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CHILDREN AND ADOLESCENTS

## MODIFICATION OF AUTISTIC BEHAVIOR WITH LSD-25

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Effective modification of autistic behavior presents the clinician with a formidable challenge as evidenced by reports of treatment results and long-term follow-up in early infantile autism(7, 8) and in the more inclusive area of childhood schizophrenia(3, 4). Characteristically, the more regressed and retarded the autistic child, the more energetic and prolonged is the effort required to modify the behavior, and in extreme cases treatment efforts have been unsuccessful.

The symptom picture in this more retarded group generally centers around: 1) preoccupation with and stereotyped manipulation of objects (toys, etc.); 2) isolation of the self from contact with animate objects (including minimal eye contact); 3) failure to acquire general social behaviors (including speech); and 4) bizarre rhythmic repetitive motor patterns(10, 11).

A wide range of approaches has been taken in an effort to alter the symptom picture of this disorder. The efforts have included insulin subcoma, drugs (stimulants and tranquilizers), electric shock(2),

various psychotherapeutic approaches(3, 4, 5, 7) and approaches based on learning theory using both positive and negative reinforcement(13, 15, 17). In many instances successful treatment has been largely absent or limited to isolated behavioral changes.

In reference to drugs, considerable recent interest has focused on the therapeutic use of LSD-25(6), even in severe childhood disturbances. Bender(2) reported favorable results in a group of 14 schizophrenic children, ages six to ten, treated with LSD. In this first report she related that the children showed mood elevations, more spontaneous play with adults and other children, more positive contacts with adults, greater responsiveness to fondling and affection and, finally, a reduction in rhythmic and whirling behavior. These responses followed by 30 to 40 minutes the ingestion of 100  $\mu$ g. of LSD-25 and lasted for two to three hours. The drug was given one to three times per week through a six-week period of time. In Bender's second study(1) the number of patients and the duration of the study were increased. Results generally were the same as reported in the initial study.

These findings are quite thought-provoking since they represent major modifications of the somewhat intractable behavior generally labeled the autistic barrier. However, it is difficult to assess the reliability or replicability of Bender's findings, since her methodology and data are not presented.

It appears logical that a first step in the

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assessment of LSD would involve some attempt to more clearly delineate the nature and uniqueness of the behavior changes of autistic children subjected to the drug. Freedman(9), studying a group of 12 schizophrenic patients, ages 6 to 12, made some effort to more rigorously define the nature of the behavioral change in an acute single trial study. However, like Bender's studies, the data and technique of measurement are not presented and no effort was made to replicate the study. In addition, both Freedman's and Bender's studies involved heterogeneous groups, making intragroup comparisons difficult.

This study was designed to investigate in a single set of subjects, presenting a reasonably homogeneous symptom picture, the characteristics of LSD-induced changes. Methodologically we adhered to an intra-subject replication design, where LSD was repeatedly presented interspersed with control and placebo observations. At the same time an attempt was made to objectively record behavior.

#### METHOD

*Subjects.* This experiment, comprised of two studies, was conducted at the Neuropsychiatric Institute, U.C.L.A. Center for the Health Sciences, and involved a pair of identical male twins. At the time of Study 1 the Ss were aged four years nine months, and at the time of Study 2 they were aged five years two months. Both Ss ( $S_1$  and  $S_2$ ) were physically well-developed boys described as having shown difficulties within the first year of life. The initial problems centered around failure of eye contact with the parents, failure to make use of objects appropriately and subsequent failure to develop speech.

$S_2$ 's difficulties appeared earlier and were more obvious to the parents than those of  $S_1$ . In both boys the second and third years were characterized by failure to develop the usual social behaviors of children that age and by the persistence of rhythmic repetitive motor patterns. Extensive physical and laboratory examination failed to reveal any physiological abnormalities.

Behaviorally, both Ss demonstrated the

following characteristics: no response to people, no appropriate play behavior, no speech and considerable rocking behavior. Both had unique repetitive motor patterns.  $S_1$  showed a rhythmic, well-coordinated finger movement when touching objects or his own body.  $S_2$  demonstrated repetitive inappropriate play consisting of spinning objects and flapping his arms at shoulder level while extending his face and gazing toward the object. Temper outbursts and crying episodes were frequent in  $S_2$  but not often seen in  $S_1$ .

*Procedure and apparatus.* Study 1 was carried out in six daily sessions distributed over two weeks. Days 1 and 6 were control sessions while days 2, 3, 4 and 5 comprised the experimental sessions. On days of the experimental sessions, Ss were either given an inert placebo or 50  $\mu$ g. LSD-25 in pill form. Neither the adult interacting with the patient nor the recorder was informed of the drug schedule. The interval between LSD doses varied from three to four days. The medication was given by the same nurse 55 minutes prior to the first observation period. The total observation period consisted of two successive 20-minute test periods; the first was designated Socialization Test and the second was Social Isolation Test. Three hours after the drug (or placebo) administration, 50 mg. of chlorpromazine (Thorazine) was given orally to terminate the LSD effects.

