2) the failure to evaluate attending on an item-by-item basis and to include the non-affective discrimination task in the evaluation of nonattending, (3) the lack of adequate and relatively equal discriminating power across tasks and items within tasks, (4) the failure to separate response generation from cognitive processing, and (5) the lack of data to support the validity of the ratings used to estimate subjects' interpersonal adequacies. None of these difficulties invalidate the results obtained, but each, to some extent, limits the conclusions that can be reached on the basis of the present data.
APPENDIX A

Rating Scale for Interpersonal Adequacy
Appendix A — Continued

Rating Scale for Interpersonal Adequacy

Patient Name: __________________________________________

Date: ________________________________________________

Rating of Interpersonal Adequacy

Rate interpersonal appropriateness or adequacy based on:

(1) the appropriateness of response to others,
(2) the extent of acceptance by his peer group,
(3) demonstrated awareness of the needs of others.

10 = leader in peer group, responds readily to the needs of others, appropriately in a variety of settings.
9 = has several peers with whom he/she interacts frequently, recognizes the needs of others with minimal prompting, responds to others appropriately most of the time.
8 = interacts regularly with no more than one or two peers, recognizes the needs of others most of the time if they are pointed out, responds to others appropriately about half the time or in a limited variety of settings.
7 =
6 =
5 = interacts regularly with no more than one or two peers, recognizes the needs of others infrequently, but rarely intrudes on the rights of others, responses to others are frequently inappropriate or self-centered.
4 = interacts with others infrequently, responds to others inappropriately most of the time, but responses are generally not intrusive, rarely shows any awareness of the needs or rights of others.
3 = rarely or never interacts with others appropriately, shows no concern for the needs or rights of others.
1 = rarely or never interacts with others appropriately, shows no concern for the needs or rights of others, responses to others are generally idiosyncratic.
APPENDIX B

Affective Facial Expression Stimuli
APPENDIX C

Non-affective Facial Stimuli
Narrow Nose
Narrow Eyes
APPENDIX D

Task Instructions
Instructions for Task 1

Task Instructions for Level 1 Stimulus Set:
Psychiatric Patient Subject (Control Subjects)

"You are about to see a series of slides containing two facial expressions. We would like for you to look at these expressions, as if you were talking to this person, and his reaction to you is important. You are trying to make a good impression, as if you were talking to some important member of your treatment team, such as your doctor or psychologist (as if you were applying for a job or seriously seeking some kind of assistance from an authority). You are trying to read his facial expression to see how he is responding.

The face on your left, marked '1', is how he begins, and the face on the right, marked '2', is how he looks a few seconds later. The slide will be presented for only four seconds. Circle 'A' on your answer sheet, if you think the person's facial expression remained the same. Circle 'B', if you think his facial expression changed. Before we begin, we will show you some examples."

Note. Before each of the first seven items, the experimenter says, "Circle 'A', if you think his expression does not change; circle 'B', if you think it does change."
Instructions for Task 2

Instructions for Level 2 Stimulus Set:
Psychiatric Patient Subjects (Control Subjects)

"You are about to see a series of slides containing two facial expressions. We would like for you to look at these expressions, as if you were talking to this person, and his reaction to you is important because you need to make a good impression. Think of it as if you are making a request of some important member of your treatment team, such as your Doctor or Psychologist (you are applying for a job, or asking for some sort of assistance from an authority figure). His reaction is important, and you are trying to read his facial expression to see if he is responding positively or negatively to you. The face on your left is labeled 'A', and the face on your right is labeled 'B'. Each slide will be presented for only four seconds. You are to indicate which face, 'A' or 'B', is more positive. Before we begin, we will show you some examples."

