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AUTHOR Zabel, Robert H.; Zabel, Mary Kay
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ABSTRACT

The paper presents an overview of an ethological approach to the study of abnormal human behavior and a review of research using ethological approaches (with an emphasis on autism research). Ethology is defined as the study of behavior as it occurs in its natural habitat. The four types of questions ethologists ask about behavior, such as what is the immediate causation of a behavior pattern, are discussed. Seven research methodologies, including ad libitum sampling and sequence sampling, are defined. Areas of interest to ethologists and representative studies in the areas are examined. Ethological approaches to psychopathology are reviewed, and the distinction between comparative psychology and ethological studies is made. The ethological view of autism, which emphasizes nonverbal aspects such as gaze aversion and stereotypic behavior, is explored. (PHF)

An Introduction to Ethological Approaches With Abnormal Populations

A paper presented to the
Council for Exceptional Children's National Topical Conference
on Seriously Emotionally Disturbed Children and Youth

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Robert H. Zabel, Ph.D.
Mary Kay Zabel, Ph.D.
Kansas State University

A definition of ethology may be viewed in either simple or complex terms. A simple definition would be 'the study of behavior' as it occurs in its natural habitat (Charlesworth, 1976). A more complex definition would attempt to include all the biological, evolutionary, zoological, psychological and neuro-physiological components that are involved in 'the study of behavior.'

It may be helpful to look briefly at the evolution of the dicipline itself, for the eclectic backgrounds of its proponents and the cross-disciplinary nature of its interests and methods are its major strength.

Historical Development

The term 'ethology' was coined in 1859 by Isidore St. Hilaire. St. Hilaire and his father (Etienne Geoffrey St. Hilaire) had been concerned with the study of evolution and nature and had worked with animal behaviorists and comparative psychologists. They studied live animals and had emphasized the natural habitats of their subjects. Isidore coined the term from the Greek "ethos"; an 'ethologist' was an actor or mimic of behavior on the stage.

The next step in the evolution of the discipline was publication of Darwin's work in 1868, although it was not widely accepted at the time. Darwin did not really understand heredity, he had some idea of a "mixing of the bloods" and also held some Lamarkian notions. Darwin had even experimented with cross breeding peas, but he never quite got it right.

Gregor Mendel's work was also written in the 1860's, but was virtually ignored until the early 1900's. At this time, theorists began to put the work of Darwin and Mendel together and ethology (primarily applied to animals) began to progress.

In the 1920's and 30's a group of zoologists began to revive the study of animal behavior and looked to other disciplines for assistance. Psychological writings such as those of Lashley and Watson and that of Yerkes and his co-workers were helpful (Tinbergen, 1972), but relied heavily on laboratory oriented and experimental research. The zoologists, aware of the tremendous variety of behavioral systems typical of separate species, felt the need for recording and classifying these behavior repertoires.

The pioneering studies of Konrad Lorenz stimulated work on what were termed 'ethograms', monographs attempting (eventually) to catalogue and define the complete behavioral repertoire of a species. Since that time, ethology has continued in the same general pattern - seeking to build bridges between various disciplines and provide attempts at truly complete descriptions of behavior. While the zoologists of the 20's and 30's were concerned mainly with the behavior of animals, today human ethologists seek to apply these same rigorous steps in the definition and cataloguing of behavior to man himself.

Research Techniques

What, then, does an ethologist actually do? What questions about the behavior of a species does he/she consider important? Cataloguing and describing behavior is certainly a large and vital task, but what one does with such a description, the questions it generates and attempts to answer, will ultimately determine the contribution of the discipline. Nikolas Tinbergen (1963) has outlined the four very different types of questions ethologists ask about behavior. Different disciplines can provide resources for each of these questions (Bart, 1977) and they can be examined in a variety of ways:

1. WHAT IS THE IMMEDIATE CAUSATION OF A BEHAVIOR PATTERN?

This question seeks to define the causal control of a behavior pattern. Physiology can be a resource here when the question is looked at intra-organismically (neural functioning). The question can also be viewed extra-organismically in terms of environmental stimuli to which the organism is responding.