The Socialization Test consisted of four five-minute subtests: 1) the S sitting alone in the experimental room; 2) the experimenter being present (sitting still) and not attending the S; 3) the experimenter talking to the S (calling his name, etc.), reaching his arms out to him and every 30 seconds picking up the S and placing him on his lap (the S left the lap if he desired); and 4) replication of subtest 1.

The Social Isolation Test consisted of a period of 20 minutes during which the S was alone in the experimental room but was provided with four toys: a ball, bucket, doll and sink stopper.

During each session behavioral measurements were taken by a recorder in an adjoining observation room connected to the experimental room by one-way screens

and sound equipment. The recordings were made using a push-button console connected to a 12-pen Esterline Angus recorder. When activated, the pen recorded appearance and duration of a given behavior. An adequate level of reliability among various recorders' measurements was assessed in sessions conducted before, during and after the study. Further description of the recording technique has been made by Lovaas (12).

Eight behaviors were recorded in the Socialization Test: 1) arranging objects in a stereotyped manner; 2) physical contact with the *E*; 3) social nonverbal behavior (behavior of child which required cues from the adult for initiation or completion, such as playing with the *E*'s hand, coming to the *E* when called, etc.); 4) vocalizations; 5) self-stimulation (rocking, flapping arms, stereotyped finger movement, mouthing objects, hand touching body repetitively, snout movement and staring at lights); 6) social nonverbal behavior initiated by the *S*; 7) destructive or screaming behavior; and 8) laughter.

During the Social Isolation Test the following behaviors were recorded: 1) vocalizations; 2) snout movements; 3) stereotyped finger movement; 4) hand touching body; 5) spinning objects with hands; 6) rocking; 7) jumping up and down; 8) mouthing objects; 9) flapping arms; 10) staring at lights; 11) arranging objects in stereotyped manner; and 12) laughter and smiles.

Study 2 consisted of a series of nine observation sessions carried out over a two-month period. The first five observation sessions consisted of three drug sessions interspersed with two control sessions. They were carried out on different days. The last four observations were made on two different days with a control and a drug session occurring on each of the two days. Only the data from the last four observations in Study 2 were plotted.

During Study 2, 50  $\mu$ g. of LSD was administered by mouth 60 minutes before the observation sessions. The LSD was given in liquid form and administered in juice or milk. When the control and drug sessions were carried out on the same day,

the drug was administered immediately following the control session. One hour later the *Ss* were observed for the effect of the drug. Again the LSD experiences were terminated with chlorpromazine 50 mg. by mouth.<sup>1</sup>

Data were collected in the same manner described above. However, only three behaviors were recorded: movement toward the *E*, movement away from the *E* and eye-to-face contact. Each session lasted for 20 minutes and was divided into five four-minute tests. During these five tests the *Ss* were presented with the following situations, designed to simulate the types of interactions which are part of the usual relationships between adults and small children.

Test 1—Peek-a-boo. A four-minute period in which the *E* sat facing the *S*, who was also seated in a chair. The *E* kept the *S* between his knees. The *E* placed his face directly in front of the *S* after moving from behind a hand-held screen, at the same time saying, "peek-a-boo." The face was presented for ten seconds and then covered by the screen for five seconds. The procedure was repeated four times a minute for four minutes.

Test 2—Pat-a-cake. The *E* and the *S* were sitting in the same position as outlined above for Test 1. The *E* presented the rhyme "pat-a-cake . . ." with appropriate gestures, for eight seconds while looking directly at the *S*. When the rhyme was terminated, the *E* then averted his face for a period of seven seconds. This cycle was repeated four times a minute for four minutes.

Test 3—Face-to-face. Again sitting as in Test 1, the *E* leaned forward and attempted to press his cheek to the *S*'s, as in a hug, for a period of ten seconds, then *E* sat back in the chair with his gaze averted for five seconds.

Test 4—Hand-holding. The *E* brought the *S* into a three-foot diameter circle every 15 seconds. *S*'s hands were held

<sup>1</sup>On the second and third days of Study 2 both the *Ss* began having episodes of pallor, profuse diaphoresis and hypotension after chlorpromazine. As a consequence chlorpromazine was discontinued and the LSD episode was allowed to terminate without medication.

lightly with no effort to impede the S's withdrawal from the circle. This was repeated four times a minute for ten minutes.

Test 5—Following. The *E* knelt in one of three three-foot diameter circles, called the *S* by name and held his arms outstretched toward the *S*. The *E* remained in the circle for 15 seconds, then rotated to one of the two remaining circles. The procedure was repeated four times a minute for four minutes.

Other than as noted in the description of the tests, no attempt was made to restrict the S's behavior.

