Journal of Autism and Developmental Disorders, Vol. 10, No. 1, 1980

The Responsiveness of Autistic Children to the Predictability of Social and Nonsocial Toys[1]

Cindy Ferrara and Suzanne D. Hill[2]
University of New Orleans

This study was designed to explore autistic children's ability to develop an expectancy from environmental events. Social and nonsocial toys were presented to autistic and control children in situations that either allowed or prevented them from predicting their appearance. It was found that autistic children's behavior was seriously disrupted if they could not predict the sequence of environmental stimuli, but their responsiveness to environmental stimuli increased when events were predictable. They approached social objects more readily than nonsocial objects when both were simple in appearance. These findings suggest that an appropriate starting point for therapeutic intervention with autistic children might be to focus on shaping social play in highly structured and predictable environments.

An important characteristic of autistic children is their avoidance of social interactions. They do not show reciprocal use of eye contact nor do they play interactive games (Ritvo, 1976; Rutter, 1978). Normal children, on the other hand, use eye contact as infants to regulate the amount of stimulation they receive and to influence the intensity of their parents' interactions with them (Garvey, 1977; Stern, 1974). These behaviors and the resulting

[1]The authors wish to express their appreciation to the staff at Southeastern State Hospital, LSU Therapeutic Nursery School, and Bienville Public School; to the Little Prince Play School and the A B C Day Care Center; and to the parents of all the children for their helpfulness in making the children subjects available to participate in the study.
[2]Address all correspondence to Dr. Suzanne D. Hill, Department of Psychology, University of New Orleans, Lakefront, New Orleans, Louisiana 70122.

0162-3257/80/0300-0051$03.00/0

behaviors that adults direct toward them lead to repeated social interactions that are enjoyed by both partners and that have beneficial effects on the development of language, cognition, motor skills, and general health (Goldberg, 1979; Papoušek & Papoušek, 1978; Rossetti-Ferreira, 1978). According to Seligman (1975) and Lewis and Goldberg (1969), infants learn that their actions are effective in controlling the environment during these early play interactions, and their motivation for further learning is increased.

Young children must learn to play with their peers as well as with their parents. Parents structure predictable sequences of sound, touch, and motion in early parent-infant play, but other children are less predictable. It has been shown, however, that the infant spends more time in interaction with peers than with parents in a free-play situation by 12 to 18 months of age (Lewis & Brooks, 1974), suggesting that infants are able to tolerate uncertainty at this age, although they continue to be more responsive to the environment when their expectations are confirmed (Kodera, Note 1).

Early maternal deprivation has devastating effects on the behavior of nonhuman primates, but if they are reared with peers or if young peer "therapists" are introduced after isolation, social behaviors, including play, are developed (Soumi & Harlow, 1972; Harlow & Suomi, 1971; Suomi, Harlow, & Novak, 1974). The effect has been found with a 15-year-old partial isolate (Gomber & Mitchell, 1974) and an 11-year-old total isolate (Strongin, Gluck, & Frank, 1977) indicating that social behavior can be recovered after the period of infancy has passed. In these studies the isolates were forced to recognize the existence of the therapist and to be involved in social interactions with them. In this way they developed more complex social behaviors that culminated in normal social interaction (Soumi & Harlow, 1972). A similar conceptualization of psychotherapy for autistic children had been proposed earlier by Mahler, Furer, and Settlage (1959).

The play behaviors of autistic children have been increased in both one-to-one and group training by shaping and reinforcing social play (Lovaas, Koegel, Simmons, & Long, 1973; Romanczyk, Diament, Goren, Trunnel, & Harris, 1975), and it is encouraging to note that only a slight decrease in social play followed when all passive shaping was discontinued.

If play is a viable focus for therapeutic intervention with autistic children, it becomes critical to identify the types and characteristics of toys that evoke approach and manipulation, and the conditions most effective in stimulating social play. The present study was designed to explore autistic children's responsiveness to social and nonsocial toys varying in complexity. The toys were presented in situations that allowed or prevented them from predicting their appearance.

METHOD

Subjects

Ten children with psychiatric diagnoses of autism participated in the study. The children attended special programs for autistic children in public school or hospital settings. Children were selected from these programs if they met these criteria: ritualistic and compulsive behaviors, serious disorder of receptive and productive language, failure to develop social relationships, and uneven development (Ritvo, 1976; Rutter, 1978). The children were being trained to imitate motor and speech movements and to respond to verbal commands in their highly structured classroom situations. They did not interact appropriately with either objects or persons, and they reverted to stereotyped body movements and withdrawal from the environment when not under stimulus control of their teachers. Their mean age was 7 years 5 months (range, 3 to 12 years). Ten normal controls also participated in the study. They were recruited from a local preschool or were brought in by their parents, who volunteered to participate in the study. Their mean age was 3 years 2 months (range, 2 years 11 months to 3 years 10 months). This age was chosen for the comparison groups because of the developmental delays in language and cognition shown by the autistic children. Earlier work in our laboratory had indicated that nonverbal autistic children similar to those in the present study solved simple perceptual problems at the 3½-year-old level (Hill, Harrison, Mawson, Mossman, Pleune, & Wagner, Note 2).

