DOCUMENT RESUME

ED 031 291 PS 001 943

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Chicago Univ., Ill. Committee on Human Development.
Pub Date Jan 69
Note-11p.
EDRS Price MF-$0.25 HC-$0.65
Descriptors-Adjustment (to Environment), Animal Behavior, Behavior Development, *Biological Influences, *Early Childhood, Grade 1, Organization, *Peer Relationship, Peer Teaching, *Social Development, Socialization
Identifiers-Ethological Approach, Umwelt

The ethological approach may become an important methodology in the developmental studies of children. The ethological approach takes into consideration the total world of the child, social and cognitive, when the child's development in that world is analyzed. Information can be obtained both from studies of other primates (for example, the study of the social behavior of monkeys) and from the study of the behavior of children. Examples of the latter include (1) a study of hierarchization in first grade boys, in which it was found that the boys could structure social relations earlier than physical relations; (2) a study of the staring encounter in nursery school and first grade boys, which showed that the nursery school boys did not have a concept of a dominance hierarchy but that the first grade boys did; and (3) a study in cooperative picture drawing, which demonstrated that boys in the first grade would more often integrate their efforts while girls at that age would either imitate each other or draw independently. In this last study, there appeared no sex differences in the way the drawings were done by nursery school children; all were primarily individual efforts. (WD)

The Development of Early Social Interaction--An Ethological Approach

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January, 1969

Back in 1935 Murphy and Murphy (in Murchison, 1935) emphasize the need for naturalistic observation in children. More recently, Claussen, et al (1968) stress again and again the "need for careful, naturalistic observation." Perhaps this need has gone unanswered because of the lack of a theoretical approach to give motivation and meaning to data collection. We believe the ethological approach may be useful in this regard by providing a theoretical framework--evolution, and a methodological approach -- naturalistic observation coupled closely with experimentation. In the following section we will discuss aspects of the ethological approach to child development, the development of social behavior in primates.

The Ethological Approach

Dichotomies found in child development literature such as innate vs. acquired, cognitive vs. social, cultural vs. biological, inner vs. outer, are antagonistic to an evolutionary view of man (Freedman, 1965). A basic ethological concept relating the social and cognitive aspects of an animal's behavior is the animal's Umwelt, his perceived and conceived world, (von Uexkull, in Schiller, 1957). For example, when a seeing eye dog stops at a stoplight it is not sufficient to infer that the dog is responding to the color red. Previous investigation has shown that the dog is color blind, and in this situation would be reacting to the interruption of traffic flow. The dog could not be taught to respond to the color red because it is not within his Umwelt. The concept of Umwelt differs from other notions of subjective reality in that it emphasizes the relationship between the animal's world and the adaptation of the species.

While the criterion of adaptation is always necessary, in itself it is not sufficient to form hypotheses for study because it can be argued that all

behavior is adaptive. Instead, the emphasis in an ethological study is on behavioral analogies between related species, (i.e. where there is the necessity for similar units of behavior in different species). If a recurring part of man's social behavior is also found to play a basic part in the social adaptation of all primates then we have confidence that we are studying an important part of the hominid adaptation and not merely a cultural artifact. Fruitful hypotheses of human behavior have been tested by reference to primate behavior in the areas of: attachment behavior (Freedman, 1965; Bowlby, 1958) sexual dimorphism (Freedman, 1967) and nonverbal communication (Edelman and Omark, 1968). In our studies we have focused on the developing ability of the child to enter into his peer group. In the following section we will outline social development in primates as providing a phylogenetic baseline for our studies of childhood socialization.

The Development of Social Behavior in Primates

During the first year, the young monkey has contact with his mother, his 'aunts' and their children. The mother generally watches him closely and frequently comes to his rescue. At about two, the males begin to move out more frequently into play groups of male peers. These play groups coalesce into a fairly tight knit group that travels with, but on the periphery of, the main troop. It is in these play groups that the males first encounter and take part in a dominance hierarchy. Through their play activities, skills are developed in fighting, understanding gestures, and learning the 'personalities' or potentialities of the cohorts (Washburn and Hamburg, 1965). This juvenile group is loosely watched over by an adult male who breaks up serious fights and keeps them from making too much noise (e.g. baboons, Washburn and DeVore, 1965; spider monkeys, Omark, 1966).

At four or five years of age the larger monkeys move back into the central group and attempt entering the adult male hierarchy (Frisch, 1969). By

this time they have sharpened not only their fighting skills, but also their social skills. They correctly make and respond to species-specific gestures that eliminate violent conflicts and allow up to 750 animals to congregate in a small area (Kummer, 1968). The adaptive value of the dominance hierarchy is to diminish the actual amount of physical fighting in animals that are potentially dangerous to each other. Dominancy hierarchies are a reoccuring form of social organization -- from the obvious "pecking order" in chickens to the less apparent hierarchies in primates.