The following recordings were made during the Pat-a-cake and Peek-a-boo Tests: 1) movement toward the *E*, defined as the *S* moving his hands or body across the knees of and toward the *E*; 2) movement away from *E*, defined as the *S* moving his body out of the chair or turning his back to the *E*; 3) eye-to-face contact, recorded when the *S* looked at the face of the *E*; and 4) stimulus presentation; in Pat-a-cake the stimulus was recorded when the *E* began the rhyme and in Peek-a-boo when the *E* peeked from behind the screen.

During the Face-to-face Test, these events were recorded: 1) movement toward the *E*, defined by the *S* maintaining face contact or reestablishing it when it was broken, but prior to the next stimulus presentation; 2) movement away from the *E*, as in the first two tests; 3) fondling, the *S* touching face of the *E* with his hands; and 4) stimulus presentation, when the *E* initiated face contact with the *S*.

During Hand-holding the following were recorded: 1) movement toward the *E* when the *S* maintained hand-holding or reestablished it before the next stimulus presentation; 2) inside circle, the *S* being inside the three-foot circle in which the *E* stood; and 3) stimulus presentation, when the *E* initiated hand-holding.

During the Following Test, recordings were: 1) eye-to-face, as in other tests; 2) inside circle, the *S* in same circle as the *E*; and 3) stimulus presentation, when the *E* moved into a new circle and called the S's name.

In Study 2 the period of time between LSD doses varied from four to seven days. The five tests were presented in an un-systematic order over the various sessions in the two studies.

#### RESULTS

*Study 1.* Briefly, the *Ss* showed consistent changes of certain behavioral areas in both tests. In the Socialization Test the social behavior of "looking at the face" was almost uniformly increased by LSD over the control levels. On the Social Isolation Test the predominant modes of repetitive motor behavior were consistently depressed during the LSD sessions. Laughing behavior was essentially absent during control sessions but markedly increased in all LSD sessions. The other behaviors measured in this study showed no consistent alteration in one direction or another.

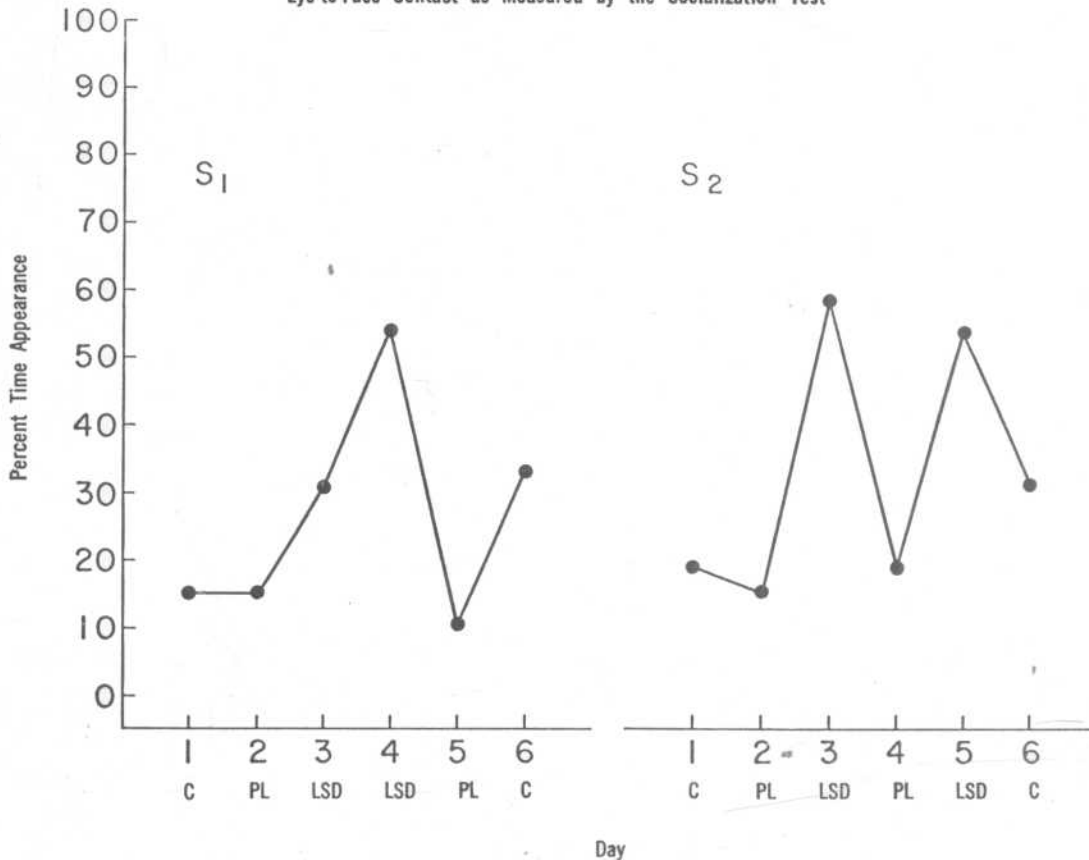
The data recorded during the various tests were analyzed separately for each test in both studies. The various behaviors are presented as the percent of total time they occurred during each test. Only those behaviors which showed consistent modification under LSD have been plotted.