2. WHAT IS THE ONTOGENETIC PATTERN OF DEVELOPMENT OF VARIOUS BEHAVIOR PATTERNS? (How did the individual grow up to be an adult who responds this way?)

This is a question for which developmental psychology can be a resource when one looks at extra-organismic development. For example, developmental research on the shift in main social figures as a child moves from maternal/paternal contact to peer contact would be of importance here (Omark, 1974). Intra-organismically, attention would be paid to brain development including reception of stimuli and motor control.

3. WHAT WAS THE PHYLOGENETIC PATH FOR THE DEVELOPMENT OF ANY PARTICULAR BEHAVIOR PATTERN? (What use is this behavior to the species?)

Such questions can be investigated structurally by viewing fossil remains, or environmentally by viewing flora and fauna associated with fossils, but the behavior itself cannot, of course, be observed. A second approach is found in the investigation of more-or-less genetically related organisms who still exist in the environment in which, say, early man lived (Omark, 1974). We use this approach to making inferences about early man's social behavior by observing savannah baboons, and his hunting behavior by observing various canids and felines.

4. WHAT IS THE BIOLOGICAL FUNCTION OF A PARTICULAR BEHAVIOR PATTERN - HOW DOES THIS PATTERN AID SURVIVAL?

These are perhaps the most crucial of ethology's questions, and in some ways,

the most difficult to answer. Anthropology and cross-cultural research may be resources for these questions.

Obviously few articles or studies speak to all of these issues, but answers to all four are necessary to provide a true ethological investigation of behavior. It is in these sorts of questions that much of the value of ethology may be found. Ethology attempts to define the parameters of knowledge of behavior, it attempts to say 'if you would understand the behavior of an organism, these global, heuristic questions must be answered.' Ethology, along with many other disciplines, has attempted to discover new 'facts' about behavior, but these large, evolutionary questions represent an attempt to provide a framework for these facts, a structure and definition within which other behavioral research will take on even greater meaning, as the pieces of the puzzle are put together.

In order to begin answering these questions, ethologists must proceed through many tasks (Charlesworth, 1975):

- -observe and record the behavior of animals in their natural habitats
- -analyze behavior in terms of immediate stimulus conditions and consequences
- -investigate behavior in terms of wider social/ecological conditions, especially those which bear upon the animal's ability to survive
- -view behavior in terms of its possible evolutionary significance and thereby its connections with the behaviors of other species, living or dead
- -search for underlying neuro-physiological/endocrinal mechanisms which control the behavior
- -view the total behavioral repertoire of the animal in terms of individual reproductive fitness and its significance for the population to which the individual belongs.

Again, while completion of all these tasks would be difficult in most instances, and nearly impossible in some, they provide an outline of the necessary forms of knowledge and areas of study that will be required before we can truly 'understand' behavior.

Research Methodology

Research methodology in ethology may take a variety of forms. Some researchers do use laboratory experimentation (Maslow, 1936), others combine laboratory experiments with observation (Smith, Rhodes & Strayer, 1975), and others prefer to use only observational techniques (Vandenbergh, 1966). Ethological observation can be done in many ways, some of which have been outlined by Jeanne Altmann (1974).

1. Ad libitum sampling - this form is the one typically referred to as "field notes". The researcher goes into the natural habitat of the animal and located in a convenient spot, or it may require a great deal of travel and commitment, such as that of Ian Douglas-Hamilton during his research with elephants and Jane Goodall in her work with chimpanzees.

2. Sociometric matrix completion - is a form of sampling dyadic interaction. The researcher designs a grid pairing all individuals of interest and then records their interactions, either as they occur naturally or by provoking them.

3. Focal animal sampling - involves choosing one animal in the group and following it for a preselected period of time - a few minutes or a longer period. Eventually, all animals in the group are observed this way. This method is often used with humans.

4. Sampling all occurrences of some behavior - is a method good for use with caged or confined groups. It involves selecting a behavior or behaviors and observing only these. It is particularly useful for attention getting behaviors, such as fights or threats.

5. Sequence sampling - focuses on the interaction sequence rather than on a particular individual. The observation begins and ends with the duration of the sequence.

