I. BACKGROUND

Headbanging represents one of the major behavior disorders among the severely mentally retarded which calls for an energetic and comprehensive approach. This severe form of self-injurious behavior is a tragic and pathetic occurrence. It terrorizes both the afflicted individuals and the observers who feel alarmed and helpless to cope with the situation.

Headbanging may persist for years and not only cause bruises, lacerations and scars of face and scalp, but also permanent injury to eyes and ears, with loss of sight (Tate & Baroff 1966; Dizmang 1957; Miron 1971 and 1973), hearing and speech. Unless intervention occurs, these people may reduce themselves 'to totally helpless, bedridden creatures, in need of full nursing care (Fielding 1968 Note 1; Bachman 1972).

Early in 1968, the late Dr. David Vail, who as Medical Director of the Minnesota Department of Public Welfare had become aware of the extent and the seriousness of this affliction, established a state-wide committee to study the prevalence of self-injurious behavior (SIB) in the Minnesota institutions for the retarded, to survey the existing literature for its causes and management, and to develop proposals for a comprehensive state-wide treatment plan.

A survey conducted *by* the State Committee in 1968 identified 190 individuals who either were actively emitting SIB in various forms and degrees of severity or had a history of it. These 190 residents represented 3.5% of the 5500 mentally retarded in Minnesota's institutions at the time and 8.6% of the 2200 severely and profoundly retarded.

In September 1970, the ad hoc committee submitted to the Department of Public Welfare a proposal to establish a Unit specifically dedicated to the intensive treatment of SIB, primarily headbanging. This Unit was also to function as a research and demonstration project for the treatment of SIB.

Subsequent to acceptance of this proposal by *the* Department of Public Welfare, the 1971 Minnesota State Legislature authorized the creation of a pilot

project at Faribault State Hospital to treat twenty (20) residents for SIB who were selected from the entire stave. After allocation of $27,060.00 for special equipment and creation of nine additional staff positions for this program, the Unit started functioning in March, 1973. It remained in operation under close supervision and direction of the authors until the end of 1975. Though the Unit continued functioning for an additional two years, only the first period of two and one half years is the subject of this report because during this period, strict conditions of observation and research prevailed as planned.

II. REVIEW OF LITERATURE

Headbanging is found as a transitory, possibly neurotic habit, in four to seventeen percent of normal children, up to the age of four (Kravitz 1960; DeLissovoy 1962), mostly during the second half of the first year (Shentoub 1961, Spock 1952, DeLissovoy 1962; Green 1967), with boys outnumbering girls by a ratio of 3.5 to 1 (Kravitz 1960). Like head rolling and bedrocking it is mainly observed at bed time and represents in its milder form an indulgence in an obviously pleasurable rhythmic activity. Self-perpetuation and gratification of primitive kinesthetic needs are its main characteristics (Green 1967; Dizmang 1967).

Pathological SIB is frequently seen in autistic, schizophrenic, retarded and brain damaged children (Bachman 1972) and is differentiated from the afore-mentioned habit of young normal children by its persistence over many years and its severity and frequency. Allegedly, it is more prevalent and severe among girls than boys (Green, 1967; van Velzen, 1975). Pathological SIB can assume many different forms either singly or in combination (TABLE 1). Headbanging and face slapping are reported most frequently (Bachman 1972; Azrin 1975; van Velzen, 1975). An association of SIB with physical "outward" aggression or verbal abuse of other people is rarely reported in the literature.

Out of forty eight cases, thirty collected from the literature and eighteen of this report, ten emitted SIB for one to four years, twenty three for five to ten years, ten for eleven to nineteen years and five between twenty and thirty one years (TABLE 2).

While severity of self-inflicted blows can be judged only from actual observation or resultant injuries, frequency rates of SIB, per minute (or per hour) give a good objective indication in numbers. Frequency rates of untreated SIB quoted from the available literature (TABLE 3) vary widely, from 0.5 per minute (30 per hour) in moderate cases, to 10 per minute (600 per hour) in severe cases, and to 25 per minute (1500 per hour) in very severe cases. Rates of 200 per minute (12,000 per hour) reported *by* Miran 1971; Miron & Rooney, 1972 must be considered as extremely severe and rare.

The etiological interpretation of SIB as given in the literature is manifold and varies with the prevailing school of thought and the scientific background of each author (TABLE 4). Considerations based on older neuropsychiatric concepts (neurosis, compulsion, self-aggression, masochism, schizophrenic reaction) alternate with psychoanalytical (ego-impairement, auto-erotism, organ inferiority) and psycho-dynamic explanations (guilt, anger, frustration, rejection, separation, death-wish, suicidal tendency, etc.)

Behavior analysis, developed primarily by B. F. Skinner, has emerged in recent years to explain self-abuse as a "learned operant behavior" (Lovaas et al. 1965; Lovaas, 1970). Skinner suggested that SIB is shaped and maintained by environmental contingencies (Skinner 1953) and he offered two possible ways that it is developed. First, he suggested that SIB may have developed as a "conditioned avoidance response" in that the emission of behavior which is self-injurious produces the avoidance of stimuli which are more aversive. Secondly, Skinner proposed that SIB may have "acquired reinforcing properties" through its association with positive reinforcers which have occurred at the same time.

The experimental literature on animals serves as corroborative evidence that behavioral principles are involved in the acquisition, maintenance, and durability of SIB (Bachman, 1972; Bucher & Lovaas, 1968). In turn, the attempts of clinical practitioners to employ behavioral techniques for the reduction or elimination of SIB have achieved sufficient success to further support these theoretical foundations.

In about one-third of Miron's cases, the original discriminative stimulus had vanished, but the headbanging was maintained as a stereotyped response to stimuli from the environment. According to Miron (1972), profoundly retarded individuals have a very limited behavioral repertoire. Headbanging is one of the few behavior patterns left to them to serve as an expression of their emotion and as a means of communication with the outside world.

Finally, some authors (Green 1967, Bachman 1972; Miron 1974) considered the possibility that SIB might be associated with a diminished perception and integration of sensory stimuli (including pain) on a aberrant neuro-physiological basis, since it is associated regularly with such organic disorders as Lesch-Nyhan syndrome (hyper-uricemia) and occasionally with Cornelia de Lange and Down's syndromes.

. Another interesting hypothesis of SIB causation is that "the stereotyped rhythmic patterns of body rocking and headbanging observed so often in schizophrenic and retarded children are self stimulatory in nature" (Berkson 1962; Davenport & Berkson 1963), and occur as a "response to a reduction of environmental stimulation associated with institutionalization and isolation" (Green 1967). Similarly, R. Wilson developed the concept that the mental retardation of most SIB residents is so severe that "they are unable to be aware of any stimuli coming from the outside and that this absence of stimuli generates an intolerable emotional condition. Though these individuals are not able cognitively to understand the absence of such stimuli, still they are able to sense this void affectively, and the SIB is an effort on their part to overcome the nothingness of their situation." (Note 2: R. Wilson, 1976)

The therapeutic management of SIB prior to the introduction of behavioral procedures 1n 1964 was medically oriented and followed traditional treatment of psychotic disorders (TABLE 5).

The primary treatment modality in earlier years was the administration of sedatives like barbiturates, chloral hydrate and occasionally lithium (Tate and Baroff, 1966; Elliot & Tate, 1968; Miron, 1971; Bachman, 1972). The use of helmets and body restraints was dictated by the desire to prevent temporary and permanent injuries (Tate and Baroff, 1966; Miron, 1971). "Change of environment," such as transfer from one ward to another ward in an institution, resulted frequently in a miraculous cessation of the affliction which was considered "spontaneous" since no reasonable explanation could be elicited.

Such a case observed by us was ., an eighteen year old non-ambulatory retarded female, with microcephaly and congenital blindness. At the age of six years she had been admitted to the Faribault State Hospital for being extremely hyperactive and noisy, and in the habit of pulling *her* hair and eating it. At the age of eighteen, still she was *very* disturbed day and night and did not tolerate any garment on her upper torso. She ripped them to pieces and responded with fierce SIB when unable to tear them off. Medication with various tranquilizers over extended periods and three different programs of behavior modification had been tried without success. Because of persistent severe lacerations and ecchymoses of both eye regions, electric skin shock (ESS) treatment with a specially designed jacket was proposed. While this proposal was under consideration, the resident was transferred to another dormitory (January 1970) with the surprising result that her tearing of garments and SIB disappeared within a few weeks without any special steps being taken. No satisfactory explanation could be found.

Dizmang (1967) recommended T.L.C. (tender loving care) of SIB patients, to alleviate "their hopeless despair over unsatisfied primitive kinesthetic-rhythmic needs." Psycho-therapy was attempted in adult SIB cases (Bachman, 1972),

but considered as unsuitable and of little value in autistic children (Kanner & Eisenberg, 1956). According to Miron (1974), electro-convulsive shock (Byrnes & Shier, 1949) and even leucotomy (Davidson, 1962) were performed in intractable cases.

The pharmacological armamentarium was vastly expanded by the introduction of "tranquilizing" drugs in the fifties, first of Reserpine (1954), followed by the Phenothiazines (Thorazine 1954, Stelazine 1954, Compazine and others) and Haloperidol (1967), etc. The treatment of behavior disorders in the mentally retarded including SIB, with the new "psycho-tropic" drugs was undertaken with great expectations (Himwich H.E. and associates 1956-62, Wolfson 1957, Rettig 1958, and many others), but was - in the long run - disappointing for several reasons.

Only mild cases of SIB showed favorable and permanent results, while severe cases showed no or at best only transitory, improvement. In addition, there was great individual, sometimes unpredictable variability in drug responses. Besides, in many instances a tranquilizing effect could be obtained only with doses so high that undesirable side effects (lethargy, pseudo-parkinsonism) were unavoidable.

In 1964, Wolf, Risley and Mees reported the successful management of SIB. of a 3 1/2 year old boy by applying the so-called "time-out" procedure and in doing so, introduced behavioral techniques into the treatment of SIB. Smolev (1971), Corte et al. (1971), Bachman (1972), Miron (1972, 1973, 1974) and Frankel & Simmons (1976) have given excellent reviews and detailed evaluation of the different behavioral methods which have been used clinically in the treatment of SIB during the last ten years (TABLE 6).

They are based on animal experiments of B. F. Skinner (1953) and his school (Keller and Schoenfeld, 1950) and on the studies of Azrin, Holz and associates on the effectiveness of "punishment" (1960, 1966). TABLE 7 shows that pver forty SIB residents have been treated in this way, in addition to two aggressive residents (Birnbrauer 1968, and Ludwig 1969) and one girl with hazardous climbing (Risley,

1968). All of these residents mostly children, adolescents or young adults, were either autistic or mentally retarded. The majority of the reports are individual case studies; only Miron (1971, 1974) presented a series of fourteen cases, and Azrin and co-workers (1975) reported favorable effects of special educative procedures on the SIB of eleven adults.

Four behavioral treatment methods of SIB have found favor with investigators and behavior therapists (TABLE 6):

1. "Extinction" procedures, consisting in ignoring SIB, whenever it occurs.
2. "Time-out" procedures, placing the resident contingent upon emission of SIB into a seclusion room for various lengths of time (from two to thirty minutes) in order to remove him (her) from reinforcing environmental stimuli and staff attention. A few therapists have used "non-contingent time-out" seclusion sessions of 1 1/2 to two hours on schedule successfully (Lovaas and Simmons 1969, Jones et al. 1974).
3. Establishment of incompatible behavior through positive reinforcement of desirable and appropriate behavior. These include D.R.O. procedures (differential reinforcement of other behavior) *which* have been found very effective, especially in combination with procedures #1 and #2 (Lovaas et al. 1965; Peterson and Peterson 1968; Brawley et al. 1969).

   Most of these programs were conducted in special treatment rooms during restricted time periods of one. hour or less per day. (TABLE 8). Only Wolf et al. (1964) and Hamilton et al. (1967) extended their contingent "time-out" treatment over entire days. Similarly, Browning (1971), Miron (1974), Azrin et al. (1975) emphasize the importance of having comprehensive structured programs cover the entire day to assure durability of the results.
4. Aversive Stimulation procedures use painful but harmless electric skin shock (EES) of high voltage and low amperage to suppress SIB. This technique, used for the first time by lovaas et al. in 1964, was resorted

to by a dozen therapists after all other treatment methods of extinguishing SIB had failed (TABLES 7 & 8). The ESS was applied by most therapists with the "Hot 5hot Prod" in special sessions, lasting from a few minutes to one and one half hours as required. Risley (1968), Browning (1971), Hiron (1972) and Prochaska (1974) applied contingent ESS all day.

In two reports, mothers learned to use the prod at home and at school (Risley 1968; Merbaum 1973). When certain safety precautions were observed, the ESS proved to be entirely harmless and without hazard.

Lichstein and Schreibman (1976) *very* lucidly reviewed the positive and negative side effects of ESS reported in the literature and concluded that the negative side effects are negligible in comparison to the beneficial effects.

It is the general concensus that ESS is superior to the three methods of extinction, time-out$_5$ and reinforcement of alternative behaviors in that it eliminates SIB in a much shorter time, in some instances within a few sessions (TABLE 8). In many of the reported cases, the result" was apparently complete and permanent (Bucher & Lovaas, 1968; Corte et al. 1971). However, Miron (1973 & 1974) stated that he obtained rapid and favorable results with ESS, but never complete suppression of SIB in his eleven cases.

Risley's (1968) case of the climbing girl required frequent ESS shocks at home to maintain suppression. Similarly Lovaas and Simmons (1969), Merbaum (1973), Rechter and Vrablic (1974) had to use occasional "booster" shocks in the after treatment of their SIB residents.

The greatest difficulty encountered was the poor "generalization" of the punishing effect of ESS; even profoundly retarded SIB residents learned

quickly to discriminate between "punishing" and "non-punishing" therapists, between different locations (laboratory, ward) and situations such as ward, walk, home. Bucher & Lovaas (1968); Lovaas and Simmons (1969); Risley (1968); Birnbrauer (1968); Corte et al. (1971); Miron & Rooney (1972); Miron (1974).

While it was possible to eliminate the former difficulty by introducing several therapists into the program, the limitations regarding locale and different situations proved hard to overcome. Bachman (1972) suggested the use of a remote-control1ed shock delivery system to preclude the "spatial and temporal pairing of the therapist with the aversive stimulus," a device successfully employed in the present study and by numerous other ' investigators (Duker, 1976; Hamilton and Standahl, 1969; Luckey, Watson and Musick, 1968; Miron,1974; Miron and Rooney, 1972; Prochaska, Smith et al., 1974; Simmons and Lovaas, 1969; Wilbur, Chandler and Carpenter, 1974; Young and Wincze, 1974).

The literature is *very* scanty in regard to the problem of durability of the treatment results. Four months are mentioned by Birnbrauer (1968) and Rechter and Vrablic (1974), six to seven months by Tate and Baroff (1966), Ludwig (1969) and Prochaska (1974). Bucher and Lovaas (1968) have emphasized that the durability of the response suppression is a function of the environment into which the SIB resident is placed after the treatment has been terminated.

It should be added that ESS has been used successfully in the treatment of rumination (White and Taylor, 1967; Luckey, Watson & Musick, 1968), enuresis and sex deviation (Lovibond, 1970), chronic alcoholism (Blake, 2965 & 1967; Jackson & Smith, 1978), nicotine abuse (Koenig & Masters, 1965; Chapman, Smith & Layden, 1971) and compulsive horse-race gambling (1968). According to Bucher and Lovaas (1967) the success rates for

treatment of alcoholism, nicotine abuse and enuresis vary from 55 to 90 percent, with relapse rates of 55 percent for smokers (Chapman, Smith & Layden, 1971) and between 22 and 30 percent for alcoholism and enuresis (Lovibond, 1963).

III. PARAMETERS OF SELF INJURIOUS BEHAVIOR IN MINNESOTA

1. Behavioral Characteristics of the "Headbangers":

A profile study of 50 headbangers at Faribault State Hospital by Bruhl and Geyhart (1970, Note: 3) revealed that these residents showed not only headbanging but also other forms of self-injury like slapping, biting, scratching, and pulling own hair; that they are more distrubed, more restless day and night, •and more inward-aggressive than a matched control group of non-headbanging mentally retarded persons. Interestingly, epilepsy played apparently no role in its causation: 15 seizure residents were in the headbanging group versus 23 of the non-headbangers. Against all expectations, 30 residents began headbanging at home, 15 in foster or private boarding homes and only 5 in State Institutions. This disproves the common belief that headbanging is a product of institutionalization.

In contrast to the Lesch-Nyhan syndrome where self-mutilization *by* biting of lips and fingertips is associated with marked increase of blood uric acid concentration, the uric acid level in the serum of 36 headbangers was found in the normal range of 3 to 7 mg % (Bruhl 1968, Note: -4).

2. Contingency Analysis of 190 Headbangers

In a detailed analysis of 190 SIB cases present in Minnesota M.R. Institutions, Fielding found the following: Of the 190 headbangers identified, 48 *(25%)* had shown this behavior in the past and 142 (75%) were still emitting it (Fielding 1970, Note: 5).

In Fielding's data collection on these 190 headbangers, staff members were asked to identify antecedents to headbanging. The question was open-ended, thus allowing for more than one response. From the 190 questionnaires, 339 antecedent events were listed. 33.7% of the questionnaires indicated that for

these SIB residents, the antecedent could not always be identified. On the other hand, a number of antecedents were identified by the staff ranging from "dissatisfaction with current state" to "thirst" (See TABLE 9).

A contingency analysis of the programming in which this population had been involved, suggested that a very large proportion of the current headbangers, though unable to control the antecedent stimuli, did control the resultant contingencies in the environment by the emission of headbanging.

For instance, 32% of the residents were likely to obtain positive social interaction with the staff, after emitting headbanging behavior, and 21% to obtain local mobility by staff taking them for a walk. At least 20% received staff attention in the form of being told to "stop" while 17% were diverted through novel stimuli. In addition, privacy, special clothing, toys or other privileges were obtained by more than 10% of the residents. Following headbanging, 9.5% . were likely to obtain a position change. More than 5% were able to obtain food, the reinstatement of manipulanda or the opportunity to emit stereotypic behaviors, or cuddling. Another 5% were given an opportunity for water play or were restrained by cuddling.

The general trend of the data showed that the more severe the headbanging problem, the more varied the staff effort to interrupt or terminate the headbanging. There was an escalating "staff behavior, reaction" ranging from "tender loving care" (T.L.C.) to diversion, to suppressive measures such as intramuscular phenothiazine injections and finally, if all else failed, to restraints of limbs or body by mechanical devices. The use of suppressive measures, including mechanical restraints and/or chemical restraints through the use of tranquilizers, appeared to be generally reserved for the most severe "headbangers," i.e. for those whose headbanging had been a major problem in the past thirty days and who had also injured themselves by their behavior in the past.

Finally, the data suggested to Fielding that the usual "treatment" of headbanging took the form of "reinforcement" through the delivery of stimuli which were unavailable to the resident prior to the emission of headbanqing. The

use of "time out" techniques, of differential reinforcement of other behaviors (D.R.O,) through intensive programming, as well as delivery of aversive contingencies likely to result in elimination of the behavior, had essentially been untried.

IV. CREATION AND ORGANIZATION OF THE SIB-UNIT

Purpose of the SIB Unit

In conformity with the intent of the State Committee, the SIB-Unit was created as a Pilot Project with the following aims in mind:

1. To make a concerted effort to treat and - if possible - to eradicate SIB;
2. To evaluate different treatment methods of both the traditional and the behavioral type;
3. To collect scientific observations and data in depth;
4. To make recommendations based on the experience gained within the project to the Minnesota Department of Public Welfare.

One of the main reasons for the creation of this special Unit was that heretofore the majority of SIB cases in the Minnesota institutions had resisted any type of known treatment methods as long as they had remained in the environment of large institutional wards (Note: 5).

From the study of the behavioral literature it was evident that contingencies which control maladaptive behavior like SIB could be more easily controlled in a small treatment Unit (Hiron and Rooney, 1972; Hiron 1974).

In addition, the committee had expressed the expectation that within such a special project the expertise of several disciplines could be combined in a concentrated team effort to bring some light to the baffling problem of SIB.

Preparatory Efforts

Preparations to establish the SIB-Unit of the Faribault State Hospital were made during the second half of 1971 and all of 1972. However, several factors delayed the operation of the Unit until March 1973: *The* extension of the governor's hiring freeze of new institutional personnel from 1971 into 1972; the selection

of proper personnel and their training in Behavior Modification methods; the procurement of videotape and monitorirg equipment; and especially the manufacture of a remote-controlled electric skin shock device.

Locality

The project was located on the campus of Faribault State Hospital in the north half of the two storied "Cedar" building. A dayroom with a nursing station and 2074 square feet of floor space was located on the first floor along with a dining room of 1368 square feet and toileting facilities. Also located on the first floor was a room for the Research Analysts. This room housed the specialized equipment for monitoring, programming, and data collection. The entire first floor had 5000 square feet of floor space. The second floor contained the dormitory for ten girls and ten boys separated by a central divider, and a floor space of 2074 square feet, plus additional toileting facilities. This provided each resident with a dormitory floor space in excess of the 80 square feet required by the Minnesota State Board of Health. Also located on the second floor were a number of small rooms utilized primarily for programming on a one resident to one staff member basis (FIGURE 1).