"Eye-to-face contact" (from the Socialization Test) showed the most consistent change in both *Ss*. In all but one instance in 12 trials the percent time that the *Ss* looked at the *E*'s face was increased during LSD as compared to non-LSD sessions. Since the eye-to-face contact was the same whether the adult interacted or was only present, the average of the two situations has been plotted in Figure 1.

Evaluation of the Social Isolation Test in Study 1 revealed a uniform reduction in self-stimulatory behavior in the LSD sessions over all six trials (Figure 2). The percentages plotted for self-stimulation represent the average of the two major modes observed. In *S<sub>1</sub>* it is the average of rocking and a characteristic hand-to-body pattern (behaviors 6 and 4). In *S<sub>2</sub>* it is the average of rocking and preoccupation with spinning objects (behaviors 6 and 5).

A second phenomenon was found consistently throughout all trials during the test of Social Isolation: a marked elevation of laughing and smiling behaviors (Figure

FIGURE 1  
Eye-to-Face Contact as Measured by the Socialization Test



2). This type of behavior generally did not appear on control days but rose to a high of 80 percent during LSD sessions. This same change (increase in smiling and laughter) was observed in the Socialization Test but was not plotted since data for one LSD session in  $S_1$  were lost.

*Study 2.* This study was designed in an attempt to obtain data on the  $S_s$ ' behavior when presented with some specific type of human interaction. During the first five observations of Study 2, it was found that certain extraneous intercurrent variables affected responsiveness to the drug, e.g., respiratory disorders; therefore, the observations were repeated and both the control and the LSD sessions were recorded on the same day in an attempt to reduce day-to-day variations in the  $S_s$ ' behaviors.

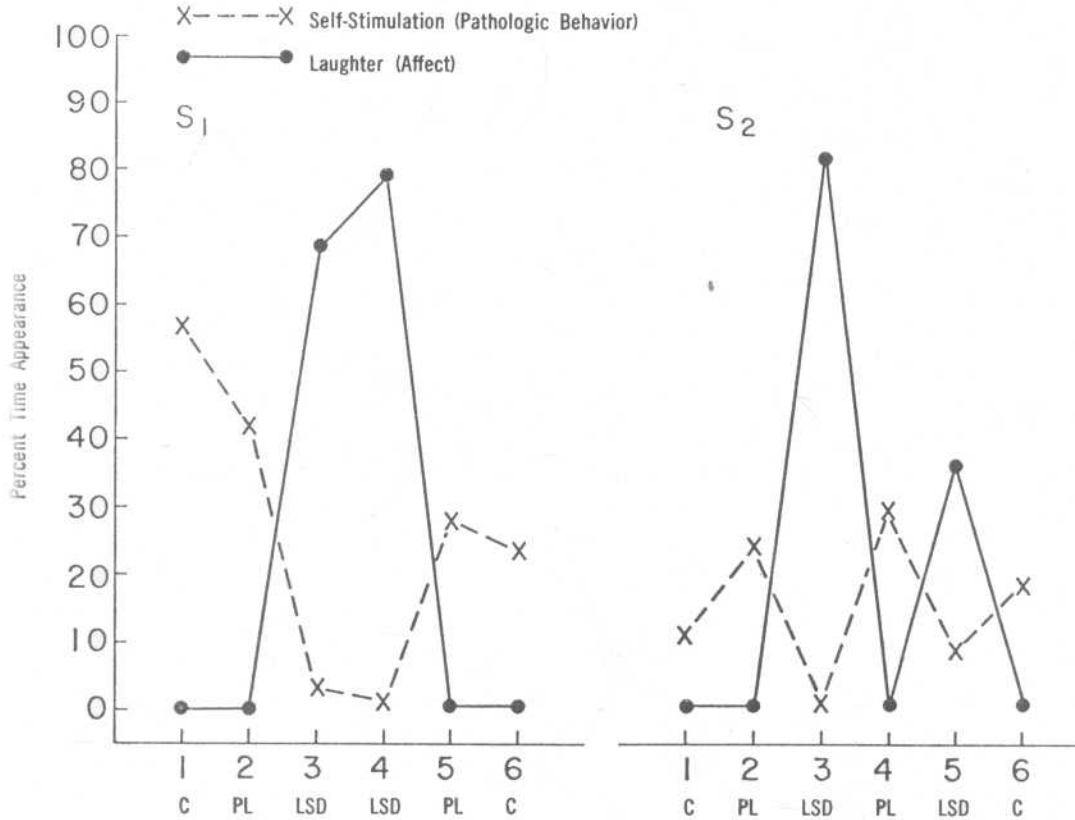
In those experimental sessions in which control observations preceded drug obser-

vations by one hour, the results were quite consistent. First, the eye-to-face measurements in the Peek-a-boo, Pat-a-cake and Face-to-face Tests revealed that in all instances under LSD the percent time appearance of the eye-to-face behavior exceeded that of the control observations (Figure 3).