Apparatus and Procedure

The toys were presented in a toy box "theater" consisting of three opaque panels with a sliding door in the middle panel. When the door was raised, a chamber (44.6 X 45.6 X 31.2 cm) was revealed containing a toy for the children to explore. A Plexiglas panel (15 X 10 cm) was mounted at a 40° angle from the vertical and placed 48 cm below the door. The panel was illuminated by a 100-watt light-bulb. A video camera, focused on the children, recorded their actions for later scoring of their responses.

Two pairs of dolls were used as social toys: a doll with lifelike features and one with features painted on the face; a pliable Raggedy Ann doll and rigid wooden doll. The two pairs of nonsocial toys were: a multicolored, eight-sided block and a plain four-sided block; a pliable Slinky and a rigid Slinky. The toys thus varied in the number of features present and in flexibility. These characteristics defined the complexity of the objects. The

toy were attached to the theater by a heavy cord, which allowed full manipulation of them but prevented the children from receiving them from theater.

The children were familiarized with the situation on the 1st day of their participation. They were seated before the theater and told that they could play with the toys when the door was raised. Each toy was presented twice for 30 sec. The children received the toys under predictable or unpredictable conditions on days 2 and 3. The light panel was illuminated for 6 sec and the door was raised immediately after its offset in the predictable condition. In the unpredictable condition, the light panel was illuminated for 6 sec as before, but the door was not raised immediately each time. A pause varying from 1 to 15 sec occurred between the offset of the light and the raising of the door (mean, 9 sec). Half the children received the predictable condition on day 2 and the unpredictable condition on day 3. The other half received the predictable and unpredictable conditions in reverse order.

The toys were presented twice in all conditions, their order of appearance randomized using 10 random lists. The amount of time spent looking at and manipulating each toy was scored for each condition from the videotape. We considered the child to be engaged in manipulation if his hands were in movement and in contact with the toy. Looking behavior was defined as gaze directed at the toy. These are primitive, presocial behaviors that were in the repertoires of our children. Half of the videotapes for each group were scored by an independent observer as a reliability check. We set a criterion of 1 sec difference for viewing time and 2 counts for manipulation. If the second observer's scores differed by more than this criterion from the first, both observers rescored the trial until the criterion was met. We used the first observer's scores for statistical analyses.

RESULTS

Combining both predictable and unpredictable conditions, the comparison group of children looked at the toys more (24.9 sec vs. 19.0 sec) and manipulated them more (20.1 sec vs. 11.4 sec) than the autistic children. These differences were significant ($p < .05$). The autistic children, however, were affected more by the predictability of events than the control children. They looked at the toys more (19.4 sec vs. 15.7 sec) and manipulated them more (13.9 sec vs. 8.1 sec) during the predictable condition than during the unpredictable condition ($p < .05$) The normal children, in contrast, were relatively little affected by predictability (looking time, 25.3 sec vs. 23.6 sec; manipulation, 19.8 sec vs. 18.1 sec; differences nonsignificant). The two

groups also differed in their responsiveness to toy characteristics. The normal group looked more at the more complex toys (26.3 sec vs. 22.4 sec) than the less complex toys and manipulated them more (21.1 sec vs. 16.7 sec). These differences in their response to complexity level of the toys were significant ($p < .05$). The autistic children, on the other hand, were relatively unresponsive to complexity differences in relation to looking time (17.0 sec vs. 18.0 sec), but they did manipulate the less complex toys more (12.6 sec vs. 9.4 sec). The complexity of the toys affected the normal group more than the social-nonsocial aspect of them. They both looked longer and manipulated the more complex toys more than the more simple toys regardless of their social-nonsocial features. Autistic children, on the other hand, both manipulated (12.6 sec vs. 9.4 sec) and looked at (20.9 sec vs. 16.8 sec) the social toys more than the nonsocial toy when both were of low complexity ($p < .05$). They were unresponsive to the social-nonsocial factor only if the complexity of the toy was high.

DISCUSSION

These data indicate that autistic children were able to form expectancies from environmental events. Their behavior was seriously disrupted if they could not predict the sequence of events, but their responsiveness to the environment increased when the timing of events was predictable. In addition, they approached social objects more readily than nonsocial objects if they were simple in appearance. They were generally less responsive to environmental events, however, than were younger normal children at approximately the same developmental level.

Young normal infants display negative affect such as increased arousal and avoidance of stimulation when novel environmental input is too difficult for them, but, when they learn an appropriate response to intense levels of input, they display positive affect, decreased arousal, and approach to stimulation (Papoušek & Papoušek, 1975). Competence of response provided the means of approaching complexity with equanimity. The competence of severely deficient isolate-reared nonhuman primates has been increased through exposure to pacer stimuli (Sackett, 1965) or to infant monkey therapists (Harlow & Suomi, 1971; Soumi et al., 1974). When first paired with the isolates, the normal infants forced physical contact and attention on the isolates because of their tendency to cling. As the infant therapist gradually developed more complex behaviors and play, the isolates were able to respond to these behaviors to develop independent play and social interaction (Soumi & Harlow, 1972).