Description of Equipment

The residents were observed from a room adjoining the living area by means of a closed circuit T.V. camera and eight microphones attached to the ceiling of the living area, and a standard video-tape recorder and screen in the observation room. The research analyst could control the direction, focus, and lens zoom of the camera from the observation room so the resident's behavior could be accurately monitored.

The resident who was on E.S.S. therapy wore a cloth bag on his belt which contained the apparatus. In it was a standard shock generator (Hot Shot Products), a battery pack which contained four "C" cell batteries (6 volts) as power source for the generator, and a modified personal pager receiver {General Electric) which limited the faradic stimulus to approximately one second in duration.

The stimulus was applied through two 1/2 inch diameter electrodes held by micropore tape against the posterior aspect of the resident's calf region. A saline electrode salve was used to prevent skin burns and to promote electrode/skin conductivity. The electrodes were placed approximately 1 1/2 inches apart.

The message for the delivery of the faradic stimulus to the individual under E.S.S. treatment was sent remotely from the portable transmitter through the use of a tone sensitive paging system. Each resident's receiver unit responded only to a narrow tone frequency transmitted on 154.625 MHz. With the transmitter was a keyboard from which the research analyst would code the correct numbers of the pager receiver, so only the resident who emitted the self-injurious behavior would receive the E.S.S. A monitor receiver with cassette recorder automatically documented the use of the remote skin shock (TABLE 10).

The parameters of the E.S.S. equipment are given in TABLE 11. They are in conformity with those of other investigators who used E.S.S. for aversive conditioning (Lovaas et al., 1964-69; Tate and Baroff, 1966; Risley, 1968; Birnbrauer, 1968; Ludwig, 1969; Corte, 1971; Miron, 1974; Merbaum, 1973; Rechter and Vrablic, 1974; Prochaska, 1974; Mc Farlan, 1975). The safety measures as established by Butterfield, 1973; Bernstein, 1975; and Tanner, 1973, were strictly observed to avoid any hazards to the residents in this project (TABLE 12). No harmful effects ever occurred.

Data Collection

Data in regards to SIB were analyzed at 21 day intervals called "determination points" during the first year of residence in the SIB Project, and at 23 days thereafter.

SIB data were collected four to seven days prior to each determination point. The data consisted of samples randomly selected between the hours of 6:30 a.m. to 8:30 p.m. in order to cover the entire time interval when the subjects were awake. The randomized samples consisted of time periods of five minutes each. During this period data in regard to restraints, amount of staff-resident interaction, SIB topography, frequency and range, were noted and recorded (TABLE 13).

At each determination point one of two possible situations existed:

1. If the SIB data revealed a decelerating trend in comparison to either the baseline (for the first determination point) or the previous determination point, the current program was altered as necessary but remained essentially unchanged.

2. If the SIB data did not show a decreasing trend, major program alterations were introduced which were designed to reduce the frequency of SIB.

Program changes were decided at the weekly meetings of the Review Team.

Personnel

Staffing for the project, including the creation of nine new positions, was covered by all 10 state institutions in proportion to their number of mentally retarded residents. Faribault State Hospital contributed 36%; Cambridge 24%; Brainerd 17%; and the rest of the institutions 25%.

The following staffing complement was allocated for the project:

1 Project "Director
3 Research Analysts
1 Special Teacher
3 Certified Occupational Therapy Assistants (COTA)
3. Senior Ps3'chiatric Technicians
10 Psychiatric Technicians
2 Hospital Aides
1 Clerk Typist
24 ALLOCATED POSITIONS

With a maximum of twenty residents in the project, the anticipated daily coverage was four direct care staff for the early shift, four for the late shift and one for the night shift, with a resultant on duty staff/resident ratio of 1:5 during the waking hours.

One year after the beginning of the project only eighteen positions were filled, with the following six vacancies: 1 COTA, 1 Senior Psychiatric Technician and 4 Psychiatric Technicians.

Several problems in staffing were encountered initially in starting and developing the project. A delay of the project occurred when the Governor mandated a freeze on the hiring of all new personnel in 1971 and 1972. Many of the Psychiatric Technicians trained and experienced in Behavior Modification in 1971 were no longer available or interested when staff could actually be hired for the implementation of the project in March 1973.

Training of the original staff involved in the project consisted in nine consecutive lectures on Behavior Modification for one and one-half hours each week followed by review seminars of the literature on a weekly basis. There was also concurrent intensive individual program design and implementation using an on the job training format. Programs implemented during the staff training phase were supervised administratively and reviewed weekly with a psychiatrist consultant in behavior modification.

The majority of new employees hired for the project were required to undergo 240 hours of psychiatric technician training, i.e. 16 hours per week for 15 weeks. After this initial training, they received additional instruction from project personnel in the manner in which the principles of operant conditioning were utilized in the project. This training accounted for approximately 10 percent of total staff time.

Difficulties were also encountered in the selection and hiring of qualified personnel. When trying to work with these very difficult residents, it was easy for staff to become frustrated and "burn out" in a relatively short period of time.

Meetings of the Review Team

Team meetings were held weekly with the following members present: The Unit Director, the Project Director, the Psychiatric and the Medical Consultants, Social Worker, one or two Research Analysts, the Special Education Teacher, the C.O.T.A. of the resident under discussion, the Speech Therapist, and the majority of the psychiatric technicians of the unit. The chairmanship rotated among the direct care staff from week to week. Three to four residents were discussed at a meeting according to schedule.

The psychiatric technician assigned as principal therapist of the resident and therefore carrying the main responsibility for his (her) treatment program, gave the report on the resident covering the past 21 (28) day period. Other team members contributed according to their involvement. Of special importance was the report of the Research Analyst and his analysis of the collected data, individual observations, charts and graphs.

The team meetings were considered an important and essential part of the project and served the following purposes:

1. Intensive, in-depth review of each resident in regard to his (her) behavior, reactions, indiosyncrasies, progress or regression during the past 21 (28) days.
2. Goal setting for the next 22 (28) day period.
3. Detailed lay-out, adjustment and modification of resident's existing program. Setting up new programs of behavior modification, aversive stimulations medication, additional tests, etc., as indicated.
4. Collection of valuable research data.
5. Inservice training of all team members in Behavior Modification, especially the direct care staff.
6. Boosting of individual and general staff morale through recognition of accomplishments.

Selection of Residents for the SIB-Project

Residents were selected for admission to the unit according to age and SIB pattern. Most of them were adolescents or young adults of both sexes under 20 years of age who emitted headbanging as the main form of SIB. Residents with violent, destructive and aggressive behavior were excluded as potentially disruptive to the program and dangerous to the younger and smaller participants in the project. Also residents with SIB and cerebral palsy had to be excluded because of their inability to climb stairs in the two-storied building.

An intensive work-up included EEG, skull x-rays, clinical and comprehensive laboratory data, intelligence ratings and historical data on past SIB.

The admission committee had the responsibility for the selection. It consisted of the Unit Director, the Project Director, the Psychiatric and Medical Consultants and the Program Director of Faribault State Hospital. Residents of other state institutions were selected on the basis of urgency and severity of their SIB, vacancies within the project and apportionment among the different institutions.

Prior to admission written parental consent was obtained for the use of aversive stimulation with E.S.S. in the eventuality that this modality of treatment became indicated.

Prior to administration of E.S.S., approval had to be obtained for each individual from several committees and authorities (TABLE 14), by submitting detailed clinical data, up-to-date therapeutic efforts and justification for the use of E.S.S. This was required in view of the on-going controversy over the ethical aspects of the use of ESS and to protect the Human Rights of the resident in compliance with the standards of the Joint Commission on Accreditation of Hospitals, Section 2.1.8.9.

The Review Board of Faribault State Hospital consisted on one attorney, a psychologist of the University of Minnesota and a member of the Minnesota . A.R.C., as representatives from the community.

V. TREATMENT METHODS

Various treatment methods were used in the SIB project to reduce the level of self-injurious behavior (TABLE 15). Both "traditional" methods and "behavior modification principles" were employed for that purpose.

As discussed in Section II, the main "traditional" methods of SIB reduction included the use of sedation, of tranquilizing drugs and of physical restraints (TABLE 5). Every resident in the SIB unit had over many years an extensive history of receiving numerous tranquilizing medications in a variety of dosage and combinations. For instance, had been treated for eight years in succession with eight major or minor tranquilizers and five sedatives. ,,

and had similar histories of ten to eleven and one half years and one of over fourteen years. The effect of these medications on the SIB had been questionable, at best short lived and transitory, wearing off after a few months or a year. Therefore, all participants in the project were taken off behavior controlling medication after admission.

Hypnotics were added as indicated by individual needs to alleviate sleep disturbances. Tranquilizing drugs, however, were used very judiciously in small doses and for limited periods only. Like all other medications, they were reviewed every twenty one days at the team meetings.

Estrogens were given to four male residents for one to two months to curb excessive masturbation. Two female residents (a n d) who exhibited increased disturbances and SIB prior to their menstrual periods reacted favorably to the administration of (menses suppressing) oral contraceptives.

Vitamin C, Folic acid and Pyridoxine were given in large doses (on parental request) to three residents for over one year without noticeable benefit (and .).

TABLE 16 shows the types of physical restraints used in the project to prevent residents from seriously injuring themselves. Restraints in the strict sense have to be diffentiated from "protective devices" such as helmets, gloves, mittens, collars, arm splints, etc., which prevent traumatization but do not impede activity and mob restraints during the night were used at a minimum. The latter were applied only for the first one or two hours of bedrest and removed as soon as sleep had ensued. Camisoles were never used.

Restraints most frequently applied in the project, because they permitted mobility and activity while simultaneously preventing injuries, were wristlets attached to a belt which the resident wore around his waist. Depending on the topography of the resident's headbanging behavior, his hands were then either restrained to his sides or behind his back in a handcuffed position. This form

of physical restraint was not encouraged however. While he or she was being trained on a one-to-one basis, the restraints were removed and, if SIB occurred, the staff would prevent a chain of SIB's by holding the resident's arms in a fixed position or by blocking an attempted hit ("staff restraint").

The use of all restraints was reviewed and discussed for each resident *every* twenty one days and reduced as rapidly as progress in reducing SIB permitted (See Section VII).

Nine residents in the unit (TABLE 16) were frequently observed to put their hands behind their back in a restraint-like position ("self-restraint"). Others would restrain themselves by putting their arms through one sleeve of a T-shirt; some would wrap their arms in towels, sheets, or clothing; a few would sit on their hands; others would put both arms through their belts or in their trousers. The problem of self-restraint is a most peculiar and fascinating one and shall be discussed later (Section VI).

One of the traditional methods used in the project as a "palliative" measure was non-contingent massage. Its beneficial effect in relieving tension and reducing SIB was found in three girls (__ and __) and in five boys (__ and __)In __ it acted also as a positive reinforcer (TABLE 17).

It should be emphasized that these "traditional" methods were adjunctive only to the major treatment for self-injurious behavior, namely the use of several behavior modification principles and techniques (TABLE 6) which, when applied in combination, reportedly had an increased chance of beneficial results (cf. Peterson & Peterson, 1968, Corte et al. 1971, Smolev 1971, Bachman 1972).

The treatment program as such was a comprehensive and tightly structured training and activity program covering a full day (TABLE 18). Though such an unremitting program confronted the unit staff with an exceedingly arduous task, its intensity favored an effective reduction of SIB and maintenance of newly acquired acceptable behaviors (Browning 1971, Miron 1974, Azrin et al. 1975).

In order to reduce SIB frequency, the emphasis in training was always on the implementation of those programs which presented positive reinforcers for the emission of appropriate behaviors. The most common programs in the SIB Unit were training in skills or behaviors which were alternative or incompatible to the SIB response (TABLE 19). The teaching of these skills was done in numerous small steps, based on the principle of "approximation" and "binary choice" i.e. pass - fail - choice at each step (Miron 1974). These behaviors included self-help skills such as hand washing, tooth brushing, or dressing; skills which were of adaptive value in a less dependent living situation, such as proper eating habits or bed making; and finally, those skills which had a special value as a self-reinforcing activity. Such skills were considered especially important, since they exposed many residents for the first time to reinforcers in the external environment which were not the product of their own self-stimulatory activities.

Other ways in which the residents received reinforcements was on a DRO (differential reinforcement for other behaviors) basis. That is, the resident received positive reinforcement contingent upon the non-emission of SIB. Reinforcement delivered according to this schedule was designed to reduce SIB by strengthening behaviors which were not self-injurious. Among positive reinforcers, attention and praise proved far more effective than edibles. For some residents "idiosyncratic" reinforcers in the form of a preferred toy, such as a ball, or an animal, a dress, a colored hat, a certain piece of music, a game, etc. were found most effective. Two residents (__ and __) responded very well to a "Token" system.

When a reduction in SIB did not occur using the above procedures for a minimum of six to eight months, a program was designed to bring the resident's self-abuse under control by aversive or deprivation programs. It is important to note that these programs were always added to the above positive procedures, and never replaced them. Generally an even higher density of positive reinforcement was made available when the aversive procedures were in effect.

Before describing these aversive programs, it may be noted that extinction programs, i.e. simply ignoring the SIB, were rarely implemented in the SIB project. The frequency and intensity of the SIB exhibited by the residents would have made such a program impossible to implement without eventual staff intervention. Not only would extinction programs have been a medical risk to these residents, they would have been behaviorally unsound: Staff intervention would have occurred on a thinner schedule which, if reinforcing, would have made the behavior more resistant to deceleration than prior to program implementation.

The "time-out" programs implemented in the SIB Unit were somewhat different from the traditional exclusion or seclusion "time-out" procedures (cf. May, J.G., Risley, T.R. et al. Guidelines for the use of Behavioral Procedures in State Programs for Retarded Persons, 1975). The SIB unit's time-out procedure consisted of restraining the arms of the resident behind his (her) back and placing him (her) in a standing box, an apparatus originally designed for physically handicapped residents so they would stand and not suffer injury by falling. The standing box was located in the household day area and was large enough so a resident could stand comfortably with his (her) arms positioned behind him (her) back, but small enough so the resident was unable to fall and hurt himself. The time-out procedure in the standing box was used for those residents who had episodes of severe headbanging in a tantrum-like fashion. The programs for use of the standing box explicitly defined the behaviors to be extinguished (SIB, hollering, scratching, undressing, food grabbing, etc.) and the duration the resident was to remain in the standing box (from 5 to 10 minutes). Using this apparatus in the time-out program had the advantage of protecting the resident from injury as well as removing the reinforcing stimuli and staff attention from his (her) environment.

For those whose SIB episodes were not tantrum-like in nature, preference was given to removing the rewarding stimuli from the resident, rather than removing the resident himself from the rewarding environment. That is, for certain residents, programs were designed that, contingent upon a specific SIB, staff attention

and other reinforcing stimuli would be removed for a specified period of time, generally from three to five minutes. If the SIB occurred during the time-out period, the timer was reset or, if the SIB was severe and the possibility of physical injury could result, the standing box was used as a backup.

Other techniques of reducing SIB contingent upon the behavior itself were instead of removing stimuli that were reinforcing, presenting stimuli that were considered aversive. These techniques, labeled in operant literature as "punishment," were designed for rapid or complete elimination of the self-injurious behavior.

Utilizing the work of Clark (1966), Yates (1958), Rafi (1962), Feldman and Werry (1966) and Lahey, McNees and McNees (1973), a technique which resembles "negative practice" was developed to reduce head-to-floor SIB in a severely retarded girl who wore a protective helmet (__) Each time she emitted a head-to-floor SIB, she was required to place her head on the floor for a three minute period. This technique, in conjunction with other behavioral programs, was effective in reducing her SIB.

One simple device used was a squirt gun which delivered a stream of cool water on the resident's forehead contingent upon SIB. A program using this apparatus was designed for two of the residents, both of whom were partially or totally blind (L.G. and S.M.). Because this method produced only transitory suppression of the SIB and both residents eventually adapted to it, the programs were discontinued (TABLE 20).

Electric Skin Shock (ESS) was the only method found to produce rapid and complete suppression without any adverse side effects. The equipment and parameters used for ESS were described in Section IV. The ESS program was carried out during the entire waking portion of the resident's day. Both a research analyst and a psychiatric technician were assigned to the resident to carry out the program and provide alternate training.

As soon as the resident emitted SIB, the research analyst delivered the Faradic stimulus which lasted approximately one second in duration. The results

It is important to point out that the ESS program was never used in isolation. That is, it was always part of a comprehensive (global) program in which a high density of positive reinforcement was given for alternative behaviors. With the shock program was included an intensive training program on a one-to-one staff/ resident basis so that the resident would have the opportunity to replace the SIB with appropriate and self-reinforcing adaptive behaviors.

Finally, for certain treatment methods used in the project, like restraints and ESS, "Fading" programs had to be instituted for gradual elimination of "stimulus control." Many of the participants in the project over the years had become so accustomed to restraints or wearing a helmet that these had acquired "stimulus control," resulting in severe SIB on their removal. Such stimulus control could be successfully eliminated by gradual fading, as shown in TABLE 21 for a helmet, and in TABLE 22 for the ESS apparatus worn by the residents during ESS treatment. The first fading procedure required 36 weeks, the second procedure . required 6 weeks.

VI. PROFILES OF SIB-RESIDENTS

The profiles of eighteen SIB-residents treated in the project are given in TABLES 23-24. Thirteen residents (72.2%) were under the age of twenty years, • eleven were boys, seven were girls. Eleven (61%) functioned on a "profoundly retarded" mental level, six (33.3%) on a "severely retarded" level with IQ's between 20 and 32. Only one (__.) was "moderately" retarded, with an IQ of 49. The majority of them had no speech.

The average age of onset of SIB was 6.3 years; the earliest age was twenty-two months (TABLE 25). Ten residents (55.6%) started to exhibit SIB at the age of four to six years. Most interesting again was the finding that seventeen residents (94.4%) began to emit SIB at home or in a foster home, only one (__) in a large state institution, disproving the common assumption that SIB is the result of "institutionalization." A similar impression had been gained in the aforementioned profile study of fifty headbangers selected at random by Bruhl and Geyhart (1970), (Section III).

The average duration of SIB (TABLE 25) was nine years, the shortest three years, the longest twenty-one years, a fact which confirms the findings in the literature (TABLE 2) and reflects the tenacity of the habit.and the inefficiency of "traditional" treatment methods.

The types of SIB and their different combinations emitted by the eighteen residents of the unit are similar to those reported by other investigators (TABLES 1, 26, 27). One boy (__.) had the additional habit of repeatedly placing foreign bodies into his ears and nostrils; another one (__) had chronic regurgitation and emesis frequently causing dehydration and weight loss.

In six residents (33.3%) SIB had resulted in severe traumatization: chronic bruises and non-healing sores of the scalp, temples and ear regions in three, retinal detachment and blindness of one eye in another resident (__). Two residents caused long lasting lacerations of buccal mucosa and lips either by incessant chewing, biting or digging (__ and __.).

5IB was considered as moderately severe by clinical observation in three (17%), as severe in eight (44%) and as very severe in seven residents (39%) (TABLES 28, 29).

There seems to be a certain but not a strict parallel between SIB-rates and "clinical" evaluation of severity. An overlap exists in two directions: Either SIB-patients hit harder blows at a lower rate (e.g., __ and __) or they emit SIB in the form of very light blows at a faster rate (e.g.,__ and __.). It is obvious that both aspects have to be taken into consideration to arrive at a correct evaluation.

In ten residents the initial base-rate of SIB per minute (TABLE 28, Column 1) decreased between the 21st and 42nd day in the unit, most likely under the influence of the "new environment." In two cases (__ and __) the base-rate. remained the same. However, in five residents (__, __., __.,__ and __.) it increased sharply, indicating an early exacerbating effect of programming, a phenomenon to be discussed later.

A compilation of personality traits (TABLES 30 - 32) reveals an interesting fact: though the etiological diagnosis of childhood autism and childhood schizophrenia had been made in four project participants only (TABLE 23), fifteen residents (88%) showed schizoid traits like aloofness and asocial behavior, twelve (71%) did not interact with peer groups or fiercely avoided them, ten (59%) had no or poor eye contact. This would lend credence to consider SIB as a manifestation of schizophrenia (Goldfarb 1958, Ristic 1970, TABLE 4) or as a "sub-class" of autistic behavior (Azrin et al., 1975).

The habit of restraining oneself is a *very* peculiar and interesting one. Ten of the residents (55.6%) exhibited it in various forms and severity (TABLE 33): __ kept his hands and forearms rolled up into a towel most of the time; __. had the habit of crawling into his T-shirt by pushing both arms through one sleeve and even attempted to take his meals in this way;__ constantly carried a pillow or a blanket over his head. He wanted so much to be restrained that, constantly, he looked for his posey-belt and put himself into it or wrapped it around his neck, though not with any evident suicidal intent. Many nights he wandered around and disturbed the others in the dorm by looking for blankets in which he could wrap himself.