In examining very limited aspects of interactional behavior vis-à-vis the  $E$ , the data showed that in  $S_1$  there was considerable movement away from the  $E$  in control sessions which was uniformly reduced in the LSD sessions. Movement toward the  $E$  showed no systematic relationship for  $S_1$  (Figure 4).

$S_2$  showed a slightly different pattern in that movement away from the  $E$  was not reliably related to LSD but movement toward the  $E$  was increased in all six LSD observations when compared to the six control observations (Figure 5).

FIGURE 2  
Results of the Social Isolation Test



In all the tests in Study 2 there was no evidence of a reduction under LSD in the number of times the *Ss* responded to stimuli presented by the *E*. In addition, there was no noticeable change in the time characteristics of the *Ss*' responses to stimuli presented by the *E*.

In reviewing all the data from the systematic observations where control, placebo and experimental sessions were varied, it did not appear that any simple adaptation existed to explain the changes obtained.

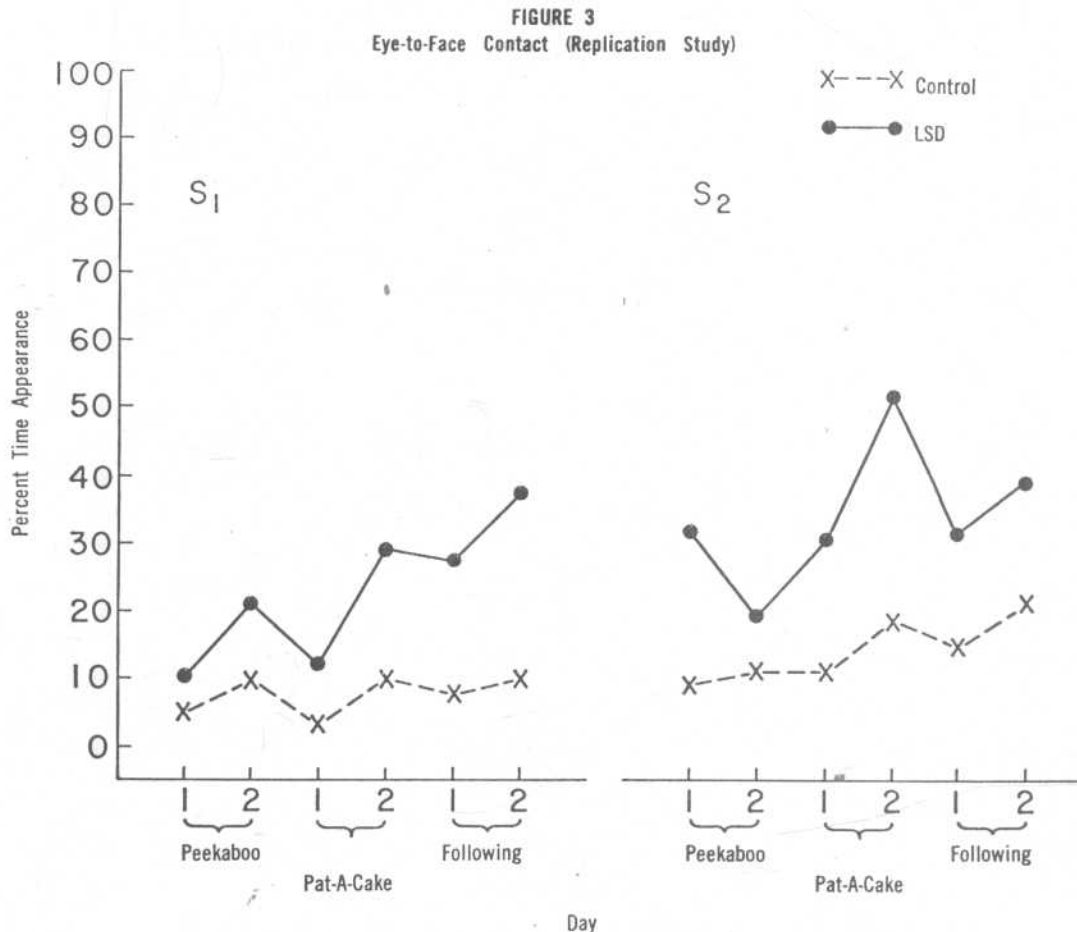
General observations made in addition to the systematic recordings on each of the LSD days revealed the characteristic onset of a response approximately 30 to 45 minutes after drug administration. The physical symptoms included dilation of pupils and flushing of the face. Blood pressure and pulse measurements showed no remarkable variation. Behaviorally there was an increase in laughter and general

activity level. The effect usually persisted for three hours and was at its peak between one and two hours.