Recent therapeutic intervention with autistic children has begun with attempts to shape language or the ability to categorize simple objects. Autistic children learn to respond appropriately while under stimulus control of their teachers, but they seldom are able to use independently their newly formed responses. A more appropriate starting place for therapeutic intervention with autistic children might be to focus on their development of social play. Social objects with low intensity should first be presented in a game that has a highly predictive and repetitive sequence of activities. Complexity of social stimuli and game activities should gradually increase in intensity. When the child begins to show pleasure in these games and to initiate them, the introduction of language and cognitive tasks matching the complexity of the game would be appropriate.

REFERENCES NOTES

1. Kodera, T. L. *Environmental influences on effectance motivation in young normal, abused, and retarded children.* Paper presented at the Annual Meeting of the Southwestern Society for Research in Human Development, Dallas, 1978.
2. Hill, S. D., Harrison, K. K., Mawson, C. D., Mossman, P., Pleune, J. P., & Wagner, E. A. *An experimental program for autisticlike children.* Paper presented at the Southwestern Psychological Association annual meeting, Houston, Texas, April 1975.

REFERENCES

Garvey, C. *Play.* Cambridge: Harvard University Press, 1977.

Goldberg, S. Premature birth: Consequences for the parent-infant relationship. *American Scientist,* 1979, *67,* 214-220.

Gomber, J., & Mitchell, G. Preliminary report on adult male isolated-reared rhesus monkeys caged with infants. *Developmental Psychology,* 1974, *10,* 598-604.

Harlow, H. F., & Suomi, S. J. Social recovery by isolation reared monkeys. *Proceedings of the National Academy of Sciences of the USA,* 1971, *68,* 1534-1538.

Lewis, M., & Brooks, J. Self, other, and fear: Infants' reaction to people. In M. Lewis & L. A. Rosenblum (Eds.), *The origins of fear.* New York: Wiley, 1974. Pp. 195-228.

Lewis, M., & Goldberg, S. Perceptual-cognitive development in infancy: A generalized expectancy model as a function of mother-infant interaction. *Merrill-Palmer Quarterly,* 1969, *15,* 81-100.

Lovaas, O. I., Koegel, R., Simmons, J. Q., & Long, J. S. Some generalizations and follow-up measures on autistic children in behavior therapy. *Journal of Applied Behavior Analysis,* 1973, *6,* 131-165.

Mahler, M. S., Furer, M., & Settlage, C. F. Severe emotional disturbances in childhood: Psychosis. In S. Arieti (Ed.), *American handbook of psychiatry.* New York: Basic Books, 1959.

Papoušek, H., & Papoušek, M. Cognitive aspects of preverbal social interaction between human infants and adults. In N. O'Conner (Ed.), *Parent-infant interaction,* Amsterdam: Elsevier, 1975. Pp. 241-260.

Papoušek, H., & Papoušek, M. Interdisciplinary parallels in studies of early human behavior: From physical to cognitive needs, from attachment to dyadic education. *International Journal of Behavioral Development,* 1978, *1,* 37-50.

Ritvo, E. R. *Autism: Diagnosis current research and management.* New York: Spectrum Press, 1976.

Romanczyk, R. G., Diament, C., Goren, E. R., Trunnel, G., & Harris, S. L. Increasing isolate and social play in severely disturbed children: Intervention and postintervention effectiveness. *Journal of Autism and Childhood Schizophrenia,* 1975, *5,* 57-70.

Rossetti-Ferreira, M. C. Malnutrition and mother-infant asynchrony: Slow mental development. *International Journal of Behavioral Development,* 1978, *1,* 207-220.

Rutter, M. Diagnosis and definition of childhood autism. *Journal of Autism and Childhood Schizophrenia,* 1978, *8,* 139-161.

Sackett, G. P. Effects of rearing conditions upon the behavior of rhesus monkeys (*Macaca mulatta*). *Child Development,* 1965, *36,* 855-868.

Seligman, M. E. P. *Helplessness: On depression, development, and death.* San Francisco: W. H. Freeman, 1975.

Stern, D. Mother and infant at play: The dyadic interaction involving facial, vocal and gaze behaviors. In M. Lewis & L. Rosenblum (Eds.), *The effect of the infant on its caregiver.* New York: Wiley, 1974.

Strongin, T. S., Gluck, J. P., & Frank, R. G. Development of social behavior in an adult total isolate rhesus monkey (*Macaca mulatta*). *Journal of Autism and Childhood Schizophrenia,* 1977, *7,* 329-336.

Suomi, S. J., & Harlow, H. F. Social rehabilitation of isolate reared monkeys. *Developmental Psychology,* 1972, *6,* 487-496.

Soumi, S. J., Harlow, H. F., & Novak, M. A. Reversal of social deficits produced by isolation rearing in monkeys. *Journal of Human Evolution,* 1974, *3,* 527-534.