6. One-Zero sampling - has the researcher score occurence or non-occurence of a particular behavior during the sampling period.

7. Instantaneous scan sampling - records all the individual's current activity at preselected moments (every minute, hour, etc.).

These methods are not, of course, used only in ethological research. Many of them are very similar to the observational methods already used by educators and psychologists.

Research Areas

There are many diverse areas investigated by ethologists, including attachment, bonding, aggression, mating, food gathering, dominance, territoriality, locomotion, communication, tool use and social organization. Many fascinating studies have been conducted in each of these areas, both with animals and humans. Since time does not permit even a cursory look at these areas before moving on to ethological views of mental illness and autism, let me briefly touch on two of the basic concepts underlying most of these areas; the innate releasing mechanism (IRM) and fixed action pattern (FAP).

These are types of behavior that can be observed in many species, including man, and consist of unlearned behavior patterns produced in answer to a specific stimulus.

A classic study in this area was conducted by Niko Tinbergen with herring gull chicks. Normally, as soon as they are hungry, these chicks peck at a red patch near the tip of the yellow bills of their parents. It is this red patch itself that brings on the pecking reaction. The red patch is termed a sign stimulus (Tinbergen, 1979). A yellow bill without the red patch stimulates only a quarter of the responses and patches of other colors score somewhere in between, even when one presents the chicks with an array of

colored bills, all get the same response - except a red bill, which is twice as effective. Yellow, the natural color of the parents' bills, scores no higher than white, black or blue. A pencil will also get pecks, provided the red dot is present (in fact, the thinness of the pencil also seems to be a part of the sign stimulus). The color red eventually acts as a signal that triggers an innate releasing mechanism in the herring gull chick, resulting in the fixed action pattern of pecking the bill. In Tinbergen's experiment, the all red bill acted as a supernormal stimulus. It presented so much of the characteristics of the sign stimulus that the chick over-reacted and pecked even more. The same phenomenon may be seen in egg choice. When the brooding gull was presented with painted wooden eggs of various sizes, she inspected them carefully and then chose the one 20 times as large as a normal gull egg. She attempted to incubate it, even though she fell off several times. The sign stimulus is not the total object, but some aspect of it - for the chicks it was red, for the brood gull, size.

IRMs and FAPs occur in human behavior also. Infants smile at a very young age - some at a few days, most by a few weeks. Blind infants also smile (although they often stop after a period of time). Therefore, rather than a learned social response, smiling is evidently a sign stimulus that releases protecting and care-taking behavior in adults. Babies themselves are 'sign stimuli' in a manner of speaking. The 'cuteness' aspects of babyhood are similar in the young of many species; short faces, large foreheads, round eyes and plump cheeks. Most adults do not have these features. It may be that these features are sign stimuli that bring out instinctive protective responses in adults - and possibly feeding and protecting responses in animals. Humans are not immune to the supernormal stimulus either, as

evidenced by the continued and world-wide popularity of Walt Disney and Charles Schultz's cartoon characters, all of whom have these same exaggerated cuteness characteristics.

These are only two of the many aspects of behavior of interest to ethology. Man has used his power to observe animals for centuries - first as a method of food gathering and hunting, later for instruction in survival (Kalahari natives have learned to watch baboons in order to locate scarce water supplies in the desert - the baboon is captured due to the man's knowledge of his curiosity, fed salt, and kept confined overnight - when he is released in the morning, he heads straight for the secret water supply and the man need only follow him to obatain water, and finally to help him better understand himself). We will now turn to research directed toward the later effort.

Ethological Approaches to Psychopathology

As indicated earlier, the majority of ethological research has involved study of a wide variety of animals other than humans, and analogies, "statements of a perceived similarity between two phenomena derived from casual observation or intuition," (Charlesworth 1975) between the behavior of these animals and humans have sometimes been made (e.g., Lorenz, 1977; Morris, 1967). In some cases the generalization from animal to man may have been precipitous.