#### DISCUSSION

This study has been undertaken to determine what value, if any, LSD may have as an adjunct to the therapy of autistic children. It was felt that in order to accomplish this an effort should be made to control as nearly as possible the circumstances under which the drug was given and to clearly define the dependent variables measured. On the basis of the results obtained in this study it seems likely, at least in the type of subject used, that LSD could be profitably used as a therapeutic adjunct to the various interactional therapies currently in vogue.

The changes in behavior which suggest this are: 1) an increase in social behaviors manifested by increased eye-to-face



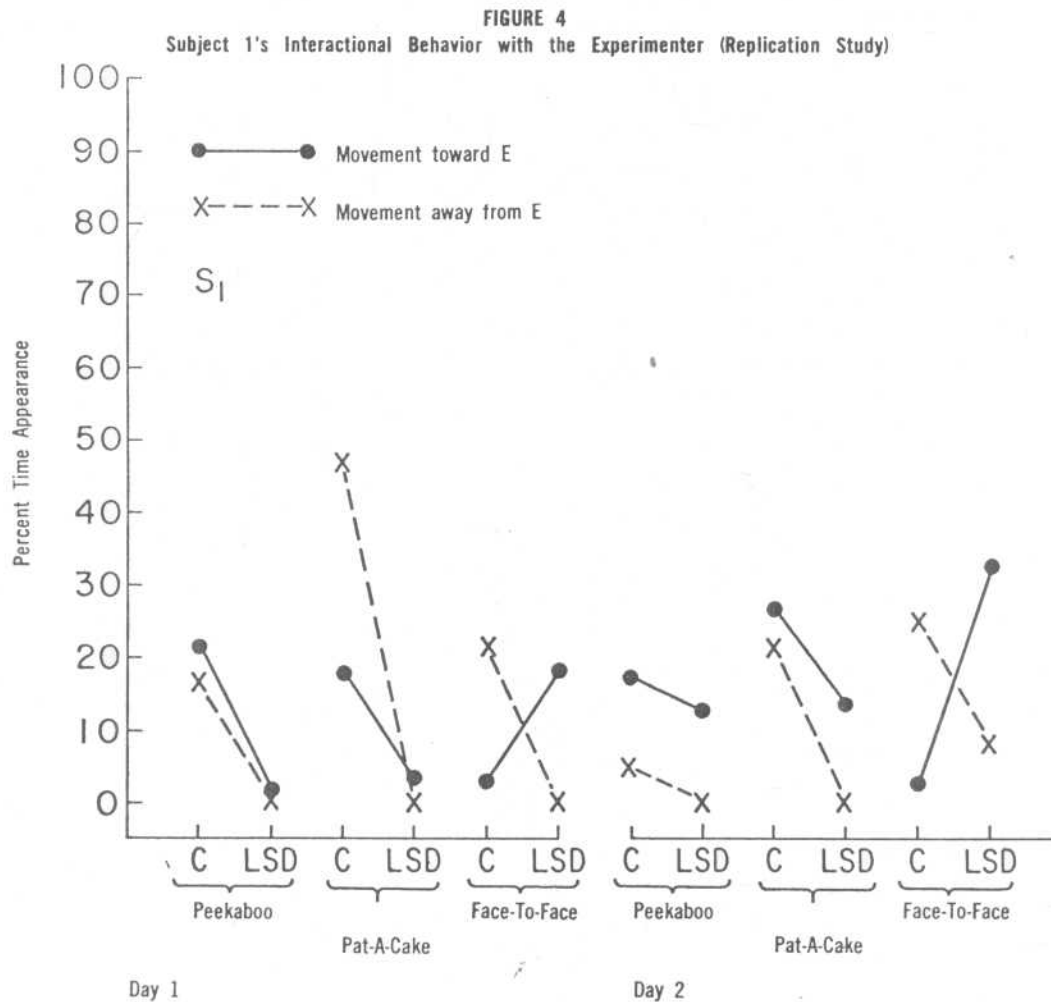
contact and increased responsiveness to adults; 2) an increase in smiling and laughing behavior, generally considered an indication of a pleasurable affective state; and 3) a decrease in one form of non-adaptive behavior demonstrated by a reduction in self-stimulation.

Therapeutic intervention in severely retarded or regressed children utilizes to a great extent close physical interaction to which the child must respond. In the usual state it is often difficult to intrude upon the child because of a general lack of responsiveness coupled with the random character of responses when they are obtained. The barrier to external stimuli is further increased by self-stimulatory behavior with a high percent time appearance both in the resting state and when stimuli are presented from the external environment. The results of our experiments clearly demonstrate changes in exactly these areas with increased at-

tendance to physical and face contact with an attending adult and concomitant reduction of competing self-stimulatory behavior.