"Self-restrained" in the described fashion, all three boys would happily sit in a rocking chair and rock for hours or wander around and look out the window; showed some facial expression of tension. They would not emit any SIB as long as they were left alone, but would respond to any attempt to remove these self-restraints with intense SIB and screaming (__). This behavior was of long standing and had presented great obstacles to their daily care in the past.

__ showed the samestrong urge to be restrained, especially at night. Being blind, she liked to hang onto any cherished object, a teddy bear, a ring, or a necklace all day long, but more often than not she would wrap this necklace tightly around her fingers. In the evening, she would not object to being put to bed without restraints, but would ask for them as soon as a certain technician

came on "late" duty; then she would fuss until her request was fulfilled. After she was weaned from this behavior, she developed a substitute by wrapping herself up either with shreds of blankets or into her pajamas so tightly that one morning it had to be cut off from her.

The other five residents (__., __, __, __, and __,) showed the habit of restraining themselves for shorter periods; besides, their desire to obtain materials for it appeared to be less strong. Therefore, it yielded easier to behavior modification techniques, as they did not emit such violent SIB responses when their self restraining behavior was interferred with. Frequently a short command in a firm voice (__),take the hands from under your blouse" or don't sit on your hands") was sufficient to terminate it.

Numerous SIB cases have been reported in the literature where removal of physical restraints elicited an immediate response of "violent SIB (Tate & Baroff 1966, Bucher & Lovaas 1966, Lovaas & Simmons 1969, Jones et al. 1974, Ball et al. 1975, McFarlan 1975, Miron & Rooney 1972, and others cited by Friedin 1976). We observed violent SIB responses on removal of physical restraints or other devices only in a few cases: __ when first admitted to the receiving hospital of Faribault State Hospital had to be placed into full restraints because his face, body and limbs were covered with extensive self-inflicted ecchymoses. Each time the restraints had to be removed to take care of him, he would respond with violent SIB.

Also __., and __, would respond with immediate SIB whenever their helmets were removed. An example of "weaning from the helmet" is shown in TABLE 21, Section V.

always liked restraints and wanted to have the posey-belt on continuously. While she was in restraints, she was restless and discontent and exhibited SIB by hitting her head against the wall. When they were removed, she became upset, tore her clothes, ran up and down the ward and slapped her face. At a later date, when her day time behavior had markedly improved with aversive stimulation, •she was put to bed one evening without restraints for the first time. She was

very upset, fussed and cried for her restraints. She kept getting out of bed to look for them, first in her drawer from which they had been removed, then in the nursing station. When her searching and raving had no results, she became very angry and banged her head on the bed. An ESS applied with the "prod" ended the episode. She settled down and went to sleep. From then on she slept without restraints.

In discussing problems connected with the use of restraints in SIB, Friedin (1976) suggests that physical restraints - originally applied for protection - could in time acquire reinforcing properties and act as "stimulus control" when they were used over extended periods and were "explicitly unpaired" with aversive events. Their release would then function as an alarm signal and the emission of SIB as a means of obtaining replacement of the restraints in order to avoid •something more unpleasant (Skinner, 1953).

It is most likely that in many of our residents, including those restraining themselves, restraints had acquired stimulus control, since they had been exposed to them for many years. It would be impossible to determine the specific aversive experience in the past for each individual. But one could conjecture that daily events like tooth-brushing, nail cutting, washing (abhorrent even for normal boys), hair combing for girls, medical procedures such as hypodermic injections, inspection of throat, etc. acted as "aversive events," which our residents tried to avoid.

Within our project, programming as such could be an "aversive event" for many of those residents who disliked it and responded to it with SIB and noise (TABLES 30, 31). As long as they were in restraints - self-imposed or applied by others - they felt safe and acted contented.

Tate (1972) and Saposnek & Watson (1974) have developed the interesting concept that for restrained children "being free from restraints may be a fear-eliciting aversive event" (cit. Friedin 1976). Within this framework, would represent restraints for SIB residents a haven of safety and security while the "free from restraints" condition would be imbued with anxiety. Restraining oneself might

be only one of several ways of seeking security, and - indeed - this appears to be the case: __ when admitted to the project, always held a chair over his head. __ constantly wore a pillow on his head or was hiding under a blanket; at other times he fenced himself in with chairs, or would carry a large rubber ball and fiercely hang on to it. __. when admitted, frequently lay on the floor under a chair. Being blind, she liked to carry a beloved object. Several other SIB-residents showed identical behaviors. In this respect they acted like normal two and three year old children who clutch a blanket, a stuffed animal or a beloved old rag doll all day long and insist upon not parting from them during the night either.

The concept of anxiety being associated with the "free-from restraint" condition gains in probability as there are indications for other types of phobias in about two thirds of the residents of the unit: Eight resident were frightened to walk stairs alone, though most of them were between fifteen and twenty years old and had no major neurological impediment; only __ being blind, and __, a seven year old under-sized boy, malnourished and unsteady on his feet, had legitimate reasons. Through systematic training and encouragement including positive reinforcers, they learned within twelve to fourteen weeks to overcome their fears and to walk stairs up and down with alternate feet. While being taught, __. had severe episodes of hysteria, and __, frequently refused to walk and responded to efforts to make her walk with headbanging on the rail. __., and __ learned to walk stairs in a normal fashion three weeks after the aversive stimulation program was implemented (See Section VII),

Other residents showed other fears, some when on the air mattress, __ when on the swing, __ on the merry-go-round, __. going on rides. __. was frightened by "anything new." Three boys (__, and __,) appeared to be apprehensive of crowds and reacted regularly to group activities either with SIB and noise, (__), or with screaming and yelling (__ and __). While __ and __ improved gradually in this respect, persistently responded to any group activity with fierce and prolonged screaming. This behavior, most likely associated with fear,

was extinguished in a special desensitization program by "gradual distance-reduction" within ten weeks. Similarly, Costenoble (1975) feels that many SIB children are overwhelmed by fear.

Another personality trait peculiar to SIB residents was their way of responding to programming:

In a contingency analysis of 190 "head-bangers" Fielding found that twelve percent of them responded to "forced activity" with SIB (Section II, TABLE 9). Twelve participants in the project (71%) responded to programming with SIB, five (29%) with noise, one (__) with excessive screaming and yelling, and seven (41%), foremost __, and __, with aggression against the programmer (TABLES 30-32).

Five residents showed this response with increased SIB rates very early in the program, between the 21st and 42nd day of admisstion (TABLE 28), __, between the 21st and 84th day, and __, between the 42nd and 63rd day. In most instances the increase was two to five times the baseline and in __, thirty times the original SIB rate per minute.

Exacerbation of SIB as a response to structured programming was *very* common and almost the rule among the participants in the behavior modification project; it would appear with regularity whenever the pressure on them was increased. TABLE 34 shows the increase of SIB parallel to intensified staff-resident interaction in the school program. In a compilation of data taken on four residents, SIB occurrence remained the same in five (22%), decreased in seven (30%) and increased in eleven (48%) instances when intensified staff-resident interation occurred.

It was left to the patience and the skill of the programmer to choose the proper behavior modification technique to overcome this type of response by the resident. TABLE 35 demonstrates just such a gradual adjustment of a resident to the increased interaction. This has to be considered a first step toward a favorable treatment result.

In the discussion of "self-restraints" the possibility was considered that structured programming, one of the main techniques used in the project, represented

an "aversive event" to most of the residents. Those who abhorred, feared and resisted it, may have emitted SIB as an avoidance reaction.

VII. TREATMENT RESULTS

The treatment results obtained in the project are shown in TABLES 36-41 and in several graphs depicting excellent, partial, transitory and negative results.

Extinction of SIB was complete in nine (50%), partial or transitory in six (33.3%) and not achieved in three (16.7%) of the residents (TABLE 36). Complete elimination was obtained in five residents by non-aversive behavior modification (BM) and in four by behavior modification including ESS. Partial elimination in three residents was achieved by non-aversive behavior modification (BM) and in another three by behavior modification including ESS.

Age of the residents, duration of SIB and length of treatment do not appear to be decisive factors in the final outcome (TABLE 36).

RESULTS OBTAINED WITH BEHAVIOR MODIFICATION

Eleven project participants were treated with behavioral techniques excluding ESS. Excellent results were obtained in the behavior of four (__, __, __ and —, TABLE 37). Their SIB rates per minute, SIS occurrence (in percent of sample time) and restraints (in percent of sample time) decreased progressively to zero levels and remained there for a follow-up period of six to twelve months. GRAPH 1 (__) illustrates such a case.

In three residents (__, and __, TABLE 38) the treatment results were considered good by clinical observation though the data do not seem to support this entirely. In the case of __, the elimination of SIB was complete except for rare SIB during occasional temper trantrums.

In four residents with high baseline SIB rates, final treatment results were poor (TABLE 39): __, and __, had shown satisfactory deceleration of their SIB as indicated by reduction of SIB rates per minute SIB occurrence and restraint data. However, this improvement was only temporary and lasted for seven months in

(GRAPH 2) and for four months in It was followed by a recurrence in both residents. In __, this was associated with the resignation of a *very* able teacher to whom he had become very attached; the deterioration of the behavior of __, was concomitant previously had been well controlled. The two other residents showed an erratic course

(__, GRAPH 3) and only minimal improvement (__.) from the beginning. These four residents had been considered for ESS treatment.

RESULTS OBTAINED WITH BEHAVIOR MODIFICATION INCLUDING E.S.S.

Seven residents were treated first, for various lengths of time, with non-aversive behavioral techniques such as extinction, reinforcement of incompatible behaviors, D.R.O., etc. After all of these had failed, aversive stimulation by ESS was under-. taken (TABLE 40): While __, and __, showed some reduction of their SIB with structured programming,__, and __, reacted to programming with an exacerbation as indicated by increased SIB rates and restraint data. Elimination of SIB was finally accomplished in these four residents by application of ESS. This had an immediate and dramatic effect and was sustained for one to two years by occasional booster ESS. GRAPH 4 (__,) is a good example for this group.

TABLE 41 gives data on three residents who present special interesting aspects. __, a seven year old boy, since the age of 22 months, had exhibited very severe SIB complicated by intractable regurgitation causing a chronic state of malnutrition and recurrent episodes of dehydration. After an unsuccessful trial treatment with non-aversive behavior modification for three months, ESS was initiated as an emergency measure to deal with a critical situation precipitated by the com-bination of SIB and emesis. It was decided to treat the SIB first. However, it was found that the boy was unresponsive to ESS when administered by "remote-control," though it was applied for two days at an exceptionally high average rate of 150 shocks per hour (TABLE 42). From the third day on, ESS was applied by a "prod." This evoked a noticeable deceleration and proved surprisingly effective in reducing the SIB to 65 per hour the fourth day. On the fifth day only 14 skin shocks (0.96 per hour) were given and from then on one to three times per day (GRAPH 5). After

SIB had been well controlled for two months, ESS was initiated contingent upon regurgitation. This was reduced to zero within seven weeks and occurred only occasionally thereafter. SIB was kept at a low level by booster ESS (0.16 to 0.63 per hour average) for seven months until recurrent upper respiratory infections and a tibia fracture resulted in a long lasting episode of severe recurrence. (GRAPH 6).

__, and __, Presented an unexpected phenomenon under ESS treatment. was a 20 year old blind, retarded, autistic and *very* disturbed resident as exhibited by frequent temper tantrums, screaming and ripping her clothes. Her SIB existed for 15 years and had proven resistant to all types of traditional therapy including a long series of psychotropic drugs (8 years). Her response to treatment with non-aversive behavioral procedures was *very* erratic and at one point, her average SIB rate had doubled (TABLE 41 & GRAPH 7).

ESS was very effective in reducing the SIB level to zero on the fourth day and extinguishing it completely for 27 days. This result was maintained for twenty more weeks by occasional booster ESS until a severe recurrence was triggered off by the "unaccustomed voices and manners" of new teachers who did not know her.

A second treatment course of ESS at an average daily rate of 3.0 to 14.76 per hour required three months to eliminate the SIB. After a SIB-free interval of one month, a sudden exacerbation occurred again - this time for unaccountable reasons. 880 ESS were applied in a 55 minute period; i.e., at a rate of 16 shocks per minute exceeding by far the pre-treatment rate of .85 to 1.63 per minute. During this episode the resident continued to hit In bursts in spite of ESS applied by "prod;" it was assumed that the ESS had lost its aversive qualities. Therefore, the aversive program was discontinued and replaced by a special 1 to 1 "holding" program.

was a ten year old *very* hyperactive and retarded boy with a five year history of severe SIB and an insurmountable habit of restraining himself by wrapping towels around his arms. Using behavior modification techniques a special education teacher (__,} who had excellent rapport with him succeeded in reducing his SIB and restraints to zero in the first five months; they were kept at a low level

for the following ten months (TABLE 41). Also a daily non-contingent massage program seemed to have a beneficial effect. However, average SIB rates and restraints increased again during the next ten months, when three hospitalizations for pneumonia, recurrent tonsillitis and tonsillectomy were followed by a noticeable regression in his behavior each time. In addition, a change to new teaching personnel increased his resistance to structured programming. Since his recurrent habit of restraining himself was an impediment to effective teaching, aversive stimulation by ESS was ultimately initiated.

It was applied over a period of four months with a gradual reduction of SIB from 159 ESS (13.25 per hour) the first day, to zero on the thirteenth day (TABLE 42). In the following weeks, one to five ESS per day kept the SIB at a tolerable level, though the period was interspersed with rare days of exacerbation resulting in .86 to 1.64 ESS per hour. Zero-days of ESS became more prevalent during the third month of treatment.

Under ESS treatment the boy gained 9% lbs. in the first five days. He laughed and smiled, became cooperative in programs, learned to entertain himself, and finally was even able to attend the school program. Suddenly, on the 127th day, the hourly ESS rate rose to 33.5, on the 128th day to 57.1 and remained at 54.9 the next day, i.e., the SIB rate of .56 to .95 per minute exceeded by far the pre-treatment rate of .15 per minute. Since neither the ESS equipment nor the technique had been altered and the boy continued to hit himself in spite of ESS, it was concluded that in this case also, the ESS had lost its aversive qualities and the program was terminated.

VIII. DISCUSSION

FULL DAY STRUCTURED PROGRAM

The majority of investigators used daily therapy sessions limited to one or two hours (Section II, TABLE 8). This pilot project was based on a 16 - hour program of behavior modification, using both aversive and non-aversive techniques, because it had been shown by Browning(1971), Miron (1974) and Azrin et al. (1975),

that a high-intensity program would be more likely to achieve maximal generalization of the results and also durability of the elimination of SIB. In addition, we hoped that by saturating the "treatment conditions" we would obtain a more rapid deceleration rate of SIB and thereby shorten the treatment time.

INDICATIONS FOR INITIATION OF AVERSIVE STIMULATION

One of the main techniques used to reduce or eliminate SIB is the teaching of incompatible, desirable behaviors (Section VI). Therefore, ESS for self-injury was initiated only when residents showed one or more of the following conditions for a minimum of five to six months:

1. Intractably uncooperative behavior (__,) and insurmountable resistance to programming (__&__,);
2. Increased SIB (__, & __,)or noisiness and aggress on toward staff (__,) as response to programming;
3. Intractable self restraint preventing structured programming (__, & __,);
4. Erratic responses to programming and extended duration of stay in the project (__,) for 22 months;
5. Reversal of a long period of improvement by a sudden increase of SIB rate (from 0 to .65 per minute) and SIB occurrence (from 0 to 12% of sample time) (__,);
6. Persistent failure in responding to program; i.e., no acquisition of skills and no improvement of SIB (__,);
7. Persistent failure to heal facial sores caused by SIB (__,);
8. Development of life threatening situation due to recurrent severe regurgitation (__);
9. Failure of trial treatment with the less aversive squirt program

EFFECTS OF ELECTRIC SKIN SHOCK

The suppressive effect of ESS on SIB was immediate and dramatic: SIB rates, including excessive ones of 36, 127 and 150 per hour, were reduced dramatically within two to three days; they reached zero on the third and fourth day in __, and __, on the eighth day in R.M., on the twelfth and thirteenth day in __, __, __,and on the twenty-ninth day in __, (TABLE 43). There was a concomitant reduction in all forms of restraints; only __ self-restraining took longer to eliminate. The number of ESS quoted in TABLE 43 are those needed to reach the first zero day; the number of ESS required for complete elimination were somewhat higher.

At least as dramatic as the rapid elimination of SIB were the personality changes which occurred simultaneously and impressed all observers (TABLE 43). Without exception, all these individuals who - prior to the use of ESS - were withdrawn, apprehensive, negativistic and irritable, uncooperative and resistive to programming, became more relaxed and were in a better mood. Frequently they were seen smiling and laughing. __, and __ became quite affectionate toward the staff, and four others started to interact with their peers. Interaction with the staff, for example, increased from 38 to 61 percent in the case of __. because __ himself initiated more interaction.- Five learned to play by themselves when they had programmed leisure time; three became more aware of their surroundings and started to explore them. Their eye contact became normal. With increased responsiveness and cooperation in programming they progressed rapidly in self-help skills and personal habits. __, __, and progressed even so rapidly in structured programs that within a few weeks, they were able to participate in school classes. They enjoyed outside activities, participated in ball games with peers, went to the library and movies, helped with chores in their dormitory, went on errands, etc., i.e. Generalization of the ESS effect was programmed, as the low SIB rates were maintained.

learned to walk stairs by himself within three weeks and acquired considerable receptive language, while __ increased her expressive language

With the cessation of SIB, physical well being improved and appetite increased. __, gained __, lbs. in five days,__, and __, gained 15 lbs. in the. first two weeks. Chronic sores in both temple regions of __, healed within six and fourteen days respectively. After his SIB had been brought under control, __ regurgitation and emesis were extinguished within seven weeks, resulting in a weight gain of seventeen pounds.

No detrimental side effects of ESS were observed. The residents emitted a "startle response" when the ESS was delivered, the source of which remained hidden to them. They developed no fear, no aggression-out, and showed no emotional upset from the pain associated with the "remote controlled" electric skin shock. In contrast to this, the administration of the "Prod," whenever it was used, evoked fear-avoidance reactions and resistance in some residents (__,). This did not detract from its benefi resultant increase in adaptive behaviors.

REMOTE CONTROL VERSUS PROD

Until recently the method most widely used *to* deliver "aversive stimulation" by ESS has been the cattle-prod. In spite of its effectiveness in extinguishing SIB, most researchers encountered poor generalization of its effect in regard to personnel, localization and situations. Also its durability was questioned. (Section II). Bachman's suggestion (1972) to use a remote-controlled shock delivery system to "preclude a spatial and temporal pairing of the therapist with the aversive stimulus" was followed in this project. Such a system was used with advantage by numerous investigators in single cases (cf.Section II).

The Prod was applied in our project only under exceptional conditions. It was used for, because he appeared to be "insensitive" to the electrical stimulus - when applied by the remote control equipment. In the absence of an obvious neurological deficit, we have no good explanation for this peculiarity except that his autism was severe and that his SIB had presumably acquired such strong conditioned reinforcement properties, that the remote ESS was insufficiently aversive to eliminate his headbanging. After one week, his treatment was switched from the prod to remote control.

The second resident treated with the prod was ,a blind female. At that particular time the remote-control units were being used to capacity for two other residents. Besides, we expected that her blindness might prevent a pairing of the ESS with the therapist.

Finally, the prod served as a back-up for the remote-control unit whenever it was out of order, or in distant localities on the Faribault State Hospital campus.

One of several disadvantages we experienced in using the prod was the difficulty in delivering the skin shock. Some residents quite violently resisted being touched by the prod, thus requiring the assistance of several staff members to hold the resident for the shock to be delivered. Also, when the electrodes of the prod were applied to the resident's calf, the amount of pressure could not be controlled because of the resistance exhibited by the resident. This resulted in minor bruises where the electrodes made contact. Finally, one of the electrodes in the "cattle prod" was connected directly to the casing. This made the prod a potentially dangerous apparatus during the application especially with residents who struggled and resisted being touched by it. If the resident should touch the casing of the prod or ground (a pipe, moist floor, etc.), while being shocked, a current path could be established through the heart. However, this possibility was eliminated by insulating the casing with several layers of plastic electrical insulating tape (Butterfield,1975).

It has been argued, from a behavioral point of view, that the advantage in using the prod lies in "generalizing" the aversive contingency to new situations. The prod becomes then a discriminative stimulus indicating to the resident that SIB will result in ESS when the prod is present. Therefore, "whenever the resident goes, so goes the prod (or its simulator)." However, we found this to be a dis-advantage. In two cases, (__), where the remote system could not be applied, the prod was utilized. The' resident became so dependent upon its presence that he could not function without having the prod present at all times. In the prod could not be removed from the resident's sight. In the other case — ?

resident was blind but became conditioned to the sound of the footsteps of the therapist who applied the ESS. Upon hearing the cue of the therapist walking away, the resident would emit SIl.