Note. Before each of the first seven items, the experimenter says, "Which facial expression is more positive? The first, 'A', or the second,'B'?"
Instructions for Task 3

Instructions for Level 3 Stimulus Set:
Psychiatric Patient Subjects (Control Subjects)

"You are about to see a series of slides containing two sets of facial expressions which represent two sets of reactions. We would like for you to look at these sets, as if you were talking to this person on two separate occasions, the top set, 'A', being the first occasion and the bottom set, 'B', being the second occasion. Imagine that this person's reaction to you is very important and you want to make a good impression, as if you are making a request of some important member of your treatment team, such as your Doctor or Psychologist (you were being interviewed for a job, or you were asking for some sort of assistance from an authority figure). His reaction to you is very important and you are trying to read his facial expression to see if he is becoming more positive or more negative toward you. The face on your left, marked '1' in each pair, is his initial reaction, and the face on your right, marked '2', is how he looks a few seconds later. What we want to know is, if his reaction to you changed more the first time, in the top pair, 'A', or the second time, in the bottom pair, 'B'. We want to know which time he showed the most dramatic change in his feelings toward you. The direction of change is not important, just the
amount of change. Each slide will be presented for only eight seconds. Before we begin, we will show you some examples."

Note. Before each of the first seven items, the experimenter says, "Indicate which pair of facial expressions shows the most change in reaction toward you, the top pair, 'A', or the bottom pair, 'B'. Circle 'A', if you think the top pairs show the most change. Circle 'B', if you think the bottom pair shows the most change."
Appendix D—Continued

Instructions for Task 4

Instructions for Level 4 Stimulus Set:
Psychiatric Patient Subjects (Control Subjects)

"You are about to see a group of four facial expressions labeled A, B, C, and D, which represent a progressive change in reaction to you, becoming more positive. The expressions as show, however, are not in the correct order. We want you to indicate on your answer sheet, the order of expressions that a person might actually go through as his feelings toward you become more positive. Imagine that you are making a request of an important member of your treatment team, such as your Doctor or Psychologist (being interviewed for a job or that you are meeting an important person for the first time). This person's reaction to you begins to change in a more positive direction. Using the expressions shown, write down the order that this person's expressions might go through as he becomes increasingly positive. Write this order beside the item number on your sheet. Begin with the least positive expressions and go through the most positive expressions. Each slide will be shown for only twelve seconds, but you will have several more seconds to finish writing your answer before the next slide is shown. Before we begin, we will show you some examples".

Note. Before each of the first seven items the experimenter says, "Beginning with the least positive expression, order the expressions as they become increasingly favorable."
Instructions for the Direction of Change Task

Instructions for Task 5 Stimulus Set: Psychiatric Patient Subjects (Control Subjects)

"You are about to see a number of series of facial expressions with three facial expressions in each series. The expressions will be shown for one second each. Each group of expressions represents a progression of an individual's reaction to you which may become more negative or more positive. You are to try to determine how the person's reaction changes. We would like for you to look at these expressions, as if you were talking to this person, and his reaction to you if important. You are trying to make a good impression, as if you are making a request of an important member of your treatment team, such as your Doctor or Psychologist (you are applying for a job, or asking for some kind of serious assistance from an authority figure). You are trying to read his facial expression to see if he is becoming more positive or more negative toward you. You are to circle 'A' on your answer sheet, if you think that the person's facial expression changes in a positive direction, circle 'B', if you think that his facial expression changes in a negative direction. Before we begin, we will show you some examples".

Note. Before each of the first seven items, the experimenter says, "Circle 'A', if his expression becomes more positive, 'B', if it becomes more negative."
Instructions for Facial Expression Rating Task

Instruction for Rating Task Stimulus Set:
Psychiatric Patient Subjects (Control Subjects)

"You are about to see a number of slides of individual facial expressions which you are to rate for positiveness or happiness on a scale from one to seven with one being very positive or happy and seven being very negative or angry. A neutral expression rated as four will be the first expression shown. The extreme expressions labeled zero and eight will be left visible for you to use as guide posts. Write a number from one to seven on your answer sheet for each slide. Remember, zero is very positive and eight is very negative."

Note. Before each stimulus items, experimenter says, "Assign this face a number between one and seven with one being very positive-approving and seven being very negative-disapproving."
REFERENCES