In recent years, however, there has been a growth of interest in ethological exploration involving humans. The ethological techniques described earlier - the careful systematic observation of organisms within their "natural" environments - have been stressed, and attempts have even been made to determine human ethograms - descriptions of behavioral repertoires in different settings (see Blurton Jones, 1972; McGrew, 1972).

Ethologists believe that their approaches can be valuable for studying human behavior because psychologists (whether stressing intrapsychic, behavioral, or physiological orientations) have been too eager to rush to interpreting human behavior, have been limited in their attention to the "smaller causal network" (the effect of more readily apparent internal or external influences or behavior), and have consequently presented somewhat fragmented pictures of human behavior. Tinbergen (1963) stated,

> "It has been said that, in its haste to step into the twentieth century and become a respectable science, Psychology skipped the preliminary descriptive stage that other natural sciences had gone through, and so was soon losing touch with the natural phenomena." (p. 411)

Ethologists advocate not only the careful observation of humans but also a more integrative/multivariate approach. They have stressed the importance of studying the "wider causal network" - the phylogenetic, evolutionary origins of human behavior - in addition to the "smaller causal network" to see if additional clues to behavior can be obtained.

Although human beings no longer live in the "natural" world - at least in the sense of the hunter-gatherer societies and environment - in which our genetic programs for both physical and behavioral morphologies are believed to have evolved, and despite the realization of the very significant effect of learning and culture on human behavior, ethologists believe that studying both species and individual development and keeping an open mind with regard to the influences of possibly innate behaviors and behavior potentialities can provide at least heuristic devices for further study. However, ethologists are not interested in only what may be viewed as generally preprogrammed, species behavior, although this has tended to be emphasized. For ethologists it is not so much a question of distinguishing between behaviors which are

innate or acquired, but what Hinde refers to as "environmentally stable or labile behaviors" (Hinde, 1966).

In recent years, a number of researchers have utilized ethological approaches to the study of children's behavior and psychopathological conditions including mental retardation, schizophrenia, emotional disturbance, depression, and autism. Attention to these two populations has a long history. In his The expression of emotions in man and animals (1872), Charles Darwin devoted most of his study to facial expressions and postural communication in various animals, children, and mentally ill adults.

There are probably a number of reasons for the ethologist's attention to the behavior of children and to those termed mentally ill. One of these is that a larger proportion of the behavioral repertoires of these populations tends to consist of nonverbal, as opposed to verbally mediated behavior. As such, some of the behavior involved in communication or social interactions of both young children and mentally or emotionally handicapped populations appears more analogous to that that has been observed in other animals. Behavioral repertoires involved in bonding, dominance, and territoriality - all of which have received considerable attention in animal research - have also been examined in abnormal populations. In addition, the influences of learning and acculturation on behavior appear to be minimized with these populations. The behavior of both groups is, in a sense more "up front" less subject to either external influences or covert control. Another reason these populations have been studied is that they tend to be less mobile than normal adults - to have more circumscribed behavioral settings and are thus easier to carefully observe in a limited number of settings. A final reason that abnormal groups have been given attention by the ethologist is perhaps

because of dissatisfaction with the ways deviant behavior patterns have been explained by the dominant schools of psychology. In the case of autism, for instance, neither psychodynamic, behavioral, nor biophysical approaches have convincingly explained the development of the syndrome.

Several reviews and discussions of ethology and abnormal behavior have appeared in recent years (Fox, 1974; Hinde, 1962; McGuire, 1976; McGuire & Fairbanks, 1977; Singh & Gang, 1974; Zegans, 1976). Each discusses the advantages or contributions ethological studies could make in this area. McGuire and Fairbanks, for example have outlined how an ethologist would engage in the study of psychopathology,