The only advantage we found in using the prod was that once the SIB patient was treated successfully by the remote shock unit from the onset and SIB emission was decelerated to a near zero rate, the ESS could then be administered with the prod without creating a dependency on its presence.

The ESS administered via remote control has the advantage of being safer and easier to administer. In addition, the remote, from our experience,has not resulted in a stimulus dependency. The only stimulus which became discriminative for the delivery of ESS, was the resident's own SIB. The remote ESS is easy to administer as the electrodes are taped to the resident's skin. That, and the fact that there is no struggle to deliver the ESS, minimizes the chance of an accidental fatality due to electrical current passing through the chest cavity.

One of the greatest advantages in using the remote control has been the rapid generalization of the aversive stimulus throughout the entire residential area. Since the aversive consequence to hitting was self-generated, no associations were made as with

ADAPTATION TO ESS

In two residents (__&__) the ESS ultimately lost its aversive qualities though neither its intensity nor its mode of application were altered, i.e., the use of the prod for., and the use of the remote-control for(__) of(__), there were earlier warning signals that such adaptation might occur.. She had become adapted to the "cold-water" squirt-gun procedure that had been quite effective in the beginning (TABLE 20). Furthermore, when her SIB recurred after it had been eliminated by ESS five months earlier, it required a five fold number of ESS over a three month's period to become extinct a second time.

Azrin (1960) and Birnbrauer (19G8) have reported adaptation to ESS in two patients (1 9 7 1) , also Miron encountered adaptation to ESS in several of his SIB patients. (Boggs & Miron,1972; Miron & Alsup 1972; Miron 1973;

There are three possible explanations for this paradoxical phenomenon of adaptation which can be surmised:

It is well documented in the literature of animal experiments (pigeons, rats and monkeys) that adaptation to an aversive stimulus like electric shock, manifested by lessening of its suppressive effect ("recovery"), will occur most likely when shocks of low or moderate intensity are used (Azrin, 1959 & 1960; Azrin & Holz, 1961 & 1966; Church, 1963; Hake & Azrin, 1963; Solomon, 1964). To avoid such a "recovery" to occur, it had been our aim to apply ESS of an intensity sufficiently high to produce an immediate elimination of the SIB and being safe and tolerable at the same time. If in spite of this, two of our seven residents (28.6%) developed an adaptation to the ESS, it seems to be a fair conclusion that in these two cases the aversive stimulus was not of sufficient intensity to overcome the strength of the SIB.

Another possibility to be considered is that the ESS had gradually become a "discriminative or conditioned reinforcing stimulus." According to Azrin and Holz (1966) this may occur when an "aversive stimulus, such as ESS, is inadvertently associated with other reinforcing stimuli. The result of such selective temporal association may be to reverse the aversive aspect of the original stimulus." .

As a third explanation on a neuro-physiological basis, it could be surmised that in the residents(__)and(__) threshhold of pain increased gradually during the prolonged ESS treatment or that their brain and pituitary gland were increasingly stimulated to produce higher quantities of pain relieving endorphins as has been demonstrated in rats which develop tolerance to electric stimulation . (Mayer, Akil & Liebeskind, cit. Marx, 1977).

Our observations on the positive and negative side effects of ESS are in agreement with those of other investigators summarized by Lichstein and Schreibman (1976). It should be added that the benefits derived from the aversive treatment with ESS are obvious and far outweigh the pain associated with it. These positive benefits fully justify its use to prevent the detrimental effects of SIB (Miron 1968, Rechtor & Vrablic, 1974), especially when milder treatment modalities have

There appears to be a high correlation between progress in self-help skills and/or structured programs and suppression of SIB: Among eleven residents treated with non-aversive behavior modification (TABLE 47) four fifths of those with very good progress in programs showed complete extinction of SIB. Only in one (__) was this not accomplished. Five residents with fair, poor or no progress in skills also showed poor results in their SIB treatment. Interestingly, the SIB of(__) was eliminated although he did not make any progress in skills or programs.

A similar high correlation is apparent in the group of seven residents treated with aversive stimulation (TABLE 48): Five residents who progressed well either in basic skills or in structured programs under ESS treatment, also showed complete elimination of their SIB (___.,___,___,___. and__),while two residents with poor progress in their skills showed only partial or tansitory improvement of SIB (__.&__).

A few observations on the performances of basic skills, based on team meeting minutes, are worthwhile reporting. While in most cases the acquisition of skills occurred in a slow gradual progression, a few residents progressed in jumps from one level to a much higher one. For example(__), performed step 16 of 26 steps in the Face-Washing program for fifteen weeks before suddenly jumping to step 24 of the steps.

Performance of several residents varied from day to day(__.,__.,__), e.g.,(__). performed, on one day 4 steps, the next day 10 steps of the Face-Washing program for the same technician. (__)., a blind girl, would follow Voice-tracking eight feet on some days, but other days would not comply.

In addition, resident performance depended both on the skill of and the rapport with a psychiatric technician: (__).and(__). would perform up to step 3 or up to step 8 in Tooth-Brushing depending on the technician.(__) would perform all 9 steps of Hand-Washing for one technician, but not for others. (__) did 24 steps in Face-Washing for.one woman employee, but only 13 steps for another. (__.) reportedly pretended to be unable to do certain Face-Washing steps which she was perfectly competent to do for one employee._____'s table manners depended entirely on the presence of particular technicians.

Regression in performance of basic skills was noted regularly when residents had been hospitalized for any length of time(&) or after a resident had lived in another dormitory for a certain period: For instance, on return from a two month trial placement in another dormitory,(__).performed only fifty percent of the basic skills she had performed one hundred percent at the time of her prior discharge from the Unit. Similar regression occurred in(__),(__)&(__) while on trial placement.

LENGTH OF TREATMENT

Length of treatment and residency in the project are summarized in TABLES 49 and 50. The main difference between aversive and non-aversive treatment is evident. As expected from the reports in the literature (Section II), aversive treatment with ESS acted more rapidly than any other Behavior Modification method. It required, on the average, 5.6 months to completely eliminate SIB by ESS, including a minimum of six weeks fading procedure for the equipment (Section V). On the other hand, it took eight to eighteen months, on the average eleven months, i.e., approximately twice as long for non-aversive methods to accomplish the same results.

The average non-aversive treatment time for "partly successful" and "unsuccessful cases was fifteen months (TABLE 49), exactly the same length of time as for the non-aversive treatment tried unsuccessfully on seven residents who underwent ESS treatment afterwards (TABLE 50).

The length of time of non-aversive behavioral treatment prior to ESS varied greatly from case to case and depended not only on the "intrinsic" criteria to initiate ESS, as discussed beforehand, but also on several extrinsic factors such as the number of professional therapists employed in the project and the availability of remote-controlled ESS equipment. The availability of these resources permitted treatment of only two residents simultaneously over fourteen to sixteen hours during the day and occasionally also during the night. It had not been foreseen that three successfully treated and discharged residents (__,__.,)&) would return to t

tied the equipment up and forced postponement of ESS treatment of other residents who were scheduled to receive it.

Also factors of an administrative nature were operative such as the withholding of consent for ESS by parents, legal problems over authorization for treatment in one instance, and delays in the cumbersome process of approval, etc.

Finally, the termination of the project after thirty months operation prevented about six residents from being placed on the ESS treatment though they would have been good prospects.

FOLLOW-UP ON TREATMENT RESULTS

Follow-up data on treatment results were obtained for all eighteen residents treated in the project. In a group of five residents treated successfully with behavioral techniques which did not include ESS, the elimination of the SIB was maintained completely in three (__,__.,__)for 8 to 12 months after termination of the project, while in two others (__&__)this elimination persisted almost complete for 1% years with some minor intermittent reverses (TABLE 51).

In the second group of six residents treated with the same behavioral methods, the SIB of two (__&__)had been partially eliminated for 4 months and 7 months before recurring during the year following the termination of the project (TABLE 52}. The status of the other four residents with inconsistent or no improvement during the project remained unchanged, in spite of the fact that they continued to stay in the SIB-Unit (TABLE 52).

Among seven residents treated with aversive stimulation in the project, the SIB of five responded to ESS with complete elimination (TABLE 53). However, this elimination, though complete, was of limited duration only: minimal it lasted 4 months (__), maximal 14.5 months(__), for the other three residents 6 months (__) to a year (__&__). The SIB of(__) and(__), which was never suppressed completely by ESS (never for more than 3 to 5 days), recurred in severe form after 2.8 and 7 months resp. (TABLE 53).

A long-term follow-up of all eighteen residents done 2 1/2 to 3 years after termination of the project had the following result (TABLE 54): Complete and almost complete elimination of SIB was reported in 12 residents (66.7%); three residents showed either partial elimination (__) or periodical recurrences(__) &__,__. TABLE 52), while another three continued to exhibit severe SIB (__), {.__,__)cf. TABLE 53).

Another interesting fact was noted, that in time SIB had completely disappeared in(__). and(__)(cf. TABLE 52) and almost disappeared in(__). and(__) (cf. TABLE 53) in spite of intermittent reverses and unfavorable prognosis.

A comparison of TABLES 52 to 54 indicates that the treatment results obtained by behavioral methods which did not include ESS might be longer lasting than those obtained by aversive stimulation.

Finally, it should be noted that after the termination of the project no further progress was achieved in eliminating SIB and that frequent relapses of SIB occurred though the residents continued to stay in the SIB unit (cf. TABLES 52 and 53). The reason for this can be found in the fact that - after the project was terminated - the environment of the unit underwent major changes in program direction, direct care personnel, application of behavioral techniques, and locality through reconstruction. SIB residents are very sensitive to all types of changes and react to them with increased SIB (cf. Vulnerability pp. 47).

"SIB-UNIT" - PRO AND CON

Treatment of SIB residents within a special unit appears to have the following advantages:

1. Combining the expertise of several disciplines (psychiatry, psychology, behavior modification specialists, teaching, occupational therapy, speech therapy, medicine, nursing on all levels) in a concentrated team effort;
2. Having a care staff well trained and experienced in behavior modification available for the team effort;
3. Conducting the therapy. at a high level of intensity;
4. Having the equipment available for aversive stimulation both by remote Control and by prod;

5. Collecting, when feasible, well documented data to further the advance of treatment methods.

However, while treating SIB residents in such a Unit, several disadvantages became apparent: To treat SIB residents in a Unit, means to concentrate a comparatively large number of disturbed individuals in a comparatively small area. Frequently, we made the observation that on certain days not only one, but several residents would become agitated one after another and stimulate each other into emitting SIB, similar to a "chain reaction" or "behavioral contamination" (van Velzen, 1975). This was favored by the fact that the Unit consisted mainly of three large areas, a day room, a dining room and a dormitory. This lay-out did not allow for adequate privacy of the residents, except for a few side rooms used for conducting behavior modification programs on a 1:1 basis. A Unit consisting of several smaller sub-units might have been more favorable for our purpose.

It was casually observed that the noise level could have been a factor in creating a chain reaction. Several of the residents responded to loud noises with **SIB(__.,(__)&(__).**

Another problem associated with treating SIB residents in a special Unit is the difficulty in transferring them back to their original living units after successful treatment. Three of the residents (__),(__),&(__)were returned to the SIB Unit after one, two and six months, respectively; a fourth one (__) was returned five days after discharge. All of them were returned with the explanation: "We have not enough staff and time to cope with their recurrent SIB."

Prior to their discharge, the SIB of these four residents had been either completely eliminated (as in(__)&(__),or had been well controlled for many months by occasional "booster" ESS (__&__)which were contingently delivered. In addition, the elimination of their SIB had shown a broad generalization in regard to localities, situations and personnel while they resided in the SIB Unit. The transfer of the residents was done over a two to three month period by gradually increasing their participation in Day Activity Centers in the original

living units, extending the time from one to four hours per day, in order to acquaint them with their new peers, and personnel.

Finally, the staff of the original living units watched the residents while still in the SIB Unit and were instructed by lectures, video-tape and practical demonstrations on how to handle the particular residents.

If, in spite of the careful preparations, the transfers from the SIB Unit to the original living units did not succeed, explanations are required: We may find them in a peculiar trait of the SIB residents which we would like to call "vulnerability," and in some qualities of the environment to which the SIB residents returned after conclusion of the treatment.

VULNERABILITY

The thirty month SIB-project gave us an opportunity to study these individuals with SIB on a daily basis over a prolonged time. We were impressed by the great vulnerability these people exhibited against all types of experiences which had SIB evoking qualities. These were of an affective or an environmental nature.

The first ones involved the family or the teaching staff.(__).,A twenty year old blind autistic resident reacted with SIB to the voice of her mother and became upset whenever the mother visited. ESS had been very effective suppressing her SIB. After she had been practically free from SIB for two and a half months except for very rare "booster" ESS, a trial visit of the mother upset the resident so much, that she required six ESS the following day.

(__), a ten year old moderately retarded boy, autistic and mute, with a severe SIB, had trantrums with severe SIB following each visit of his overprotective family. His tantrumlike episodes decreased using behavior modification techniques.

Changes in teaching staff were found to be of decisive impact in many instances. Considering the close relationship which developed in time between resident and teacher, especially when the teaching was done daily on a 1:1 basis, it appears quite natural that the resignation of a teacher would evoke a SIB response in the resident.

For example, — reacted this way temporarily to the resignation of a special teacher (__) who had excellent rapport with him. A more serious and

permanent set-back occurred in the case of(__). who had made a remarkable improvement 1n his SIB, tantrum-behavior and performance under the tutelage of a very able teacher (Mr. V.}. After Mr.V's resignation,(__). entered a long lasting episode of regression (TABLE 39 and GRAPH 2).

The simultaneous reaction of several Unit residents to new teaching staff was recorded at the end of August 1975. (__) whose SIB had been completely eliminated by ESS for three full months, required fourteen ESS from August 29th to 31st when new teachers began working with him. In the same time period, two blind residents (__&__) responded in a similar manner to the "unaccustomed voices":(__), whose SIB had been kept at zero level for three months with very rare "booster" ESS (between five and eight per month), suddenly required 66 ESS on August 26; 9 on August 27; and 3 on August 28.(__), without SIB for two months, required five ESS in the period from September 6 to 8, shortly after the new teachers started working.

The deleterious effects of environmental changes on the SIB behavior of the project participants were observed whenever they had to be hospitalized or when they were transferred from the SIB Unit to their original living units after successful treatment.

Recurrences of SIB following illness or hospitalization were noted in numerous residents (__).,(__),(__),(__),(__),(__),&(__).Depending on the length of hospitalization, these reverses were either transitory or permanent, obliterating painstaking efforts of behavior modification treatment of months or years, as in the case of (__) and (__)

(__) had to be hospitalized in short succession for pneumonia (July 1974), recurrent tonsillitis (January 75) and a tonsillectomy (April 1975). The first two hospitalizations were' of four to five days duration and had only a transitory effect on SIB (TABLE 53). The stay at another hospital for surgery lasted for three weeks and caused a major set-back. During this time (__) was not only exposed to a staff strange to him, but also to personnel not trained to use behavior modification methods. In addition, he was kept for "three weeks in restraints

and diapers" at the other hospital which appeared to obliterate previous gains.

The case of(__). (GRAPH 6) illustrates how a long period of suppression of SIB and emesis achieved through aversive stimulation with ESS was decisively curtailed by a lengthy hospitalization for a fracture. It triggered off an episode of SIB and emesis lasting over a year.

After discharge from the SIB Unit the residents had to adjust to an entirely different habitat. They had lived for extended periods in a highly staffed, closely observed and tightly structured environment and returned to a milieu far less structured, less programmed and organized.

An additional factor was the attitude of the staff of the original living units: They were not accustomed to the use of behavior modification and not steeped in its principles. In the case of(__),instead of interdicting firmly when he restrained himself, they tried to prevent it and, when he responded with SIB, they gave up all efforts in frustration. In the case of (__), it was reported they were afraid of her occasional aggressiveness, and in the case of, reports stated that staff were unwilling to accept her because of a "shortage of personnel."

Such experiences seem to confirm the opinion of Bucher and Lovaas (1968) that the durability of the SIB suppression is in large part a function of the environment into which the SIB resident is placed after the conclusion of the treatment.

Chorus (1975) reported that many of their SIB-children seemed to be especially sensitive to all kind of changes which would function as trigger mechanisms for their "autoplectic" behavior, e.g., changes in their peer group or living situation, the arrival of new and unknown, or known but demanding persons, etc.

The "vulnerability" of the SIB residents appeared to be one of their basic characteristics and could explain the persistent recurrences of their SIB even after it had appeared to be eliminated. However, in many instances it was not possible to identify the event that triggered the SIB response to recur. A

graphic demonstration of SIB presents the cyclical pattern of this behavior, suggesting underlying biorhythmic periodicity (GRAPHS 2, 6 and 7).

In discussing the vulnerability of the SIB residents, we simply juxtaposed the SIB and the SIB-evoking event and intentionally refrained from indicating any possible psychodynamic interpretation. Besides being inappropriate within the framework of a behavioral analysis, such undertaking would have been rather speculative and imbued with uncertainty as the following examples might show: When(__),unfailingly reacted to her mother's voice with SIB, it could have signified the desire to get attention or - in view of the antecedent family history - to express hate against the mother or desire to get even with her, or it could have been just irritation by the voice. Similarly, when(__)developed temper outbursts with SIB after each family visit, this was open to interpretation either as an expression of "separation and loss," or an attempt to retain the permissive treatment by his family, or anger to face again the behavioral treatment in the unit.

PERSONNEL

The treatment program in the SIB Unit designed as a full-day structured program, presented an exceptionally arduous task to the entire staff. When trying to work with residents with this difficult behavior disorder, it was very easy for the staff to become frustrated and to "burn out" in a relatively short time (cf. Browning, 1971). Therefore, it was not surprising that the turn-over of newly employed staff dealing directly with the residents (direct care staff) was 55%, which was much higher than the usual turn-over of 30% among new employees at the institution during the same reporting period.

65.7% of direct care staff of the Unit resigned within the first twelve months of employment and an additional 8.5% in the following year, i.e., 75% of the psychiatric technicians resigned within two years of employment, being unable to tolerate the incessant pressure which work in the SIB Unit entailed (cf. Browning, 1971). In contrast, there was much less turn-over in the professional staff positions. (TABLE 54).

In this context, the staff/resident ratio is of primary importance, since the direct care staff had not only to supervise the residents in their daily self-care tasks and activities, *but* also to teach them basic skills. At the end of the first year, eleven psychiatric technicians were available for direct care of nine residents in the unit. According to the staffing formula 3 + 3 + 1 = 7 X 1.6 - 11.2, with three staff people working in the early shift, three in the late shift and one at night, a staff/resident ratio of 3:9 or 1:3 resulted for the day time. (1.6 is an administrative factor which covers absenteeism due to overtime, vacations, illness, etc.).

During the second year the number of residents in the unit increased to twelve and finally to fifteen without corresponding increase of staff. Consequently, the staff/resident ratio declined from 1:3 to 1:5.

This had a twofold effect. First of all, the staff became overburdened, irritable and tired-out. Secondly, their efficiency in programming decreased (see TABLE 55).• This occurred at a time when already four or five residents had improved to such an extent that they were expected to require less attention. Apparently this was an erroneous assumption.

We had the definite impression that the program functioned better, smoother and more efficiently at a time when there were not more than eight to ten SIB residents in the Unit. During the two day shifts the staff/resident ratio of 1:3 appeared to be the minimum to effectively provide a comprehensive behavior modification program for SIB.

IX. RECOMMENDATIONS

Our recommendations based on experience gained while treating eighteen SIB residents with behavior modification techniques over a period of thirty months are concerned with two aspects of the problem: One concerns the resident himself and the best approach to free him from his terrifying affliction; the other one is of a more extrinsic nature and deals with the question of which organizational structure is more favorable for accomplishing the task.

Treatment of a large group of SIB residents within a "special" Unit certainly served best the specific purpose of a pilot study, but it revealed at the same time the inherent disadvantages of such an approach. The grouping of a fairly large number of SIB residents in one area favored mutual stimulation of basically disturbed people who possibly would benefit from a certain degree of privacy. Difficulties arose at the point of their re-transfer into a less structured environment. Finally, the exceptionally high demands made by a "full-day" treatment program on the Unit personnel created permanent staffing problems which ultimately were detrimental to the program, i.e., to the resident.

Therefore, the treatment of SIB using behavior modification, based on daily sessions of one or two hours might have great advantages: It could be conducted within the living area of the resident, it would require fewer specially trained staff accredited in Behavior Modification and it might avoid the difficulties which resulted when residents were to be re-transferred from the SIB Unit into his (her) original living unit.

However, there could be possible disadvantages to this paradigm also: First of all, there is no guarantee, and the literature does not support the notion, that the deceleration of SIB occurring during the short special training sessions, would generalize outside of them. Secondly, our experience, though anecdotally recorded, suggests that the original living unit staff is not particularly receptive to using techniques taught and demonstrated by those who worked with the SIB resident intensively.