Additionally, the general response characteristics of the Ss during the LSD experience were the same as during the control period, i.e., the number and latency of the responses to externally presented stimuli. With these factors operating concurrently, it is possible to conclude from a behavioral point of view that the Ss were aware of and increasingly attendant upon external events, particularly as they related to the E. Thus, two possible criteria for a successful intervention in autistic children are met: a diminution of competing events (self-stimulation) and increased contact with the attending adult (object).

A third item which must be considered is the increase in smiling and laughing behavior, which can be viewed from two perspectives—first, the significance of the



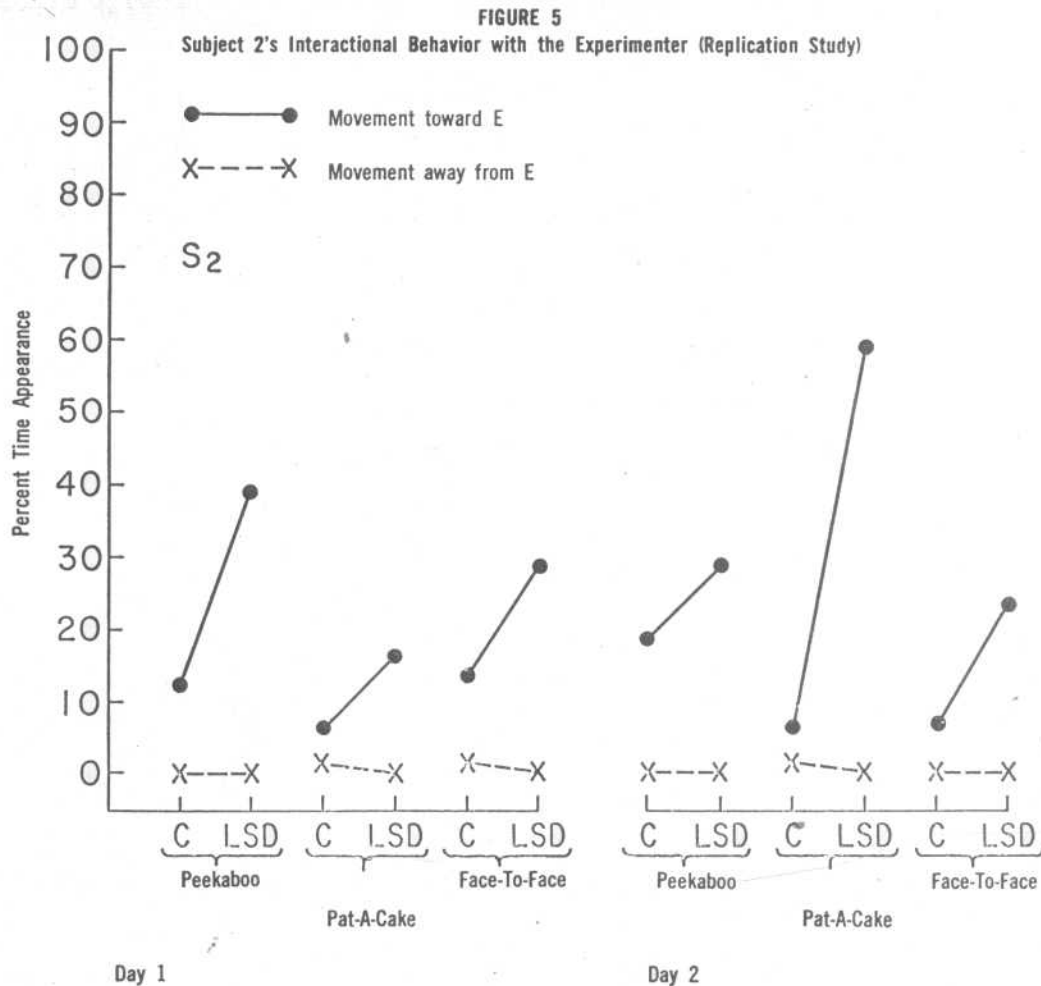
behavior in terms of internal events in the S and second, in terms of the response of the E to the subject's behavior. It is possible that the laughing and smiling behavior is representative of a mood change in the individual where external and internal stimuli are perceived as pleasurable. If this is so, another criterion for treatment may be achieved in that the external events manipulated by the E (the treatment) would be associated with or superimposed upon a pleasurable state and attending adults may acquire properties symbolic of gratification.

Also, one must consider the reinforcement provided the E on the basis of changes in the S. Characteristically it is very difficult to respond to the autistic schizophrenic child because of the very

limited response hierarchy available to him. The behavioral changes obtained in the subjects of our studies are consistent with those considered desirable and necessary in child-adult interactions in order that adults receive some gratification for their efforts. These changes have been related to an alteration in the behavioral characteristics of the attending adult which has been noted anecdotally in the nonmeasured part of our experiments and in previous pilot studies on the use of LSD with this type of child. The interaction is more intense except when controlled by the experimental design.