> "The ethological view of the relationship between biologically based tendencies, conditions (including learning), and resultant behavior is essentially monistic in nature and does not differentiate actions of the body from those of the mind.... The "self" is not separate from the "body". Within this interpretative framework, data obtained from learning studies as well as the investigation of psychic structure find a place. From the perspective of evolutionary biology the causes of behavior extend beyond but include learning; while man is modifiable, there are, along a gradient of behaviors, limits to this modifiability. At one extreme this means that certain conditions will lead to certain behaviors relatively independent of learning, e.g., a noise frightening a child, while at the other extreme learning may be by far the major variable. In turn, the capacity to learn certain behaviors and not others may be genetically based, both on a species and an individual basis. In a similar way, ethology would neither deny the presence of psychic structures nor appetitive-like behavioral drives, but the scope within which these behaviors and their influencing variables are understood is more comprehensive than is usually found in psychiatric studies. We believe it is in recognizing species-typical tendencies, exploring their ontogeny, their tenacity, and their modifiability, as well as observing the consequences of thwarting them that ethology gains interpretive leverage over other current theories of normal and abnormal behavior."

Some of the species typical types of behavior that have been studied by ethologists, and which also have received considerable attention in other species, are dominance, territoriality, problem solving behaviors and bonding.

Comparative Psychology

Before reviewing some of this literature, it might be helpful to make a distinction that is not always clear between ethological studies and those of comparative psychologists, since the two are not infrequently confused. Comparative psychologists, such as Harlow (Harlow & Novak, 1973), McKinney (McKinney & Bunney, 1969), Fox (Fox, 1973) and Berkson (Berkson, 1967) have conducted experimental studies where human psychopathic states have been simulated in animals by controlling various environmental, behavioral, physiological, and neurological conditions. Since there are obvious ethical reasons for not deliberately creating such conditions in humans, these psychologists have attempted to create abnormalities in monkeys, dogs, and other animals resembling psychopathological conditions. According to Harlow, the emphasis in these investigations has been on

> "...precise control over psychotic determining variables, including heredity; life history; deliberate induction of trauma or sequences of trauma; adequacy and inadequacy of individual or sequential environments; alteration of physiological states (homeostatic and hormonal); and alteration of anatomical structures, particularly neural and glandular" (Harlow & Novak, 1973, p. 463).

Using laboratory research designs, comparative psychologists have been able to produce pathological conditions of privation and deprivation, fears and phobias, and depressions. Some of the behaviors (e.g., withdrawal, gaze aversion, stereotypes) they have produced by isolating infant animals have been compared to human psychopathological symptoms described by Spitz (1942) and Bowlby (1973) and have contributed to interpretations (especially in a psycho-dynamic vein) of autism.

Comparative psychologists sometimes cite the work of ethologists, and ethologists also refer to the work of comparative psychologists. However,

there are some basic differences in their approaches. Comparative psychologists, for example, do not observe behavior within the "natural" environment. In fact, quite the contrary is the case. They devise highly controlled laboratory experiments with deliberate manipulations of the environment. Secondly, they tend to adhere to traditional theoretical constructs (e.g., behavioral, psychodynamic, physiological) to explain the syndromes they produce.

Examples of ethological studies of abnormal human behavior involving both adults and children are available and include a spectrum of abnormal behavior from that considered simply "problematic" to that considered psychotic or austistic. Blurton Jones and his associates (Blurton Jones, et al., 1979), for example, have studied individual differences in the aggression, crying, and physical contact of young children with their mothers. The researchers observed discrete occurrences of hits, bites, hair pulling, kicking, and the like--what they called "unprovoked assaults". Children were observed during periods of group free play, and the nature of interactions with their mothers was also observed. Based upon their observations of both aggressive behavior and interactions with mothers, the researchers determined that there were correlations between mothers' responses to the crying of aggressive toddlers and their aggression. Mothers who picked up their children after a delay or not at all had children more often attacked other children. The authors related this finding to other research indicating that children noted for their frequent aggression and infrequent sociable behavior have mothers who use fewer appeasement facial expressions (e.g., smiles, head on one side, etc.). Thus, they believe, aggressive behavior may be related to attachment behavior between mother and child.

Leach (1972) has also compared behavior of problem and normal preschool children by recording specific types of social interactions between children and their mothers related to attachment. In his study, actions (e.g., approach-avoid, fall, punch, run, etc.), faces (e.g., avert, fixate, smile, etc.) and speech (e.g., grunt, laugh, talk, etc.) were coded and then dyadic interactions were observed to determine the way children "initiated" and "responded" in playgroups. Children who were considered "problems" because they experienced separation anxiety from their mothers were observed along with normal peers, teachers, and their mothers, and a running commentary was kept. Leach concluded that the problem children had reduced, unsatisfactory interactions with both peers and mothers. They initiated less behavior and were less responsive to other children than were the normal children. They were less successful at eliciting responses from other children and, despite their clinging to mothers, were even less responsive to their mothers than were the nonproblem children.