X. SUMMARY

The SIB literature was reviewed for etiology, clinical types,duration and treatment modalities. Organization of a special treatment unit within a State Institution was described. A pilot project of treating SIB both by conventional and behavior modification methods was conducted over a period of thirty months. The eighteen SIB residents studied were severely and profoundly retarded adolescents of both sexes. The majority showed traits of autism, different types of phobias and persistent "vulnerability." Problems of self-restraints were discussed. Restraints had acquired stimulus control and intensive structured programming often functioned as aversive event evoking SIB as an avoidance reaction.

Study of treatment methods had the following results: The long term effect of pharmacotropic medication was nil and transitory at best. A combination of several behavior modification techniques, obtained complete extinction of SIB in 50%, partial in 33.3% and none in 16.7%. Behavior modification methods without E.S.S.,though slow acting and time consuming, produced permanent results in 72.7%.Aversive stimulation by ESS suppressed SIB almost instantaneously. Global behavioral changes occurred concomitant to SIB extinction through ESS, making SIB residents accessible to additional self help skill training using behavior modification techniques. However, durability of effect was limited in spite of the fact that ESS was part of an intensive, full-day teaching and behavior modification program. Suppression ofSIB could be maintained through booster ESS. In two of seven cases, ESS lost its aversive qualities. Remote-control ESS was superior to stimulation by "prod," easier to apply, avoided pairing of "prod" and therapist with ESS, and achieved better generalization. The use of ESS appears justified when milder treatment modalities have failed. Possible advantages and disadvantages of full-day program in a "Unit" versus daily training sessions were discussed.

TABLE 1

TYPES OF SIB

1. Head Banging

   Face Slapping

   Head against objects (table, wall, floor, door frame)

   Fists,knees against face, eyes, ears.

   Fists to arms, trunk, thighs.

2. Biting of hands, wrists, arms.

3. Scratching - any body parts.

   Pinching - any body parts.

4. Eye gouging

5. Placing foreign bodies into nose, ears, rectum.

   Ingesting foreign bodies,

6. Rectal digging.

7. Self Mutilation:

   Chewing off lips, fingertips.

   Pulling hair.

   Pulling off nails.

TABLE 2

SIB - DURATION

Author		1 - 4 years	5 - 10 years	11 - 19 years	20 - 31 years
Wolf, Risley, Mees	1964	1 (31/2)			
Allen & Harris	1966	i (1)			
Tate & Baroff	1966		1 (5)		
Mogul & Schiff	1967		1 (8)		
Hamilton, Stephens, Allen	1967			1 (17)	
Bucher & Lovaas	1967 .	,	2 (5,6)	1 (16)	
Peterson & Peterson	1968		1		
Birnbrauer	1968			1 (11)	
Corte, Wolf, Locke	1971	4 (4)			
Miron N. (14 cases)	1972		2 (5,8)		
Merbaum	1973		1 (5)		
Prochaska	1974		1 (6)		
McFarlan & Andy	1975				1 (21)
Azrin, Hughart et. al.	1975	1 *(1/2)*	5 (6-8)	2 (14,18)	3 (20-31)
Fairbault State Hospital	18		9		
	48	10	23	10	5

TABLE 3

SIB-RATES IN THE LITERATURE

	Author	Quotation	SIB per hour	SIB per minute
1962	de Lissovoy		2664 2172	Boys 44.4 Girls 36.2
1966	Tate & Baroff		198-396	3.3 - 6.6
1967	Hamilton, Stephen & Allen	Head-b. 350-6770 Back-b. 560-8870 in 6 hours	58-1128 676 93-1478 820 Av.	1.0-18.8 11.3 min. 1.6-24.6 13.7 min Av.
1968	Peterson & Peterson		1596	26.6
1968 1969	Bucher & Lovaas (John) (Gregg)	3,000/day 900/day	125 37.5	2.08 0.63
1971	Corte, Wolfe #2 & Locke #2 #1 #1	195 15 min 158 15 min 20-50 15 min 15-30 15 min	776 632 80-200 60-120	13 10.5 1.3 - 3.3 1 - 2
1972	Miron (Jan) (Jan & Robert) (Katie) Variability:(bedrm) (training room)	3,000-20,000 average 6,000/day 15,000-20,000 4,000/day	125-833 250 625-833 167 10,800 27	2.1 - 14 4.2 10.4 - 14 2.8 180 0.45
1973	Merbaum	55-419 10 min av.221 10 min	330-2520 av. 1326	5.5 - 42 av. 22
1974	Prochaska		210	3.5
1975	McFarlan & Andy		750-2724 av. 1344	12.5 - 45.4 av. 22.4

TABLE 4

SIB - FORMS, CAUSES AND INTERPRETATIONS

MILD TRANSITORY HABIT	4 - 15% in normal children up to age 4.	Kanner	1952
	Indulgence in pleasurable activity	Spock	1952
	SeIf-gratification	Kravitz	1960
		de Lissovoy	1962
		Collins	1964
SEVERE PATHOLOGICAL FORM	Neurosis	A. Freud	1946
	Organ-inferiority	Fenichel	1956
	Auto-erotism	Silberstein	1966
	Ego-impairment	Green	1969
	Poor body image	Costenoble	1975
	Anaclitic depression secondary to maternal deprivation	Spitz £ Wolf	1946
	Guilt of children	Spitz	1953
	Anger	Kanner	1952
	Fear	Costenoble	1975
	Frustration and despair	Dizmang	1967
	Rejection and separation from mother		
	Suicidal tendency		
	Death wish	Ferenczi	1956
	Self-aggression	Hartman	1949
	Masochism	Sandler	1964
	Obsession - Compulsion	Bruhl"	1970
	Schizophrenic reaction	Goldfarb	1958
		Ristic	1970
	Autism	Chorus	1975
	Cyclic psychotic reaction	Fielding	1970
	Social reinforcement	Ferster	1961
	Learned, operant, instrumental social behavior	Bucher & Lovaas	1968
ORGANIC DISORDERS			
GENETIC SEX LINKED RECESSIVE	Hyperuricemia, mental retardation & choreoathetosis	Lesch, Nyhan	1964
	Cornelia de Lange syndrome	Shear, Nyhan et al	1971
	Down's syndrome	Miron	**1972**

TABLE 5

TRADITIONAL TREATMENT METHODS OF SIB

1. Sedation (Phenobarbital, Chloralhydrate).
2. Tranquilizing Drugs (exogenous depressants) acting as chemical restraints.
3. Physical restraints for protection against temporary and permanent injury:
    a. Restraint devices:
        Helmets, mittens, wrists to belt etc.
        4-point restraints at night.
    b. Staff restraint
    c. Self restraint
4. Non-contingent isolation.
5. Change of environment:
    Change of milieu, peers,personnel, through transfer to another ward or dorm.

TABLE 6

TREATMENT OF SIB BY BEHAVIOR MODIFICATION

USE OF OPERANT CONDITIONING TECHNIQUES

1. Extinction of undesirable behavior (SIB):

   Removing of environmental contingencies which reinforce SIB (stimulus control) by ignoring all SIB.

2. Establishing of incompatible behavior:

   Positive reinforcement of desirable behavior through:

   a. DRO (differential reinforcement of other behaviors):

   b. Structured, full day, programs.

3. Suppression of self destruction behavior (SIB)

   by "operant punishment" procedures:

   a. Contingent "social withdrawal;"

   b. Contingent removal of reinforcing manipulanda;

   c. Contingent "time-out" (standing box 5 minutes);

   d. Contingent "aversive (noxious)" stimuli:

      Squirt bottle;

      Electric skin shock (ESS).

TABLE 7

NUMBER OF SIB CASES TREATED WITH BEHAVIOR MODIFICATION AND/OR ESS

Author	Year	No. of Patients	ESS	Treatment
Wolf, Risley £ Mees	1964-67	1	0	All day
Hamilton, Stephens £ Allen	1967	2	0	All day
Peterson £ Peterson	1968	1	0	Daily sessions
Brawley et al.	1969	1	0	Daily sessions
Lane & Domrath	1970	1	0	Daily sessions
Myers £ Deibert	1971	1	0	Daily sessions
Jones et al.	1974	1	0	Daily sessions
Azrin,Hughart et al.*	1975	11	0	All day
Tate & Baroff	1966	1	1	Sessions (20 p.d.)
Bucher £ Lovaas	1967	4	3	Daily sessions
Risley (Climbing girl)	1968	1	1	Laboratory sessions 4 times per week- all day at home
Bimbrauer (aggressive boy)	1968	1	1	Daily sessions
Ludwig (psychotic aggressive adult)	1969	*1*	1	Daily sessions
Corte,Wolf&Locke	1971	4	4	Daily sessions
Browning	1971	5	3	Full day
Miron	1972-74	14	11	a. All day - prod. b. Sessions 1) prod. 2) remote con
Merbaum	1973	i	1	All day at home
Prochaska	1974	1	1	a. Sessions - prod. b. All day - remote con,
Rechter & Vrablic	1974	2	2	Daily sessions
McFarlan & Andy	1975	1	1	Daily sessions

Published after the termination of this investigation.

TABLE 8

E.S.S. SESSIONS

		LENGTH OF SESSION	FREQUENCY	TOTAL DURATION OF THERAPY	NO. OF ESS	TOTAL NO. SHOCKS
Tate & Baroff 1966		90 Minutes 5½ hours 8½	2 x per day	10 days	9 20 15	 44
Lisley, 1968 6 yr. girl (climbing)		10 Minutes 20-30 Min. 0.5-1.5 hr. At home	4 x per week	5 Sessions 12 sessions 10 sessions All day Aggression	6 1 (booster) 50 17	 50
Hirnbrauer, 1968 11 yr. aggressive boy		60-90 Min.	Daily	4 Sessions 5 Sessions	11 6	 17
Lucher & Lovaas, 1968		John (7) Linda (7½) Marilyn (16) M.R.	Daily	4 out of 30 sessions 4 additional	12 15 5	
Ludwig et al., 1969 Psychotic female)		20 Minutes 30 Minutes	5 x per day 1 x per day	5 months		
orte, Wolf, Locke 971	1. 2. 3. 4.	15 Minutes 15 Minutes 5 Minutes 5 Minutes	Daily Daily Daily Daily	5 Sessions 8 Sessions 4 Sessions 8 Sessions	3 + 1 22 + 5 96	4 27 97
iron, 1972, 2974	a. b.	in the "Ward" 20 Minutes	Whole day 3-4 per day	2 Years 12 Sessions		
cFarlan, Andy 1975		2 Minutes	Daily	9 Sessions 7 Days	22 per min.	44 9
erbaum 1973		School & Home	All Day		17	25
rochaska 1974	a. b.	30 Minutes	3 x per week All Day	7 Sessions 1 Week		Prod. Remote Cont

TABLE 9

IDENTIFIABLE ANTECEDENT STIMULI

Rank	Item	% of Questionnaires Listing Item (N = 190)	% of Total Items Listed (N = 389)
1.	Unknown	33.7%	16.4%
2.	Dissatisfaction with current state (clothing, toys,being wet, denied "own way")	28.4%	13.9%
3.	"Boredom" or lack of staff attention	15.8%	7.7%
4.	Being teased by other residents	14.7%	7.2%
5.	Noise	12.6%	6.2%
6.	"Forced" activity	11.6%	5.6%
7.	Impatience (waiting for a routine event)	11.6%	5.6%
8.	Restriction of geographic mobility (res- •triction to place)	11.0%	5.4%
9.	Interruption of ongoing activity (stereotypic), loss of materials or "play" food	10.5%	5.1%
10.	Novel environment of change in geographic position or location	8.9%	4.4%
11.	Being physically abused by other residents	7.9%	3.9%

TABLE 10

ESS - EQUIPMENT

Monitoring Equipment

i. Close circuit T.V. cameras for observation.
2. Standard video tape recorder with screen.

Remote controlled ESS device

1. Portable transmitter with key board.
2. Receiver Unit worn by patient (in a bag fastened around the waist).

    a. Battery pack of four "C" cell batteries (=6volt) as power source, for
    b. Standard shock generator
    c. Modified personal pager receiver providing a pulse of one second.

3. Monitor receiver with cassette-recorder for automatic documentation.

Walkie-Talkie equipment

Data storage in computer.

TABLE 11

PARAMETERS OF HOT SHOT PROD

According to Mr. Vera Larson, Superintendent,
Hot Shot Production Company, Savage, Minnesota

	Voltage (Prim. Coil)	Induced Voltage (Sec. Coil)	Milli-Amps
3 Batteries	4.5 V	3000	< 15 M.-Amps
4 Batteries	6.0 V	3,500 - 4,000	< 20 M.-Amps
5 Batteries	7.5 V	4,500 - 5,000	< 25 M.-Amps
7 Batteries	10.5 V		Max 25 M.-Amps
8 Batteries	12.0 V		

Used in present investigation.

TABLE 12

SAFETY MEASURES IK ESS

(Acc. to W. H. Butterfield)

1. Current intensity, not voltage, has to be low, not to exceed 10 milli-amps.

2. Shock to be applied to limbs only (arm, thigh, calf).

3. Both electrodes to be placed on a single extremity and close together (5.0 cm distance)

4. Avoid accidental grounding (radiator pipes, water taps, bath tub, wet floor, perspiration).

5. Good insulation of equipment against leakage currents.

6. Equipment to conform to safety standards.

TABLE 13

SELF-INJURIOUS BEHAVIOR DATA

Name:

DETERMINATION POINT	1	2	3
DAYS IN PROJECT	21	42	63
DATE	1974 12-4	12-19	1975 1-14
TOTAL NUMBER OF TIME SAMPLES	65	73	63
TOTAL SAMPLE TIME DURATION (minutes)	325	365	315
PERCENT OF SAMPLES IN WHICH SIB OCCURRED	87	91	94
RANGE OF SIB FREQUENCY PER FIVE MINUTES WHEN SIB OCCURRED	1-246	2-215	1-119
AVERAGE SIB PER MINUTE IF SIB OCCURRED DURING SAMPLES	9.65	"8.95	8.44
PERCENT OF SAMPLE TIMES IN - WHICH RESIDENT WAS RESTRAINED	14	16	27
PERCENT OF TIMES IN WHICH STAFF-RESIDENT INTERACTION TOOK PLACE	58	68	62

TABLE 14

PERMISSION PROCEDURE FOR ESS

Written parental consent.

Team proposal.

Review by Research Review Committee at Faribault State Hospital.

Review by Review Board of Faribault State Hospital.

Consent of Medical Policy Committee of Department of Public Welfare.

Final approval by Assistant Commissioner.

Approval by Judge of Probate Court in M.R. cases committed to the State of Minnesota.

TABLE 15

TYPES OF TREATMENTS USED IN SIB PROJECT

Tranquilizers, (major or minor)

Hypnotics (sleeping medication) p.r.n.

Anti-cholinergic medication (anti-Parkinson)

Adrenergic medication (against enuresis)

Anti-histaminic medication (anti-pruritic)

Anti-convulsants in epileptic patients

Hormones (estrogens)

Vitamins in large doses (Vitamin C, Folic acid, Pyridoxine)

Restraints - used for all patients, at some time

Protective dressings and/or helmets

Programming - used for all patients

Aversive shock

TABLE 16

RESTRAINTS

USED IN SIB PROJECT

	No. of Residents
Belt with wristlets or arm-wheelchair-ties used in	11
Protective devices (gloves, mittens, bandages, collars, splints, etc.) used in	7
Helmets used in	4
"Self-restraints" exhibited by	9

TABLE 17

EFFECT OF MASSAGE PROGRAM

OK SIB INCIDENCE

m - 15 years)

Date	SIB Before	SIB During	SIB After Massage
l-23-74	48	10	47
2-12-74	13	1	17
3-5-74	5	1	3
3_26-74	15	12	35
5-7-74	I	3	2
6-4-74	4	0	1
7-2-74	9	1	11
7-30-74	1-2	0	0
8-27-74	2	0	1
9-24-74	0	0	
10-22-74	0	0	

TABLE 18

DAILY ACTIVITY SCHEDULE

Get up, toileting, handwashing

Breakfast

Toileting (bowel care), facewashing, toothbrushing, and dressing.

Music Therapy

Juice Break

Library

Industrial Arts (painting, woodcraft, clay modeling)

Toileting and handwashing

Lunch

Handwashing and toothbrushing

Special Adjunctive Programs (Attention, Eye Contact)

Special Programs

Occupational Therapy

Juice Break

Car ride on Monday & Wednesday. Group Activity on Tuesday £ Thursday £ Friday using kitchen.

Special Programs

Handwashing

Supper

Facewashing, toothbrushing and toileting

Bathing and special programs

T.V. and unstructured time

Toileting and bed time

A. Self-care-skills (1:1 basis)

1. Hand washing
2. Face washing
3. Tooth brushing
4. Dressing
5. Eating, incl. tray carrying
6. Toilet training
7. Grooming
8. Bathing

B. Gross Motor Skills:

Indoor activities:
Airmat, play ball, stairwalking;
Outdoor activities:
Play ball, playground equipment (slide, tricycle).

C- Fine Motor Skills:

Table activities;
Tactile programs;
Workshop.

D. Discrimination (1:1 basis)

Texture, scent, shape, temperature.

E. Communication (1:1 basis)

Attention span training;
Eye contact training;
Receptive language:
Response to name; "come on call;"
• Understanding and response to commands.
Expressive language:
Sign language;
Special therapy.

F. Play Activities:

Coloring; fingerpainting; clay molding.

G. Social Activities:

Group play; quiet time;
Outside activities:
Walk, picnics, movies, church, etc.

H. Special Elimination Programs:

Food grabbing;
Tearing clothes;
Undressing.

TABLE 20

EFFECT OF AVERSIVE STIMULATION ON SIB

Cold Water Squirt-bottle Program

RESIDENT	DATE	SIB cts/min	% of SIB OCCURRENCE	% RESTRAINT TIME
	3/26/74	.16	14	56
	4/16/74	.19	13	7
	5/14/74	.32	16	5
	6/11/74	.09	3	0
	7/9/74	.08	-9	2
	8/6/74	.18	5	0
	8/6/74	Program discontinued after no SIB occurred in the last three weeks.		
	3/19/74	1.41	53	24
	4/9/74	2.15	81	25
	4/30/74	1.26	36	6
	5/21/74	.43	38	3
	6/11/74	.61	32	41
	7/9/74	1.13	40	24
	8/6/74	.45	39	50
	8/6/74	Program disccontinued for the last 10 days.		

Effect of Squirt-Program on SIB

5/1/74	SIB in 79% of samples	Taken during application of Squirt-Bottle
5/22/74	SIB in 76% of samples	
6/11/74	SIB in 30% of samples	
7/9/74	SIB in 9% of samples	
8/6/74	SIB In 0% of samples	
10/2/74	"Squirt" program found not effective anymore.	

TABLE 21

FADING HELMET PROGRAM

Fem. - 11 yrs.)

Date	Days In Program	Clinical Comments
5/8/73	42 days	Wears helmet day and night
5/29/73	63 days	Helmet off for 2 x 15 min. in 12 hours
6/18/73	84 days	Helmet off for 3 x 15 min. in 12 hours
7/10/73	105 days	Helmet off for 3 x 20 min. (1 hr.) in 12 hours
8/21/73	147 days	Helmet off for 4 x 20 min. in 12 hours
10/2/73	189 days	Helmet off for 6 X 20 min. (2 hrs.)
11/13/73	231 days	Helmet off for 7 x 20 min. in 12 hours
12/4/73	252 days	Helmet off for 9 x 20 min. (3 hrs.)
1/15/74	294 days	Helmet off for 9 x 30 min. (4 1/2 hrs.)
2/5/74	315 days	Helmet off for up to 10 hrs. in 12 hours
2/10/74	320 days	XXXX throws helmet away; likes to wear ribbon or a little hat instead.

TOTAL FADING PROGRAM TOOK 257 DAYS (36 weeks).

TABLE 22

FADING PROGRAM OF AVERSIVE STIMULATION APPARATUS

Program Application Requirements:

Fading Program will be initiated after seven consecutive days of no SIB or restraint. Each step of the program will advance at seven day intervals providing no SIB or restraint has occurred. Therefore, the shortest time in which the program can be completed is six weeks.

If the aversive stimulation program has to be reinstated for re-occurrence of SIB, the fading program is to be discontinued and can be re-instated (beginning from step 1) only after program application requirements are met once again.

Resident Name:

Tentative Date	Program Step	Step Description
	1.	Wearing of Dummy Bag (2 blocks of wood and foam rubber) with wires, electrodes, and 1 inch tape.
	2.	Wearing of Dummy Bag (2 blocks of wood and foam rubber) with modified wires and electrodes and 1 inch tape.
	3.	Wearing of Dummy Bag (1 block of wood and foam rubber) with modified wires without electrodes and 1/2 inch tape.
	4.	Wearing of Dummy Bag (foam rubber) and 1/2 inch tape.
	5.	Wearing of Dummy Bag (cloth bag only).
	6.	Removal of Dummy Bag.