The young female infants grow up within the central group. They do not form clusters outside of the main group, but rather grow into the female dominance hierarchy, if one exists. In monkeys, great apes and man, the care of infants apparently has to be learned. Monkeys reared in isolation make very poor mothers (Harlow, 1962). The continued presence of the developing female primate within the central troop provides her with the opportunity to groom, handle and carry newborn infants, besides placing her in a position where imitation of more experienced females is possible. It is not a large evoluationary jump to suggest that the ability to relate to a hierarchy on a verbal and on a nonverbal level is central to man's adaptation. Anthropologists are quick to point out that since over 95% of man's past evolutionary history has been as a hunter, the basic unit of selection has been the band, not the individual. Natural selection has favored man's fitness in the group (language, the ability to relate to a hierarchical social structure) rather than man's fitness as an individual (aggressive potential). Thus the first study of hierarchization in boys was motivated by the development pattern in primates and by the adaptive significance for the species.

Study of Hierarchization in Boys

Our earlier informal naturalistic observations suggested there was a hier-

archical social structure among the first grade boys. We follow this up with the following experiment. We seated two first grade boys at a table and presented them with two index cards on which were written the names of two boys in their class. They were asked who's the toughest. A card with another boy's name was added and they were asked to place his name in the proper order. We continued this through all members of the class, including the two boys performing the task.

We found that the boys were able to agree on the rankings of the other boys. When asked the reasons for the ranking we would get answers such as "I saw Jeff winning over Bill and I'm tougher than Jeff so I know that I'm tougher than Bill." In Piaget's terminology, this demonostrates the boy's ability to form transitive relations, while the ability to rank the boys demonstrates the mastery of "seriation." When presented with a Piaget test of the transitivity of length (the two towers) the boys did not show a knowledge of transitivity. If this finding holds up it would mean that boys can structure social relations earlier than physical relations. In addition, the enthusiasm with which the boys performed the task, and the emotional investment which they showed in the placement of their names in the hierarchy gave us confidence that we were studying a significant part of the child's Umwelt.

It was suggested earlier that an ethological approach to the child would emphasize the child's Umwelt, or perceived world. This notion that the child's world is different from the adult's world is not new to child development. Piaget has destroyed our "adultomorphic" view of the child just as the ethologists have destroyed our "anthropomorphic" view of other animals. The difference between the cognitive and ethological approach is one of emphasis.

The ethologist emphasizes characteristics of the species which are basic to its adaptation. The Umwelt of the animal is as subject to selection pressure

as its species-specific manner of walking. For the child to fit into a dominance hierarchy, he has to be able to perceive the structure of the group and to be able to communicate with the members of the group. Thus while the child's ability to perform logical operations with candy and sticks, and to know where dreams come from may be adaptive, it is of secondary importance to the child's developing ability to relate to the group.

Piaget has not ignored the importance of social behavior. In fact, social interaction with peers is the liberating factor for the child's egocentrism (Flavel, 1963). However, other than a few observations of group behavior, Piaget has not pursued the relationship between social behavior and cognitive development. If the result of this study that the child first uses logical operations on the social level is borne out, we have insight into how the child proceeds from one stage to the next.

Staring Encounters

This portion of our research focused on one aspect of nonverbal behavior -- the staring encounter, and its relation to dominance hierarchies. Eibl-Eibesfeldt (1961) has pointed out that fights between individuals of the same species almost never end in death and rarely result in serious injury to either combatant. If this were not the case, it would have grave disadvantages for the species since the losing animal may not be less healthy but simply less mature. To decrease the need for a harmful interaction, a stable dominance hierarchy has evolved in most social species.

The staring encounter, or stare threat, is encountered in carnivores (Schenkel, 1966; Schaller, 1967; Ginsburg, 1967) and throughout all of the primate species that have been studied for any length of time (e.g. lemurs - Jolly, 1965; baboons - Hall and DeVore, 1965; and chimpanzees - Van Lawick-Goodall, 1967). They all make use of the stare as a gesture in the maintenance of the

dominance hierarchy.

Sackett (1966) studied young rhesus monkeys which had been reared in isolation. He presented these animals with colored slides of monkey exhibiting threat behavior, and other types of stimuli. He concluded:

> the visual stimulation involved in threat behavior appears to function as an "innate releasing stimulus" for fearful behavior. This innate mechanism appears maturational in nature... Although the maintenance of responses to socially communicated stimuli may well depend on learning and some type of reinforcement process, the initial evocation of such complex responses may have an inherited, species-specific structure.

Assuming that man fits within a similar evolutionarily developed paradigm we hypothesized that young children would have a reaction to a staring encounter, but that the correlation of the stare to the dominance hierarchy should increase with age.

We asked pairs of nursery school and first grade boys to "look into each others eyes until we tell you to stop." The pair was then asked "Who's the toughest?" The teacher and assistant teacher in each class was then asked to rank each member of each pair as to "Who would win in an argument?"