Zabel (1977) utilized the ethological concept of dominance hierarchy to compare normal and identified emotionally disturbed preschoolers in different settings. Dominance hierarchies have been viewed by ethologists as serving the adaptive function of reducing aggression. They are established orders of leadership and precedence so that each member of a social group knows its relative rank and that of the other group members (Price, 1967). Using a coded time sampling procedure to observe categories of behaviors that have been determined to indicate dominance or submission (e.g., physical gestures, threat gestures, object-position struggles, and initiative behavior), she found that the two groups did not differ in repertoire. They did, however, differ in the amounts of some types of behavior they utilized. The disturbed

In another study conducted by Esser and colleagues (Deutsch, Esser, and Sossin, 1978), dominance and territoriality were again examined in a group of 18 institutionalized female adolescents with behavioral, emotional, and learning problems. During a nine week period, trained observers recorded information on space use and dominance behavior in a cottage for three continuous hours each day. Data on girls' locations were recorded on maps of the ward divided in functional units and 1 1/2 x 2 1/2 ft. areas. Any obvious dominance or aggressive behaviors (e.g., behavior directed at another that caused physical insult, brought about withdrawal, intimidated the other, or limited the other's behavior) exhibited by cottage residents or staff were recorded. The authors found that the high ranking girls expressed dominance primarily through the use of verbal orders, while more than 1/3 of the middle groups' interactions were physical, and the lowest dominant girls engaged largely in name calling. In addition, observed dominance was highly correlated with staff judgments of girls' social status and with age of girls. However, no significant correlations were obtained between dominace and IQ, frequency of social interactions, or length of stay in the cottage. One interesting finding was that the most dominant girls spent the greatest amount of their time in their bedrooms and in a limited number of other locations, while less dominant girls utilized a greater number of locations.

Some similar territorial behavior patterns have been observed in institutionalized severely retarded boys. Paluck and Esser (1971a) observed the rapid development of territories for all 21 members of a group of 7-10 year olds and found that the territories were resistant to change even when aggressive defense of territory was punished (with verbal reprimands), rather than ignored by staff. In a follow-up study (1971b) including some members

of the original group 20 months later, Paluck and Esser found that the boys continued to show clear preference for specific areas. And even after the passage of time, those who had been in the earlier study quickly returned to their former territories. It is interesting to note that these researchers found correlations between improvements in clinical condition during the interim between studies and the boys' territorial behavior. Movement from an isolated, uninteresting or uncontested territory to an interesting and populated one, along with the move from a fixed territorial ownership to participation in the staff power structure, appeared to be related to improved clinical status as evidenced in reductions of stereotypies and escape behaviors and increases in communicative behavior.

Cole (1977) too, has examined spatial relationships in terms of their socioecological correlates with psychiatric patients and has found that the number of people present seems to act as an inhibitor of deviant behavior. Deviant behavior was highest when patients were alone and decreased rather linearly. Willer, et al. (1974) have also used behavior mapping in studying territorial behavior of chronic psychiatric patients and found consistent patterns such that it was soon possible to predict both an individual's location and activities.

In discussing the results of some of these studies of territoriality and dominance interactions for schizophrenic patients, Esser and Deutsch state that "Withdrawal from the social world characterizes the most pathological state of sociospatial behavior...." (1977, pp. 140-141). They believe that "both a deficient signaling intent and the inability to risk a social definition of self, reinforce the possibility that all social interactions are perceived as stressful and thus produce an abnormally increased level of

arousal" (p. 140). They further believe that this interpretation may apply especially to consideration of childhood autism. There is some evidence in ethological research that has focused on the autistic population that this may be the case.