TABLE 23

PROFILES IN 18 RESIDENTS IN SIB UNIT

Residents of:	Faribault State Hospital	11
	Cambridge State Hospital	4
	Brainerd State Hospital	3
Sex:	Hale	11
	Female	7
Mental Retardation:	Moderate	
	Severe	
	Profound - severe	
	Profound	

Etiological Diagnosis of Mental Retardation:

Autism-Schizophrenia	4	Down's	2
Anoxemia	3	PKU	2
Prematurity	3	Undetermined	2
Familial	2		
Epilepsy	4		
Blindness	2		

Present Ages:	8 - 9 years	2
	10 - 19 years	11
	20 - 29 years	
	32 years	1
Age of Onset of SIB:	1 - 2 years - at home	2
	6 years - at home	10
	8 - 11 years - at home	5
	12 years - in the institution	1
Duration of SIB:	3 - 4 years	3
	5 - 7 years	6
	9 - 11 years	
	13 - 15 years	
	22 years	1

TABLE 24

INTELLIGENCE RATINGS

RESIDENT	Date	M.A.	I.Q.	LEVEL	Eating	Dressing	Toilet Training	Speech
[redacted] (m)	2/15/71	3-2	49	Moderate	+	+	+	0
[redacted] (f)	9/16/57	4-7	32	Severe	+	+	+	+
[redacted] (f)	11/6/74	3-5	26	Severe	+	+	+	+
[redacted] (f)	11/9/66	3	25	Severe	0	0	+	+
[redacted] (m)	9/21/71	2-7	24	Severe	+	+	+	0
[redacted] (m)	10/18/74	2-8	18	Severe	+	+	+	±
[redacted] (f)	7/15/70	1-1	23(?)	Severe-Prof.	0	0	0	0
[redacted] (m)		untestable		Severe	+	±	0	0
[redacted] (m)	1971	1-6	18	Profound	0	+	0	±
[redacted] (f)	4/21/70	1-6	10	Profound-severe	±	±	±	0
[redacted] (f)	4/1/71	untestable		Profound-severe	0	±	0	0
[redacted] (m)	3/29/74	untestable		Profound-severe	+	0	0	0
[redacted] (m)	1/9/69	untestable		Profound	+	0	+	0
[redacted] (m)	4/2/73	1-8	11	Profound	+	0	0	0
[redacted] (f)	2/6/68	1	9.5	Profound	+	0	±	0
[redacted] (m)	2/23/61	0-8	9	Profound	+	+	0	0
[redacted] (m)	9/27/62	untestable		Profound	+	±	0	0
[redacted] (m)	11/14/72	untestable		Profound	+	0	0	0

TABLE 25

AGE OF ONSET AND DURATION OF SIB

RESIDENT	Admission Age to SIB Unit	Age of Onset Of SIB	Duration Of SIB
[redacted] (m)	7	22 mos.	5 years
[redacted] (f)	9	5 years	4 years
[redacted] (m)	10	1 year	9 years
[redacted] (m)	10	5 years	5 years
[redacted] (f)	11	6 years	5 years
[redacted] (m)	12	5 years	7 years
[redacted] (m)	12	8 years	4 years
[redacted] (m)	14	4 years	10 years
[redacted] (m)	15	4 years	11 years
[redacted] (f)	15	12 years	3 years
[redacted] (m)	16	Before 11	5 years
[redacted] (m)	17	4 years	13 years
[redacted] (f)	17	10 years	7 years
[redacted] (f)	20	5 years	15 years
[redacted] (f)	20	6 years	14 years
[redacted] (m)	20	10 years	10 years
[redacted] (m)	21	6 years	15 years
[redacted] (f)	31	10 years	21 years

TABLE 26

TYPES OF INJURIOUS BEHAVIOR
TREATED IN THE SIB PROJECT

	No. of residents
Head banging (hand, fist, or knee to head)	16
Head banging, causing trauma to face	6
Banging head or back against objects	15
Head banging, plus hitting other areas of body	9
Head banging, plus biting and scratching wrists and arms	6
Head hangings plus self induced emesis	1

TABLE 27

TYPES OF SIB

RESIDENT	Hitting Face, Fist or Knee Slapping Face.	Trauma to Eyes, Cheeks, Lips, Mouth	Hitting and Slapping Other Body Regions	Banging Head or Back Against Objects	Biting of Wrists Scratching different Body Regions	EMESIS
[redacted] (m)	-	Scalp wounds	-	+ door frames	-	
[redacted] (f)	+	Temporal sores	-	+ floor, wheelchair	-	
[redacted]. (m)	+	Retinal detachment Left Eye	+	+ Head objects Knees floor	-	
[redacted] (m)	+	Bites lower lip	+	+ Wall	-	
[redacted]. (f)	+	Laceration lower lip and jaw	+	+ Wall	Scratches face & neck	
[redacted]. (f)	+	Sores of ear region	+	-	Scratches severely all body regions	
[redacted]. (m)	+	-	-	-	Bites & scratches arms and wrists	
[redacted]. (m)	-	-	-	+ Head floor or objects	Bites wrists and fingers	
[redacted]. (f)	+	-	-	+ Back objects	Bites herself	
[redacted]. (f)	+	-	+	+ Head floor	Bites herself occ.	
[redacted] (m)	+	-	+	+ Head wall occ.		
[redacted] (m)	+	-	+	-		
[redacted] (m)	+	-	+	+ Head wall, wheelchair		
[redacted] (f)	+	-	-	+ Head wall		
[redacted]. (m)	+	-	-	+ Head wall		
[redacted] (f)	+	-	-	+ Head wall and floor		
[redacted]. (m)	+	-	-	+ Head objects occ.		
[redacted] (m)	+	-	+ severe	+ Head table and floor		+ severe
	16	6	9	15	6	1

TABLE 28

SIB - RATES

(Base rates and Maximal rates)

RESIDENT	Base Rate SIB cts/min d.21	d.42	Average SIB Base Rt. cts/ Min.	cts/ Hr.	Max. SIB Rate Observed cts./ Min.	cts./ Hr.	% of SIB Occurrence	Clinical Evaluation of Severity
[redacted] (m)	.004		.004	.24	.004	.24	2	Moderately severe
[redacted] (m)	.09	.04	.07	4.2	.09	5.4	6	Moderately severe
[redacted] (m)	.15	.02	.09	5.4	.17	10.2	13	Severe
(m)	.15	.09	.12	7.2	1.02	60.	11	Moderately severe
(m)	.28	.01	.15	9.0	3.35	201	5.5	Severe
(m)	.29	.32	.31	18.6	.76	46	34.5	Severe
[redacted] (m)	.55	.25	.40	24	2.18	132	30.5	Very severe
[redacted] (f)	1.41	.25	.83	50	2.03	122	24	Severe
[redacted] (f)	.74	.95	.85	51	4.53	272	45	Very severe
[redacted] (m)	.06	1.82	.94	56	4.3	258	42	Severe
[redacted] (f)	1.91	.06	.99	59	1.91	155	18	Severe
[redacted] (f)	2.32	.31	1.32	79	2.32	138	17	Very severe
[redacted] (f)	3.5	6.60	5.05	300	6.6	396	49	Very severe
[redacted] (f)	10.9	.50	5.70	342	10.9	660	38	Severe
[redacted] (m)	3.25	8.47	5.86	352	8.47	508	51	Very severe
[redacted] (f)	10.9	1.63	6.28	377	10.9	660	29	Severe
[redacted] (m)	9.64	8.95	9.30	558	9.3	578	89	Very severe
[redacted] (m)	3.95	21.13	12.50	750	21.13	1270	52	Very severe

TABLE 29

SIB - BASE RATES AND GRADES OF SEVERITY

	SIB - Base Rates cts/min Min	Max	cts/hrs Min	Max	SIB - Rates average cts/min	cts/hrs	Grade
Group I	.001	.15	• 24	9.0	.088	5.28	Moderately severe
Group II	.31	.99	18.6	59.0	.72	43.2	Severe
Group III	1.32	12.50	79	750.0 .	6.57	394.4	Very severe

TABLE 30

PERSONALITY TRAITS

10 Male SIB - RESIDENTS

Hyperactivity-restlessness					+	+	+			++
Destructive tendencies		++		+	+	+			occ.	
Aggression-out (primary)	+	+								occ. +
Tantrums (explosive pers.)	++	+	++	+		+	+			occ.
Screaming spells (crying)	+		+		+	++	++			
Noisiness				+						
Sleep disturbance				+		+		+	++	
Aloofness asocial behavior	+		+	+	+	++	+	++	+	+
Interaction with peers			0	0	0	0	0	0	0	0
Seeks selfprotection (hiding)						+		++	++	
Restrains self						+	+++	++	+++	+
Seeks restraints							+	+	++	+
Likes physical contact	+		+		+			+		+
Dislikes (avoids) physical contact									+	
Eye contact		poor	poor		0	poor	good	0	0	poor
Attention span		short	very short	short	very short	very short	very short	very short	very short	good
Motivation	+	+			0					
Resists programming (uncooperative and stubborn)				+					++	
Responds to program w/SIB		+	+	+			++	++	+	+
Responds to program with noise				+		++	++			
Responds w/aggression	+	+					+	+	+	
Frustration level		low	low			low				

TABLE 31

PERSONALITY TRAITS

7 Female SIB - RESIDENTS

Hyperactivity-restlessness		+					
Destructive tendencies			+	+		+	
Aggression-out (primary)			+	+			
Tantrums (explosive personality)			++	++		+	+
Screaming spells (crying)		+	+	+		++	+
Noisiness				+			+
Sleep disturbance		+	+	+		+	+
Aloofness asocial behavior	+	++	+	+	+		+
Interaction with peers		0	0	0	0		
Seeks self-protection (hiding)		+				+	
Restrains self		+	+			++	+
Seeks restraints				++		+	
Likes physical contact					+	+	
Dislikes (avoids) physical contact			+				
Eye contact	poor	none	poor			-	-
Attention span		short	short		good		short
Motivation	0	0	0				
Resists programming (uncooperative and stubborn)	++		++	++	++	+	+
Responds to program w/SIB		+	+	+	+	+	
Responds to program w/noise			+	++			
Responds with aggression				++	+		±

TABLE 32

TRAITS	M 10	F 7	Total No.	Per Cent
SIB	10	7	17	100
Social aloofness	9	6	15	88
No interaction with peers	8	4	12	71
Attention span short	8	3	11	65
Tantrums	7	4	11	65
Eye contact, none or poor	7	3	10	59
Restraints-self or seeks restraints	4	5	9	53
Sleep disturbance	3	5	8	47
Destructive tendencies	5	2	7	41
Screaming spells	2	4	6	35
Seeks physical contact	4	2	6	35
Hyperactivity	4	1	5	29
Aggression-out	3	2	5	29
Seeks self-protection	3	2	5	29
Resists programming •	2	6	8	47
Reacts to programming				
with SIB	7	5	12	71
with aggression-out	5	2	7	41
with noisiness	3	2	5	29
No motivation	1	3	4	24
Avoids physical contact	1	i	2	12

TABLE 33

SELF RESTRAINTS

RESIDENT	Percent of sample time	Forms of self-restraints
[redacted].(m)	82-98	Wraps towels around forearms; pushes hands into his shirts
.(m)	61-88	Wraps himself up into blankets and shirt; carries pillow or blanket over his head
.(m)	62	Crawls into his T-shirt; wraps arms up into his T-shirt
.(f)	25-50	Wraps fingers up into her necklace during day time; Wraps herself up into her pajamas at night
(m)	30-55	Restrains his right arm in his shirt at night
.(f)	25	Hides arms high up under blouse
.(f)	7-15	Hides hands behind apron
.(f)	81	Sits on hands (at times)
.(m)	16-30	Puts hands in pants; sits on hands
.(m)	?	Hooks arms under staff's arms while near staff or hooks arms under arms of chair

TABLE 34

SIB-OCCURRENCE AND STAFF-RESIDENT INTERACTION

__, male, 10 yrs)

	Unit School	Unit School	Unit School	Unit School
DATE	10/22/74	11/20/74	12/18/74	1/14/75
SIB Occurrence % of sample time	0 0	9 0	4 9	15 64
Average SIB per min	• 0 0	2.49 0	.04 14	.17 .87
Staff - Resident % interaction	41 67	26 73	45 91	39 100

TABLE 35

SIB-OCCURRENCE AND STAFF-RESIDENT INTERACTION

(__, male, 10 yrs)

	Unit	School/Unit	School/Unit	School/Unit	School/Unit	School/Unit	School/Unit	School
DATE	10/15/74	10/29/74	11/19/74	12/10/74	1/21/75	2/11/75	3/4/75	
SIB Occurrence % sample time	52 ! 75	48 | 25	62 53	26 54	4 6	29 21	28 13	
Average SIB per min	9.06 4.9.	3,03! 1.2	5.92 6.04	3.84 1.9	.23 .13	3.28 .82	2.56 .65	
Staff-Resident % interaction	60 k00	75 ! 83	62 82	50 100	58 [94	52 | 97	51 87	

TABLE 36

LENGTH OF SIB TREATMENT AND RESULTS

TABLE 37

RESULTS OF BEHAVIOR MODIFICATION I

(Excellent Results)

RESIDENT	Period	Aver. SIB Rate cts/min	cts/hr	% of SIB occurrence	Restraints per cent
___ (m)	Base rate d.21-42	.004	.24	2	79
	d. 42-84	0	0	0	33
	d. 106-175	0	0	0	3
	one year follow up	0	0	0	0
___ (f)	Base rate d.21-42	.99	59.4	18	65
	d. 63-189	.11	6.6	3	20
	d. 210-553	.08	4.8	2.3	0.8
	B.R. at readmission	.15	9.0	3.5	28
	d. 56-280	.06	3.6	1.6	0.6
	4 mos. follow up	.01	.6	4.0	0
. (m)	Base rate d.21-42	.07	4.2	6	1.5
	d. 63-329	.03	1.7	4.7	.25
	Final day 364	.01	.6	5	0
	10 mos. follow up	.02	1.2	5	0
___ (f)	Base rate d.21-42	5.05	300	49	100
	d. 63-315	.20	12	19	83
	d. 336-406	.03	1.8	6	0
	Final day 434	.01	.6	1	0
	First 6 mos. follow up	.03	1.8	4.7	0
	Second 6 mos. follow up	.47	28	47	30

TABLE 38

RESULTS OF BEHAVIOR MODIFICATION II

(Good clinical results)

RESIDENT	Period	Aver. SIB Rate cts/min	cts/hr	% of SIB occurrence	Restraints per cent
(m)	Base rate d.21-42	.09	5.4	13	26
	d. 63-119	.15	9.0	15	60
	Final obser. day 147	.04	2.4	4	17
	1 year follow up	.09	5.4	9	25
On).	Base rate d.21-42	.12	7.2	11	
	d. 63-231	.40	24.0	28	.43
	d.266-434	.25	15.0	22	.14
	Final day 462	.10	6	9	
. (m)	Base rate d. 21-42	.31	18.6	34.5	0
	d. 63-140	.28	16.8	18	0
	1 year follow up	.35	21	26	2.2

TABLE 39

RESULTS OF BEHAVIOR MODIFICATION III

(Transitory and Poor Results)

RESIDENT	Period	Aver- SIB Rate cts/min	cts/hr	% of SIB occurrence	Restraints per cent
____(m)	Base rate d. 21-42	5.86	352	51	3
	d. 63-126	3.1	188	37	3.7
	d.147-364	.9	54	17	3.7
	12 mo. follow up	2.37	119	32	6
(f)	Base rate d. 21-42	5.7	342	38	44
	d.105-441	1.1	66	39.6	15
	d.469-581	.66	40	29	1
	d.609-763	1.20	72	24	3.4
(m)	Base rate d. 21-42	.94	56	42	100
	d. 63-210	1.86	112	45	76
	d.231-581	4.48	269	38	67
	d.609-917	1.26	76	27	56
	1 yr. follow up	1.57	94	32	82
____(f)	Base rate d. 21-42	6.28	377	29	11.5
	d. 62-175	4.19	251	35	21
	Final obser. day 203	3.34	200	26	18
	1 yr. follow up	3.86	232	35	16

TABLE 40

TREATMENT RESULTS WITH ESS I

(Excellent Results)

RESIDENT	Period	Aver. SIB Rate cts/min	cts/hr	% of SIB occurrence	Restraints per cent	ESS/day
(__) (m)	Base rate d. 21-42	.40	24	30.5	96	
	Before ESS d. 63-189	1.16	70	31.8	100	
	ESS start on day 190					
	Under ESS d.210-415	.007	.42	21	25	.69
	After re-admission d.1-196	0.0	0.0	0.0	29	.16
	One year follow up	.045	2.7	4.4	42	.11
	Second year follow up	.007	.42	2.3	80	0.0
(f)	Base rate d. 21-42	.83	50	24	45.5	
	Before ESS d. 63-126	1.12	67	24.5	68.8	
	ESS start on day 140					
	Under ESS d.147-336	.03	1.8	.8	1.6	.78
	After re-admission d. 1-196	0.0	0.0	0.0	0.0	.16
	One year follow up	.08	4.8	2.8	.1	.12
	Second year follow up	.001	.06	.5	0.0	0.0
(f)	Base rate d. 42-63	1.32	79	17	88	
	Before ESS d.126-357	.17	10	10	76	
	Before ESS d.378-714	.16	9.6	7.7	3	
	ESS start on day 734					
	Under ESS d.742-945	.004	0.24	1.0	0	.63
	First 6 mo. follow up	.001	.06	.4	0	.13
	Second 6 mo. follow up	.28	17	. 15	75	
(m)	Base'rate d. 21-42	12.5	750	52	73	
	Before ESS d. 63-511	5.2	312	49	63	
	ESS start on day 525					
	Under ESS d.539-623	.0	.0	.0	.75	5.41
	After re-admission d. 1-182	.002	.12	.86	1.0	1.04
	First year follow up	.026	1.56	1.55	-.6	.33
	Second year follow up	2.27	136	34	36	.0

TABLE 41

TREATMENT RESULTS WITH ESS II

(Partial or Transitory Results)

RESIDENT	Period	Aver. SIB Rate cts/min	cts/hr	% of SIB occurrence	Restraints per cent	ESS/day
(m)	Base rate d. 21-42	,3	558	89	15	
	Before ESS d. 63-84	,6	455	96	33.5	
	ESS start on day 91					
	Under ESS d.105-315	,03	1.8	6	.75	45.46
	One year follow up	,0	300	77	34	1.49
(f)	Base rate d. 21-42	**.85**	51	45	100	
	Before ESS d. 63-637	**.78**	107	49	57	
	ESS start on day 651					
	Under ESS d.665-784	.0	.0		.0	12.80
	Relapse d.805-924	.18	10.8	**22**	.6	76.17
	4 mos. follow up	.91	54.6	**25**	**50**	.73
(m)	Base rate d. 21-42	,15		5,	100	
	Improvement d. 63-469	,19	11	2.	28	
	Relapse- d.497-805		108	34	95	
	ESS start on day 827					
	Under ESS d.868-952	,014		6	1.75	21.93
	8 mos. follow up	,9	114	38	92	

TABLE 42

AVERSIVE STIMULATION PROGRAM

ESS-rates per hour

RESIDENT							
1st d	1.08	1.30	4.45	13.25	36.00	125.90	150.00
2nd d	0.21	0.62	0.32	5.28	14.59	2.43	77.00
3rd d	0.07	0.41	0.00	1.57	5.65	0.60	149.00
4th d	0.14	0.14	0.21	0.78	12.06	0.00	65.00
5th d	0.21	0.07	0.21	0.43	4.28	0.00	0.96
7th d	0.56	0.35	0.14	0.36	1.71	0.00	0.28
8th d	0.35	0.00	0.00	0.56	0.36	0.00	0.21
10th d	0.07	0.07	0.00	0.42	0.14	0.00	0.14
12th d							
13th d	0.00	0.00	0.00	0.00	0.00	0.00	0.07

TABLE 43

EFFECTS OF ESS

RESIDENT	(__)(m)	(__)(m)	(f)	(f)	[(f)	(m)	Km)
SIB Decrease to 0 within	12d	3d	8d	4d	12d	29d	13d
No. of ESS given	954	54	39	1818	70	6077	303
Extinction complete in	23d	17d	26d	4d	5 wks	14d	partial
Restraints reduced to 0 in	14d		26d	14d	7d	14d	2 mos.
Self restraints reduced to 0 in		5 mos.					
ESS - Loss of aversive quality							
Mood Elevation		++			++		
Affection to staff increased							
Tantrums £ aggression less							
Awareness of surroundings increased	+	+					
Response to commands increased	+	+					
Receptive language acquired							
Expressive language acquired							
Cooperation increased	+	+					
Progress in program enhanced	+	+					
Socialization and group interaction increased	+	+					
Play activity increased	+	+					
Appetite increased	++	+				++	+
Weight gain	14#	15#					9 1/2
within	2 wks	17d				17#	5d
Emesis control within							
Sleep improved					+	2 mos	
Sores healed within					6-14d		

TABLE 44

BOOSTER ESS REQUIRED TO MAINTAIN EXTINCTION OF SIB

RESIDENT	EXTINCTION Project Days	EXTINCTION OF SIB Days	Months	BOOSTER ESS Total No.	average per day	Longest SIB free period
	1.* 168-336	168	5.6	62	.37	65 days
	2.* 16-196	180	6.0	12	.07	90 days
	1.* 210-415	205	6.8	64	.3	92 days
	2.* 1-196	194	6.5	18	.1	42 days
	1.* 539-623	84	2.8	41	.48	19 days
	2.* 1-182	182	5.4	203	1.12	15 days
	742-945	203	6.8	31	.15	68 days
	665-784	119	4.0	50	.42	27 days

*First and second admission to SIB-project

TABLE 45

ACQUISITION OF BASIC SKILLS

(USE OF BEHAVIOR MODIFICATION)

RESIDENT	(__)(m)	(__)(f)	(__)(f)	(___)(f)	(__)(f)	(f)	(___)(m)	(__)(m)	(___)(m)
Hand/W									
h.o.h.				100% 6 wks	100% 2 mos	78% 15 wks	67% 2 mos	100% 37 wks	100% 15 mos
o.c.	100%* 3 wks	100% 6 wks	100% 24 wks	100% 10 mos	100% 7 mos	100% 13 mos	78% 8 mos		
alone	100% 6 mos	100% 9 mos	100% 19 mos.	100% 16 mos	100% 14 mos	44% 17 mos	100% 18 mos		
Face/W									
h.o.h.				100% 6 wks	100% 7 mos	50% 15 wks	65% 8 wks	75% 15 mos	32% 16 mos
o.c.	62% 5 mos	90% 9 wks	100% 7 mos	100% 10 mos	50% 25 mos	50% 17 mos	24% 18 mos		
alone		90% 9 mos	100% 19 mos	100% 16 mos	62% 26 mos				
Tooth/Br.									
h.o.h.				100% 6 wks	100% 6 mos	69% 15 wks	69% 8 mos	56% 15 mos	50% 16 mos
o.c.	100% 2 mos	100% 3 mos	89% 6 mos	100% 10 mos	63% 21 mos	69% 16 mos	50% 18 mos		
alone	50% 8 mos	100% 9 mos	61% 19 mos	100% 16 mos	64% 21 mos				
Eating	+	+	0> +9 mos	0> +8 mos	+ +8 mos	0 +5 mos	+ +4 mos	0 +17 mos	+ +4 mos
Dressing	+	+	+> +9 mos	0>+16 mos	0 +1 yr	0 + 5 mos	+ +5 mos	+ +17 mos	+ +21 mos
Toilet Tr.	+	+	0> +1 yr	+	+ +5 mos	0	0 +21 mos	0 +17 mos	0 +21 mos
Progress Rating	very good	very good	good	good	good	poor	poor	fair	poor

h.o.h. = hand on hand
o.c. = on command at each "step"
"percent" indicates the maximal step attained in the series for each skill within the stated time.