The results of this study are consistent with those of Bender and Freedman. However, our findings have been limited to a small sample with similar relatively





unchanging behavior patterns representing more or less a pure culture of the disease picture.

There are some reservations to the application of these findings to the more general population of psychotic children because of the restricted sample. Experiments are currently being carried out at U.C.L.A. with a heterogeneous population of 18 psychotic children (16). Analysis of the data available shows a much wider variety of responses, with a tendency for children similar to the subjects of this experiment (severely retarded patients) to respond in a like manner, while less retarded schizophrenic children showed evidence of social withdrawal and disorganization.

The effects of LSD on the behaviors measured in this study are transient. Con-

sequently the drug may have to be used on a schedule similar to that utilized by Bender (1, 2) in her long-term experiments. Here again, however, studies will have to be undertaken to compare behavioral changes occasioned by the drug to clearly established baseline behaviors in the same subject.

Since psychotherapy can be considered a learning experience, experiments should be attempted to determine if there is a transfer in learned behavior from LSD days to non-LSD days and vice versa. In terms of this consideration, pilot studies already carried out by the authors (15) demonstrated that LSD abolished behavior maintained by weak symbolic rewards and had no effect on behavior reinforced by strong symbolic punishment.

Finally, one must question whether or

not LSD is merely replacing self-induced stimuli with pharmacologically-produced stimuli which will tend to block interaction with the environment. The data presented here do not support that contention.

#### SUMMARY AND CONCLUSIONS

1. LSD-25 appears to offer a useful adjunct to the psychotherapy of autistic children because of its positive effect in areas which are closely related to the process of psychotherapy.

2. A pair of identical male autistic twins was periodically administered 50  $\mu$ g. of LSD-25 and observed for behavior changes.

3. Control and drug observations were made while the Ss were placed in a series of standard test situations referred to as the Socialization Test, Social Isolation Test, Peek-a-boo, Pat-a-cake, Face-to-face, Hand-holding and Following Tests.

4. Diverse behaviors were recorded in the areas of self-stimulatory behavior, social interaction and affect.

5. Recordings were made using an Esterline Angus Multiple pen recorder. All behaviors were measured in total time appearance and plotted as percent time in appearance.

6. Consistent behavioral changes resulted after LSD in that the Ss demonstrated an increase in eye-to-face contact with the E, an increase in laughter and smiling behavior and decrease in self-stimulatory behavior. There was an increase in S<sub>2</sub> in movement toward the E and a decrease in S<sub>1</sub> in movement away from the E.

7. Further experiments are needed on the effects of LSD, utilizing a more diverse population, varying the drug dosage and observation times and analyzing the transfer of learning from drug to nondrug situations.

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## CHRONIC SCHOOL FAILURE IN BOYS : A SHORT-TERM GROUP THERAPY AND EDUCATIONAL APPROACH

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Failure in primary school is a family crisis; repeated or *chronic school failure*, as we choose to call it, is a major dilemma for the whole family(3). Considering that underachieving children represent between about 15 and 30 percent of all school children of normal intelligence, and five to seven percent fail repeatedly, there is a truly awesome number of children with serious problems at school.

In the literature the terms secondary learning impotence(13), primary neurotic learning inhibition(4) and neurotic reading disability or secondary reading retardation(12) have been applied to the difficulties these children face. Since 1960 the authors, representing respectively the disciplines of psychiatry and educational psychology, have collaborated to organize an outpatient clinic-school as an approach to these problems. This is a five-year progress report on our treatment program involving 55 boys and their families. A preliminary report has been published previously(1).

Read at the 121st annual meeting of the American Psychiatric Association, New York, N. Y., May 3-7, 1965.

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### SELECTION OF FAMILIES FOR INCLUSION IN PROGRAM

Specifically excluded from the study were children with discernible neurological deficit as determined by psychological tests as well as physical examination and children with obvious specific reading disability or dyslexia. Evaluation procedures, including pediatric, neurological, psychiatric and psychological testing, preceded the admission of the family to the treatment program.

Criteria for admission were established as follows: 1) the presence of repeated school failure in a physically healthy boy, aged seven to 12 years; 2) the absence of gross or minimal brain damage in the child; 3) the presence of a reliable intelligence quotient of at least average range; 4) the absence of frank or subclinical psychosis in the child or his parents; and 5) the presence of real concern and interest on the part of the parents, and a willingness and ability to participate in mandatory group therapy.

The therapeutic program was of limited duration (3.5 to 5 months) with intensive involvement of each member: child, mother and father. Group psychotherapy sessions were held once a week for 90 minutes, separately for the mothers and for the fathers. Participation of both parents was a requirement for admission and continuation of the family in the program. Each child attended his regular public or parochial school during the morning and the clinic-school in the afternoon.

Each child was assessed with regard to his specific educational defects and was