Autism

Although the term autism has been used by some interchangeably with childhood psychosis and schizophrenia, not to mention even less "severe" forms of disturbance, ethologists tend to employ a fairly rigid definition. Balow (1980) recently discussed several definitions or descriptions of autism and concluded that "all major definitions are simply lists of signs or symptoms, showing general agreement at the core but much disagreement on the edges" (p. 2). Ethologists have generally focused on the behaviors about which there is "general agreement" as apposed to "disagreement on the edges."

Ornitz, et al. (1978) reported data from parents' responses to a written questionaire concerning autistic disturbances of relating to people and objects, perception, and motility. They categorized behaviors as autistic relating disturbances, language disturbances, perceptual disturbances, motility disturbances, and compared autists and normal children. Among the relating disturbances, over 75 percent of their autistic children avoided eye contact, ignored people as if they did not exist, and were emotionally remote. Yet, several other "austistic behaviors" (e.g., withdrawal from affection, rigidity/limpness when held), were found in fewer than 50 percent of austistic children. They also found that a majority of autistic children did display perceptual disturbances (e.g., hyperactivity, heightened awareness of sensory stimuli, heightened sensitivity to sensory stimuli), and auditory, visual, tactile, vestibular, and pain modalities were all found to be

significantly involved (p. 29). Motility disturbances (e.g., hand flapping, whirling, and head or body rocking) were also reported in over 50 percent of the autistic children. In addition, only a small number of their sample had any use of language.

Behaviors in all three of these categories have been studied by ethologists--gaze aversion, level of arousal, and stereotyped behaviors. Because of the low level of verbal behavior exhibited by autists (muteness or echolalia), ethological approaches seem especially apt for studying this population since nonverbal behavior has occupied much of the attention of animal as well as human ethologists.

The Hutts have conducted a number of ethological studies of autistic children. Hutt and Ounsted (1970), for example, studied gaze aversion and its significance. From an ethological perspective gaze fixation signifies readiness for action and is qualified by other display components to indicate threat, attention, sympathy. Conversely, the failure to make or to maintain eye contact is viewed as inhibiting social interaction. When this is a persistent characteristic, communication is minimized and deviant consequences may be displayed. The authors filmed 12 autistic children in free play situations with other normal and autistic children. They found, not surprisingly, that autistic children were nearly always solitary in their play--they engaged in no verbal contact with others, no aggressive behaviors, and seldom were aggressed upon. Yet, perhaps more surprisingly, the autistic children did seek contact with adults. In fact, the authors found little difference in the form (morphology) of the approach behaviors of the autists and nonautists, although there were fewer approaches by the autists. The one difference in form that was observed was that of gaze aversion for the autists.

Hutt and Ounsted proceeded to experiment with gaze averson situations by placing faces (happy, sad, blank, monkey, and dog faces) on cards around the periphery of a room. Individual autistic and nonautistic children were observed for the nature of their interactions with the faces. There were differences both in the number of encounters with the faces and the amount of time spent in encounters. Nonautists spent the least amount of time looking at the blank face, while autists encountered the happy face the least frequently. They encountered the blank and animal faces more frequently and also spent more time exploring other environmental stimuli (light switches, windows) than the nonautists. In addition, the autists spent less time with faces as a whole than nonautists, and were, in fact, quite active in their avoidance of exploration of the faces. Frequently, when first confronted with the facial models, they stood with their backs to them and engaged in stereotypies. In short, the human facial configuration elicited more avoidance than the non-human, and smiling faces, which invited social interaction, were avoided.

From an evolutionary point of view (Hutt & Ounsted, 1970; Coss, 1970, Coss, 1979) prolonged fixation has been viewed as threatening, intimidating, or hostile in a wide range of species. Receptively, too, the visual modality appears to be a chief carrier of arousing stimulation. The authors believed that autists <u>were</u> obtaining information about the faces despite their gaze aversion--through peripheral vision--so their aversion cannot be attributed to perceptual inconstancy or instability. They were simply too selective in their avoidance of certain faces. In discussing the maladaptiveness of this behavior, they say,

"It would appear that much adult affectional behavior is contingent

> upon the child making and maintaining some degree of eye contact. Gaze aversion would then result in attenuated responsiveness as well as reduced stimulation from the adult," (p. 115).

placing the parents in the fabled "double bind". The effects on peer relationships could be equally deleterious. Autistic children did not fight for territory or possessions and, if attacked, would back off. Here in the immediate situation, gaze aversion was an adaptive technique to inhibit aggression or threat behavior.