TABLE 46

ACQUISITION OF BASIC SKILLS -

(PROGRESS BEFORE AND AFTER ESS)

	[redacted].(m)		[redacted].(m)		[redacted].(m)	
SKILL	Before ESS	After ESS	Before ESS	After ESS	Before ESS	After ESS
Hand/W h.o.h. o.c. alone	93% 8 mos 44% 13 mos -	100% 3 mos -	22% 3-6 mos 0 -	100% 3 mos 0 -	100% 1 mo 22% 1 mo -	22% 4 mos -
Face/W h.o.h. o.c. alone	36% 1 yr -	91% 3 mos -	16% 5 mos 0% -	16% 2 mos -	25% 1 mo -	25% 4 mos -
Tooth/Br. h.o.h. o.c. alone	81% 10 mos 12.5% 11 mos -	63% 3 mos -	19% 6 mos 0% -	19% 2 mos 81% 2 mos -	19% 1 mo 44% 1 mo	12.5% 4 mos -
Eating	+ +9 mos	very well 6 wks	±	+ 4 mos	+	very well 2 mos
Dressing	0	+ 8 wks	0	+ 2 mos	0	+ 2 mos
Toilet Tr.	0	+ 6 wks	0	+ 2 wks	0	0
Progress Rating	poor	higher % attained at faster rate	very poor	higher % attained at faster rate	no progress	moderate progress

h.o.h. = hand on hand
o.c. = on command at each "step"
"percent" indicates the maximal step attained in the series for each skill within the stated time

TABLE 47 .

LENGTH OF RESIDENCE IN SIB UNIT AND TREATMENT RESULTS WITH BEHAVIOR MODIFICATION

RESIDENT	Residence in Demonstration Project		Acquisition of Basic Skills	Progress in Structured Programs	Extinction of SIB
(m) 14y		8 mos	had basic skills	very good	complete
—(m) 15y		14 mos	had basic skills	very good	complete
.(f)11y		14 mos	very good (100% in 9 mos)	rapid	complete
—(f)22y	1. 18 mos 2* 9 mos	27 mos	good (60-100% in 18 mos)	very good	complete
—(m)21y		11 mos	none	none	complete
[redacted](m)11y		16 mos	very good (50-100% in 8 mos)	very good	partial (transitory
—(m)10y		5 mos	fair (75% in 8 mos)	fairly good	inconsisten
[redacted](m)12y		5 mos	slow	slow	fair
[redacted].(f)18y		26 mos	poor (50-70% in 18 mos)	fair	partial (transitory
.(m)16y		30 mos	poor (25-70% in 18 mos)	fair	none
—(f)9y		6 mos	none	none	none

* Second admission to SIB Unit

TABLE 48

LENGTH OF RESIDENCE IN SIB UNIT AND TREATMENT RESULTS WITH AVERSIVE STIMULATION (ESS)

RESIDENT	Residence in Demonstration Project Prior to ESS	After ESS	Acquisition of Basic Skills	Progress in Structured Program	Extinction of SIB
(__)(m)20y	6.3 mos	1. 6.5m 11.5 mos 2* 5m	rapid 81-100% in 2 mos	good	complete
(__)(f)32y	4,6 mos	1, 5m * 2" 11 mos	has all basic skills	very good	complete
.(f)17y	25.0 mos	5 mos	has 63-100% of basic skills	good	complete
(__)(m)17y	17,5 mos	1. 3.7m A f 9.7 mos 2. 6.0m	rapid 63-100% in 3 mos	good	complete
—(f)21y	22.0 mos	7 mos	has all basic skills	much improved	complete (transitory)
-(m) 8y	2.8 mos	8 mos	only slight progress	enhanced	partial (transitory)
(m)11y	27.0 mos	4 mos	———	enhanced	partial

*Second admission to SIB unit

TABLE 49

LENGTH OF TREATMENT OF SIB

(USE OF BEHAVIOR MODIFICATION)

	Name	Time		Name	Time
Successful cases	(m)	8 mos	Partially-successful cases	(__)(m)	5 mos
	(m)	11 mos			5 mos
	(m)	14 mos		(__)(m)	16 mos
	(f)	14 mos		(__)(f)	26 mos
		18 mos	Unsuccessful cases	(__)(f)	6 mos
		9 mos*		(__)(m)	30 mos
Average Treatment Time		10.6 mos			14.8 mos

*Second admission to SIB Unit

TABLE 50

LENGTH OF TREATMENT OF SIB

(USE OF BEHAVIOR MODIFICATION AND ESS)

RESIDENT	Prior to ESS	Under and After ESS		Total Time of Treatment
[redacted] (m)	2.8 mos	8.0 mos		10.8 mos
[redacted] (f)	4.6 mos	5.0 mos 6.0* mos	11.0 mos	15.6 mos
[redacted] (m)	6.3 mos	5.5 mos 5.0* mos	11.5 mos	17.8 mos
[redacted] (m)	17.5 mos	3.7 mos 6.0* mos	9.7 mos	27.2 mos
[redacted] (f)	22.0 mos	7.0 mos		29.0 mos
[redacted] (f)	25.0 mos	5.0 mos		30.0 mos
[redacted] (m)	27.0 mos	4.0 mos		30.0 mos
Average Treatment Time	15.0 mos	5.6 mos (8.0 mos)		23.0 mos

* Second admission to SIB Unit

TABLE 51

LONG-TERM RESULTS

TREATMENT WITH NON-AVERSIVE BEHAVIOR MODIFICATION 1)

RESIDENT	SIB - Elimination while in Project	Follow-Up results	Observation time	Location	Present Status	Additional Observation time	Location
(m)	Complete for 3 mos	Excellent Very good	1st 6 mos 2nd 6 mos	C.S.H. C.S.H,	Occasional SIB	3 yrs.	C.S.H.[1])
(m)	Complete for 3 mos	Complete elimination	12 mos	C.S.H.	Occasional SIB	3 yrs.	C.S.H.
(m)	Complete	Very good	8 mos	SIB Unit	Occasional SIB	2 yrs.	C.S.H.
(m)	Complete 1* for 12 mos 2* for 7 mos	Good with three intermittent reverses	18 mos	SIB Unit	Rare SIB	18 mos	SIB Unit
(m)	Complete	Good with two short intermit-tent reverses	16 mos	SIB Unit	Complete elimination	16 mos	"Pine" dormitory

*First and second admission to SIB-project
1) Cambridge State Hospital

TABLE 52

LONG-TERM RESULTS

TREATMENT WITH NON-AVERSIVE BEHAVIOR MODIFICATION

RESIDENT	SIB - Elimination while in Project	Follow-Up " results	Observation time	. Location	Present Status	Additional Observation time	Location
(m)	Transitory for 7 mos	Severe recurrence	12 mos	SIB Unit	periodical SIB	3 mos	Special private school
(f)	Transitory for 4 mos	Severe recurrence	5 mos	SIB Unit	SIB completely eliminated	2 yrs	B.S.H.[1]
Cm)	Inconsistent for 5 mos	Inconsistent elimination	11 mos	SIB Unit	SIB completely	2 mos	C.S.H.[2]
(m)	Inconsistent for 5 mos	Inconsistent elimination	24 mos	SIB Unit	Slight improvement	12 mos	SIB Unit
(m)	Inconsistent erratic	Inconsistent elimination		SIB Unit	SIB Completely eliminated	9 mos	M.S.H.[3]
(f)	None for 6 mos	No elimination	12 mos	SIB Unit	Transient SIB major problem (4.1/day)	14 mos	B.S.H.

1) Brainerd State Hospital
2) Cambridge State Hospital
3) Moose Lake State Hospital

TABLE 53

LONG-TERM RESULTS

TREATMENT WITH AVERSIVE STIMULATION

	SIB - PROJECT			FOLLOW-UP		
RESIDENT	Project Days	Elimination	Length of time	Length of time	Elimination of SIB	Location
(f)	1* 168-336	Complete	5.6 mos	d.198-746	almost complete	SIB Unit
	2* 21-196	Complete	6.5 mos	(18 mos)	with one short reverse	
				12 mos	very good (4.24/mo)	Mohawk Dormitory
[redacted] (m)	1* 210-415	Complete	6.8 mos	d.231-948	almost complete	SIB Unit
	2* 28-196	Complete	6.5 mos	(24 mos)	with two short reverses	
				5 mos	fairly good (13.6/mo)	Pine Dormitory
(m)	1* 539-623	Almost	2.8 mos	d.182-552	almost complete	SIB Unit
	2* 21-182	complete	5.4 mos	(12 mos)	with two short reverses	
				d.568-616	severe recurrence	SIB Unit
				(7 wks)		
				d.616-925	partial elimination	SIB Unit
				(10 mos)		
				9 mos	almost complete	SIB Unit
(f)	742-945	Complete	6.8 mos.	d.945-1176	complete	SIB Unit
				(7.7 mos)		
				d.1176-1657	severe recurrence	SIB Unit
				(16 mos)		
				9 mos	almost complete	SIB Unit
[redacted] (f)	665-784	Complete	4.0 mos	d.925-1043	severe recurrence	SIB Unit
	896-924	Complete	27 days	(4.0 mos)	severe recurrence	At home
[redacted] (m)	868-952	Partial & transitory	2.8 mos	d.980-1363 (12.8 mos)	severe recurrence	SIB Unit
[redacted] (m)	105-315	Partial & transitory	7.0 mos	d.425-1153 (24 mos)	severe recurrence of SIB & emesis	SIB Unit

*First and second admission to SIB-Project

TABLE 54

LONG-TERM TREATMENT RESULTS

Elimination of SIB	Non-aversive Behavior Mod.	Aversive stimulation	Total results
Complete elimination	[4a]	2[d]	6
Almost complete	4[b]	2[e]	6
Partial or transient	3[c]		3
No elimination		3[f]	3
	11	7	

Legend: Initials indicate grouping of residents

a) [redacted]
b) [redacted]
c) [redacted]
d) [redacted]

TABLE 55

EFFEC OF HOSPITALIZATION ON SIB

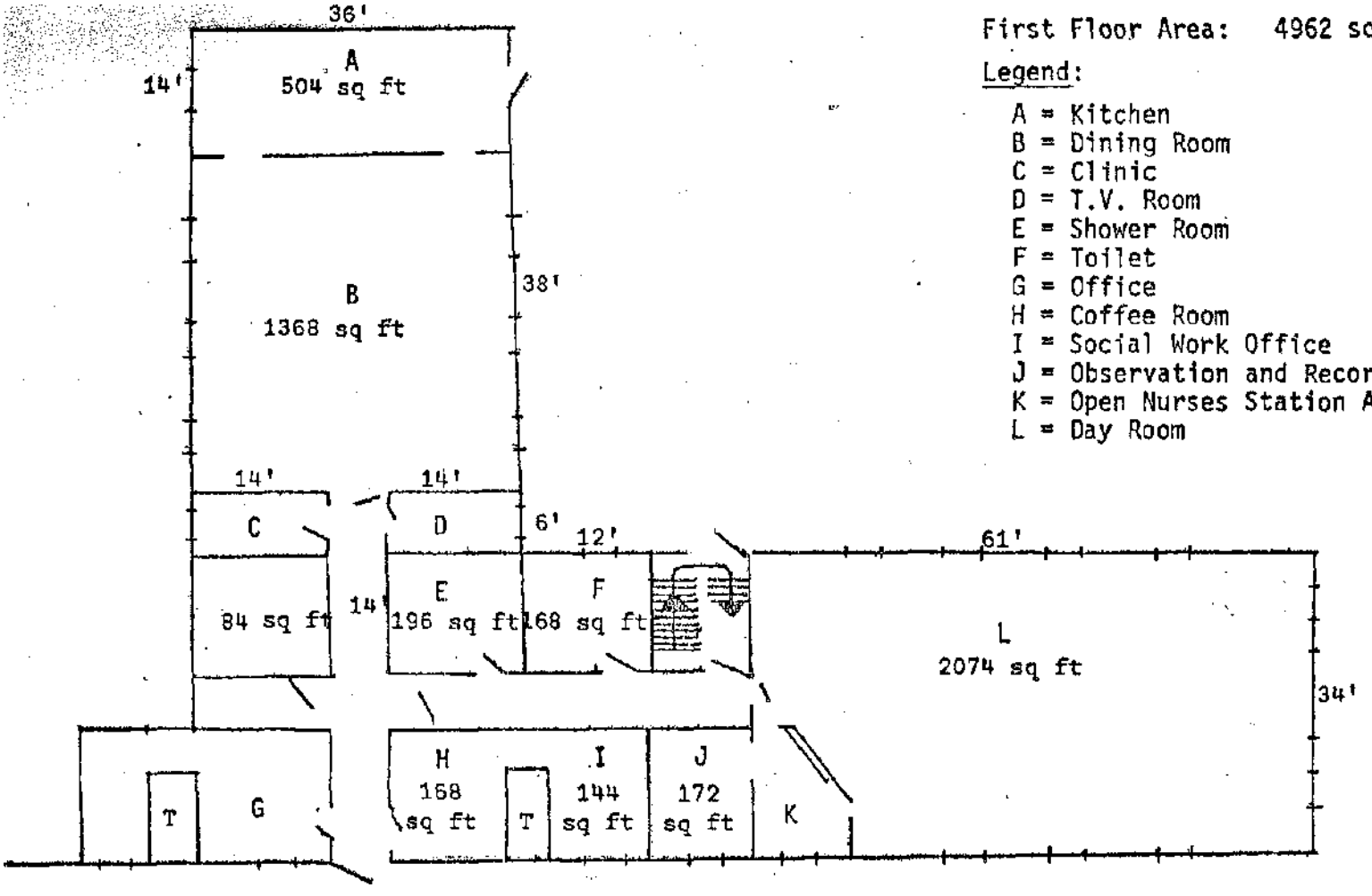
hospitalized 7/27-7/31/74)

Day in Project	294	315	336	257	385	413
Date	6/25	7/16	8/6	8/27	9/24	10/22
SIB Occurrence % of sample time	0	0	9	3 0 0		
SIB rate per min	0	0	.72	.06	0	0
Restraints per cent	0	0	11	3	0	0

TABLE 56

STAFF POSITION AND LENGTH OF STAY IN SIB UNIT

Length Of Stay	Project Director	Research Analysts	Special Teacher	COTA	L.P.N. Senior P.T.	Psychiatric Technicians 35	%	H.S.T.)	
1 - 3 mos.		1			1	12	34.3		
4 - 6 mos.				3	1	5	14.3		65.7%
7 - 12 mos.		1		1		6	17.1		
1 - 2 yrs.			1		1	3	8.5		
2-3 yrs.	1	2			2	6	17.1		25.6%
3 yrs. +		1				3	8.5		



First Floor Area: 4962 sq. ft.

Legend:

A = Kitchen
B = Dining Room
C = Clinic
D = T.V. Room
E = Shower Room
F = Toilet
G = Office
H = Coffee Room
I = Social Work Office
J = Observation and Record Room
K = Open Nurses Station Area
L = Day Room

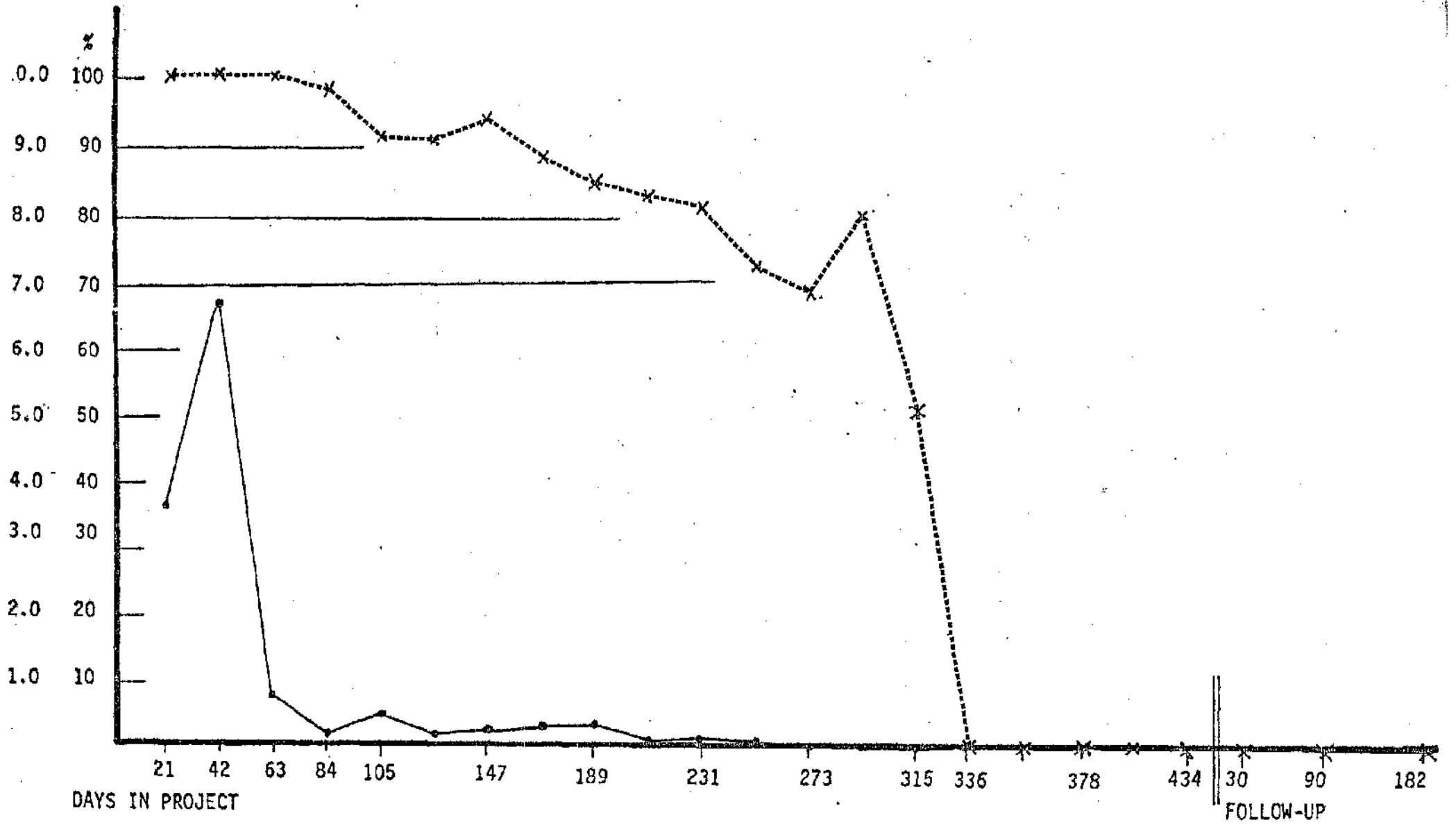
GRAPH 1

S I B / M I N .