In nursery school, although there were clear winners in the staring encounter, there was no correlation between that and the teacher's conception of the boys. The boy's conception of himself vis-a-vis the other also bore no relation to the winner of the staring encounter. When asked, "Who's the toughest?" both boys would give the egocentric answer "ME!" so typical of that age.

The results in the first-grade class were in marked contrast. Table 1 shows the number of times the boy chosen by the teachers as the one "who would win in an argument" was the same boy that won the stare.

Table 1
Relationship between teachers' rating and the winner of the staring interaction (n-12 pairs)

	No. of agreements with stare winner	Per Cent agreement with stare winner
Head teacher	10	83%
Part-time assistant	6	50%

The probability that the head teacher's ratings would agree with the stare encounters results in 10 out of 12 cases, under the assumption that the two ratings are independent, is equal to 2 chances out of 100 (p=.02).

Table 2

Agreement between the head teacher's rating of "who would win in an argument" with the student's mutual choice of "who's the roughest" in terms of their agreement with the stare winner (n=10*)

		Head Teacher's Agreement with the Stare Winner	
		Agree	Disagree
"Toughest Student" agreement with the stare winner	Agree	7	1
	Disagree	2	0

*The total does not equal 12 because the students did not reach agreement in two of the pairings.

The largest cell in Table 3 is where all three measures agree, i.e., the stare winner was also rated by the teacher as winning an argument and was both boys' choice of being the "toughest." In no instance was the loser of the stare encounter chosen as winner of an argument and the toughest. Since both independent measures never jointly disagree with the stare rating, it could be argued that the stare winner is what both are rating.

The young child grows from an egocentric state where little or no attention is paid to those around him to a socially integrated adult. To successfully move into a hierarchy means that the child has to be able to recognize the group structure, and to successfully use the mechanisms -- in this case staring -- which are required for eliciting responses from others. The purpose of this portion of the study was to more firmly establish the link between hierarchies in man and other primates and to investigate some means, other than language, by which children deal with each other.

Draw-a-picture-together Test[1]

Through observations of behavior on the playground, we found that boys tended to move from place to place as a large mass, continually interacting as they moved. Girls, on the other hand, played in much smaller groups in activities which could be characterized as side-by-side and imitative, rather than the cooperative and conflictive behavior we saw among the boys. To more thoroughly investigate the gestures and patterns of behavior we developed the draw-a-picture-together test which would require two children to cooperate with each other.

Two first grade classes and 14 nursery school children participated in a study of cooperation in the drawing of crayon pictures. In all cases the children involved were paired and placed together at tables. Other pairs were placed at other tables to reduce the amount of interchange between pairs and increase it within the pairs. The children's own choice of partner was not permitted; they were randomly assigned by the researchers. Each child was told to choose a single crayon of a color other than that chosen by his partner and to use it for the entire drawing. No exchange or replacement was permitted. Each pair was then given a single sheet of 8 1/2 x 11 inch white paper. The instructions were to draw a picture together on the same piece of paper.

As a general trend, on the basis of this sample, it can be said that first grade boys usually will integrate their efforts in producing a joint picture (Table 4). Some of their pictures clearly show dominance (i.e., one boy draws the entire outline, while the other merely fills it in). This not occuring, the boys will split the paper and draw individually. Girls, on the other hand, will either imitate when drawing together or ignore each other and draw individually.

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[1]This data was collected and analyzed with the help of Edward Fahrmeier.

Table 3

Age and Sex Differences in the Ability to Integrate a drawing with a partner.

		Integration	Separation
1st Grade	Boy-Boy	21	11
	Girl-Girl	2	12
Nursery School	Boy-Boy	1	4
	Girl-Girl	0	6

In contrast to the first graders, there seems to be little sex difference in the type of drawings which are produced by nursery school children. Almost all of their pictures were separate efforts by each child. A spot check on a pair of boys and a pair of girls at the fourth grade level gave a completely integrated picture by the boys, and a picture integrated in theme but drawn from two different perspectives by the girls.

At this initial stage of our project it would appear that there is a basic difference in the age at which boys and girls are able to deal with another person on a joint project. Their mode of interacting with another may also vary; the girls appear to be much more imitative, while the boys go through this stage quickly, if at all. In contrast, the boys, when drawing in pairs, appear to respond to both the cognitive and hierarchical level of the other boy. When two boys near the bottom of the totem pole are placed together they each draw separate pictures, but placing a low boy and a high boy together results in an integrated picture.

Recent education work on the "buddy system" of teaching, where an older child is placed with a young child who is having difficulty with his school work (Thelen, 1968), may reflect this same phenomenon. More work along the line of the Draw-a-picture-together test may reveal ways of pairing children, within the same

class or from different classes, who could effectively work together to help the slower of the pair.