Hutt & Ounsted speculate that autistic children are in a chronic state of high arousal (for whatever reason) and gaze aversion serves to reduce that arousal. There is additional evidence that this is the case. Experimental studies conducted by Coss (1979) utilizing various facial schema found that those with two concentric discoid elements schematically resembling facing eyes were arousing stimuli. In these studies, he found that when presented with such stimuli, psychotic children looked significantly less at face-like models than did normal children.

Other ethological studies have examined stereotyped behaviors and their relation to arousal of autistic children. In one of these, Hutt and Hutt (1970), the frequency, duration, intensity, and sequence of behavior of autistic children was recorded in an unfurnished waiting room. They found that in general, stereotypies increased with increasing environmental complexity (28 percent of the time in unfurnished room; 52 percent in social situations). They also exposed autistic children to novel objects (bell and buzzer on apparatus with lever) and found that they characteristically engaged in stereotypies when encountering the novel stimuli. In a clinical application of this type of finding, Stroh and Buick (1970) placed two autistic children in a constant structural environment for several months.

They discovered that the longer the children were exposed to these environments, the greater the fall in arousal, the greater the amount of exploration they engaged in, and the more normal the involvement of their perceptual channels.

Hutt and Hutt also attempted to determine relationships between EEG patterns and stereotypies for two autistic children. They recorded a commentary of each child's behavior while taking EEG readings and later attempted to analyze these together. They transcribed the commentaries, timed them and matched them with the EEG tracings to determine if there was bioelectric activity accompanying the motor activity. Although they could not demonstrate a specific EEG pattern during stereotypies, "not only did the frequency and duration of stereotypies increase with increasing situational complexity, but a corresponding increase in abundance of low voltage irregular activity" (p. 184) was recorded. Sroufe, Steucher & Stutzer (1973) have also found relationships between stereotypy and some physiological activity (e.g., heart rate) with an autistic boy. After heart beat began to increase, stereotypy began. As heart beat decreased, stereotypy stopped. Although in their study, the arousal was viewed as governed by some internal rhythm, the stereotyped behavior was interpreted as reducing physiological arousal.

Conclusions

This, then, is a sample of some of the research concerning abnormal human behavior, including autism, that has been generated by ethological perspectives. Some of ethology's distinctive features--concepts like territoriality, attachment, and dominance that have been explored in animal studies; observational techniques to record behavior in natural settings; and the utilization of theory and research from a number of conceptual models--have been illustrated in this review.

Ethology will continue to investigate various non-verbal aspects of autism, i.e., gaze aversion and stereotypic behavior, with an eye toward answering questions of evolutionary development and significance. Questions concerning the "adaptiveness" of these behaviors can only be speculated upon --indeed we have made only small steps toward answering Tinbergen's four questions as they pertain to autistic behavior. Obviously, autism is a very maladaptive situation whether considered ontogenetically or phylogenetically - one which causes pain and sorrow to both parents and children. It may be, in fact, that autism is only with us due to the "ecological release" provided man by his lack of competition for environmental resources from other species. We have so dominated our environment that maladaptive individuals remain a part of our social structure.

Along with their existence in our social realm comes our absolute responsibility to try to define, to understand and thus to initiate change, for along with language and reasoning ability, concern for one's fellow beings is a trait more highly--although not completely--developed in man. Observation of himself and his fellow animals is man's oldest learning technique--from the early man who observed cooperative behavior in wolf packs, to the Kalahari native who realized curious baboons can find water, to King Arthur, one of England's most famous heroes, who gained his wisdom from Merlin's animals. Ethological research is essentially a more sophisticated and scientific approach to this same search for knowledge. Perhaps this tool, which like behavior itself is both simple and complex, can lead us toward the answers that we must have.

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