% Restraint time

SIB per Minute and Percent of Time in Restraint vs Days in the Program

[redacted] f. 11 yrs.



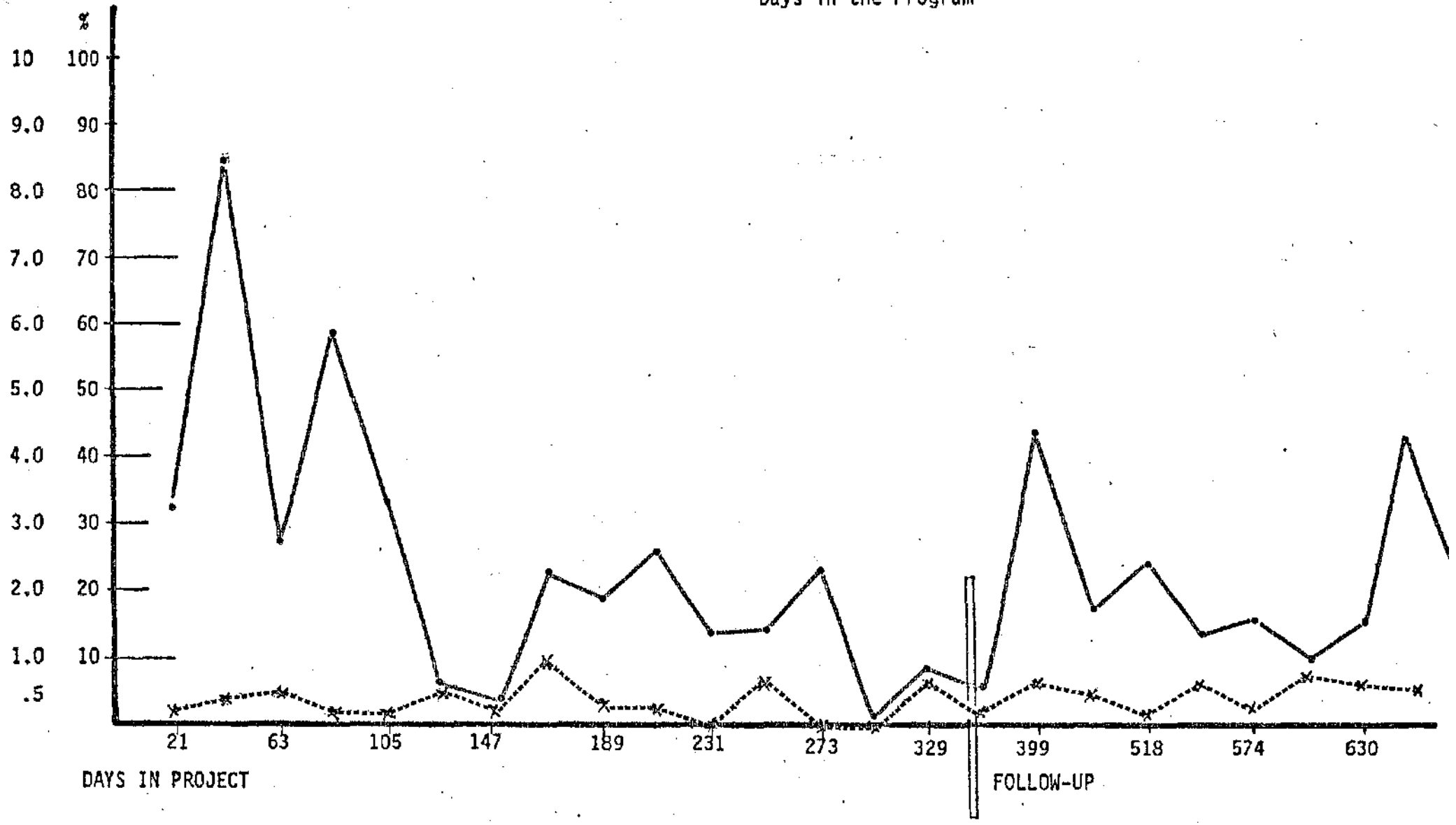
GRAPH 2

S I B / M I N .

% Restraint time

SIB per Minute and
Percent of Time in
Restraint
vs
Days in the Program

[redacted]
m. 10 yrs.



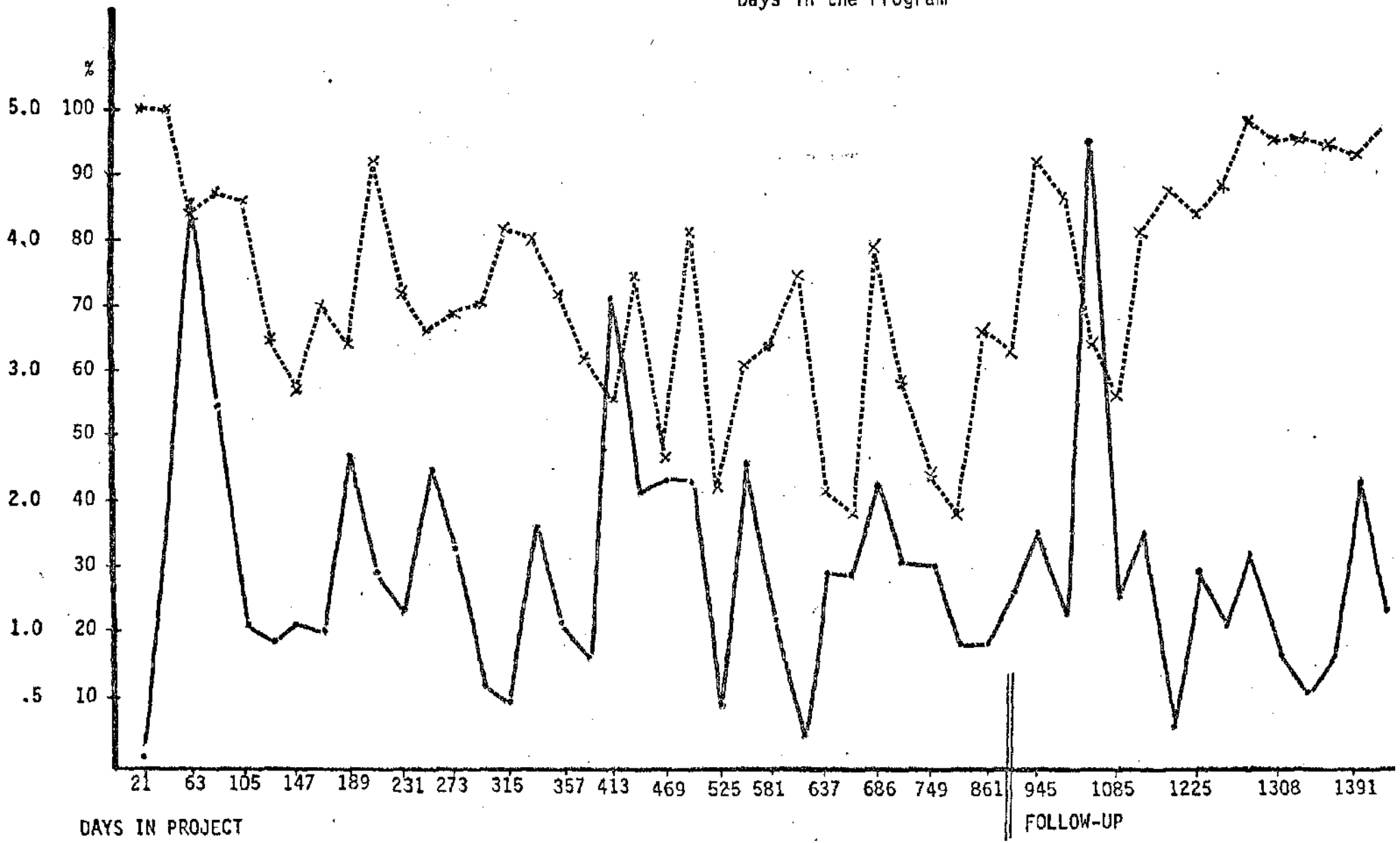
GRAPH 3

S I B / M I N .

% Restraint time

SIB per Minute and Percent of Time in Restraint vs Days in the Program

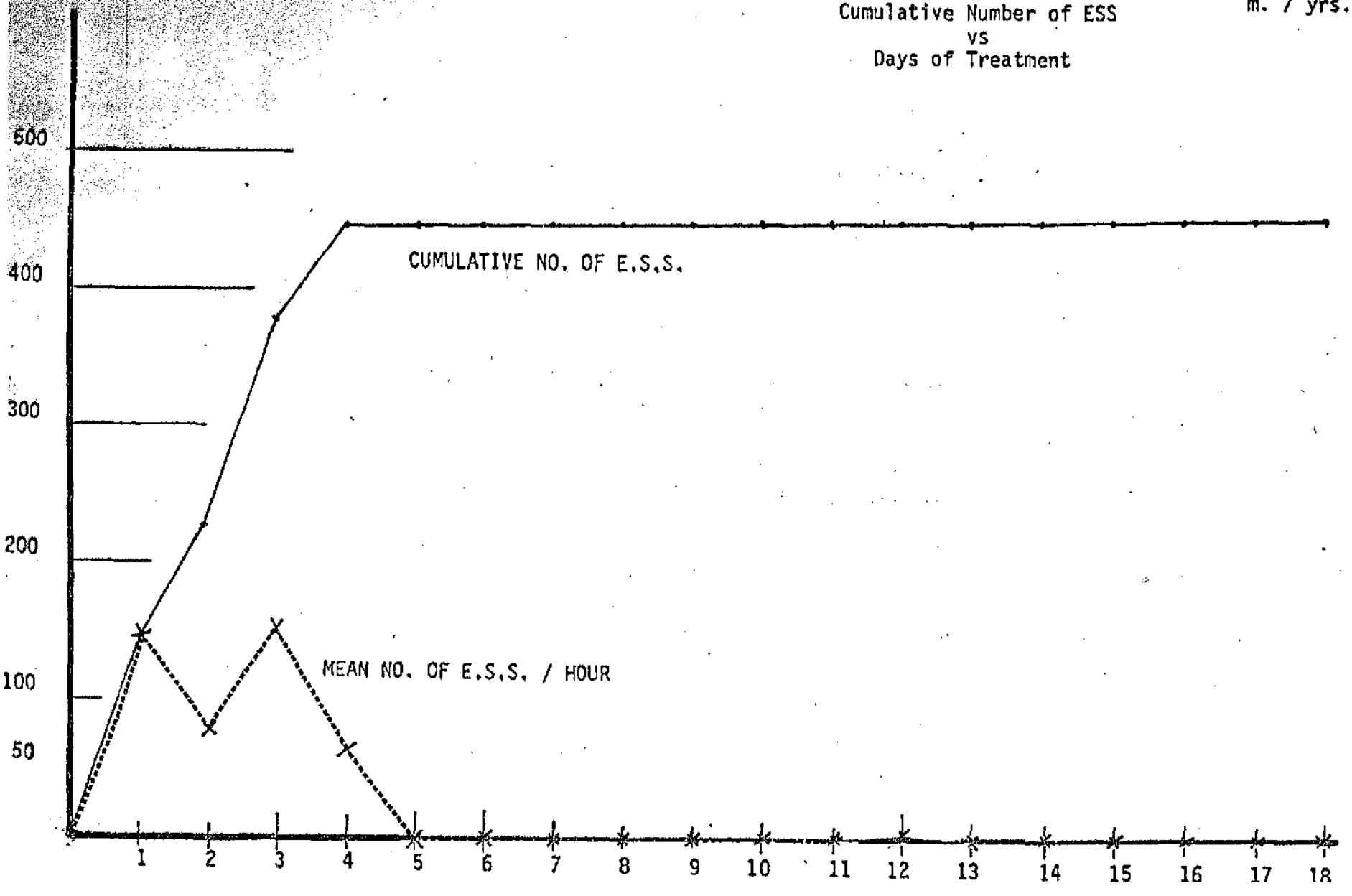
[redacted] m. 15 yrs.



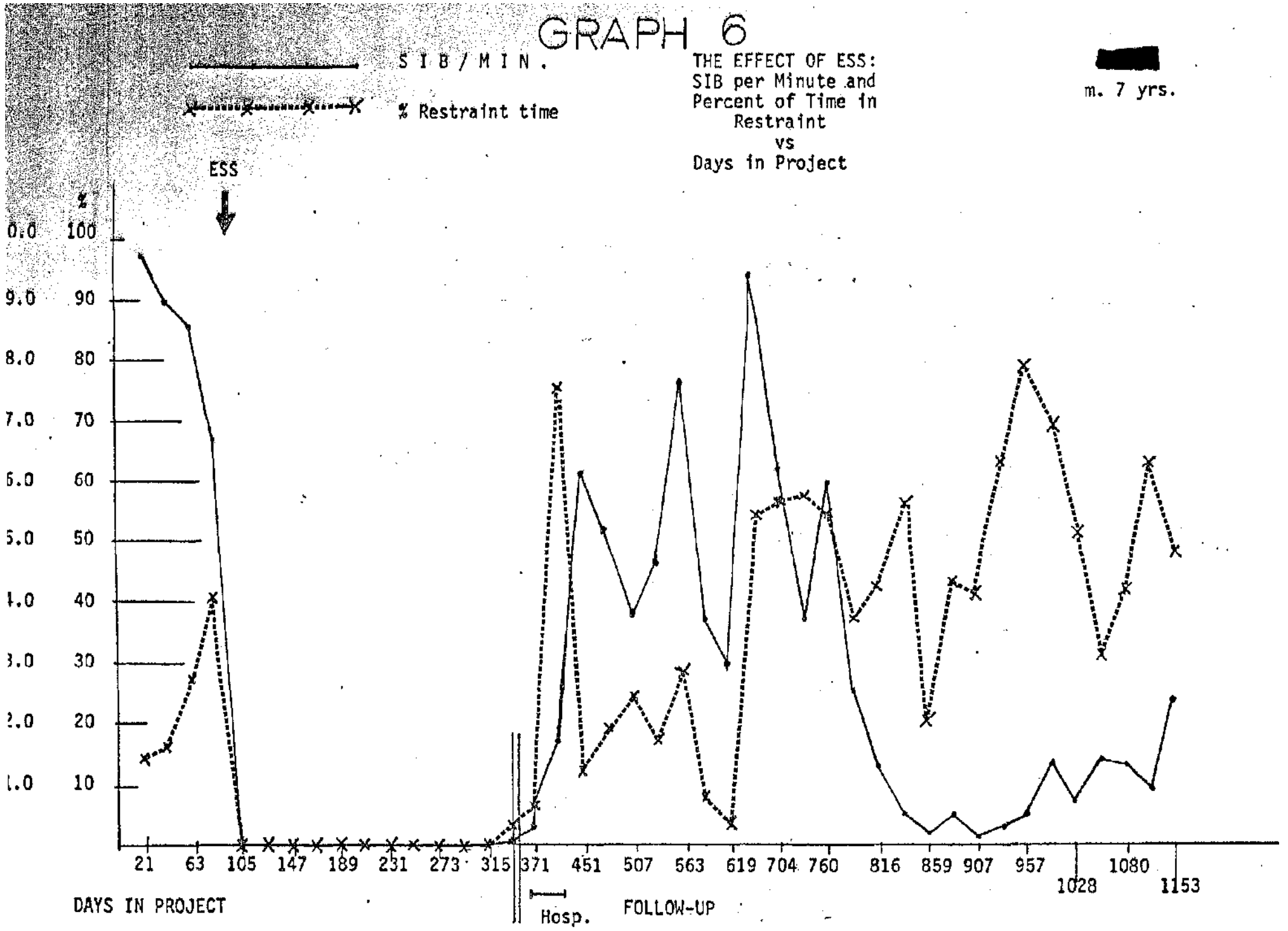
GRAPH 5

Mean Number of ESS per hour
and
Cumulative Number of ESS
vs
Days of Treatment

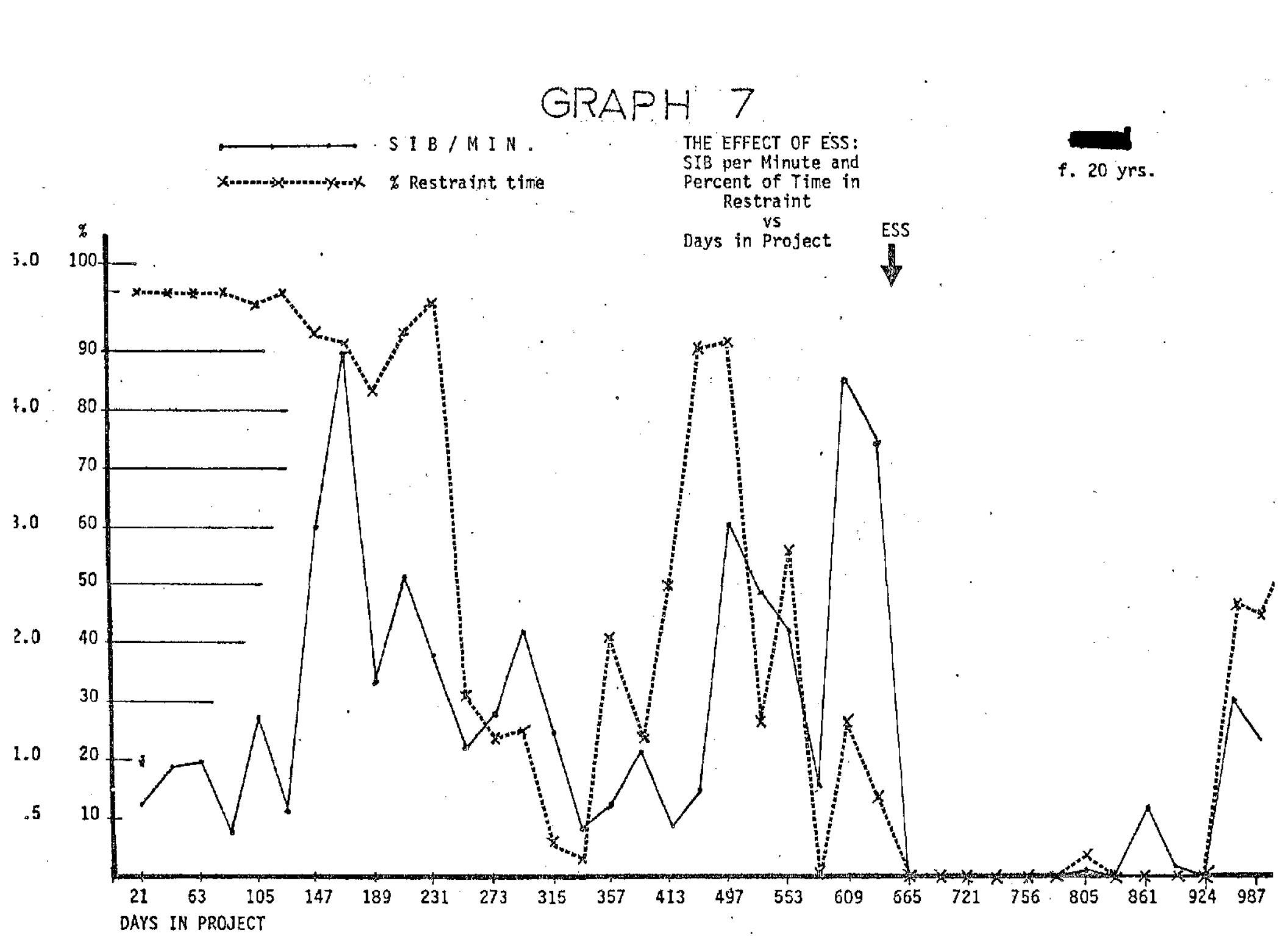
[redacted] m. 7 yrs.



GRAPH 6


SIB/MIN.
% Restraint time
THE EFFECT OF ESS:
SIB per Minute and
Percent of Time in
Restraint
vs
Days in Project
[redacted]
m. 7 yrs.
ESS
%
0.0 100
9.0 90
8.0 80
7.0 70
6.0 60
5.0 50
4.0 40
3.0 30
2.0 20
1.0 10
21 63 105 147 189 231 273 315 371 451 507 563 619 704 760 816 859 907 957 1028 1080 1153
DAYS IN PROJECT
Hosp.
FOLLOW-UP

GRAPH 7


S I B / M I N .
% Restraint time
THE EFFECT OF ESS:
SIB per Minute and
Percent of Time in
Restraint
vs
Days in Project
ESS
f. 20 yrs.
%
5.0
4.0
3.0
2.0
1.0
.5
100
90
80
70
60
50
40
30
20
10
21
63
105
147
189
231
273
315
357
413
497
553
609
665
721
756
805
861
924
987
DAYS IN PROJECT

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