INTERMITTENT DRUG THERAPY FOR PROFOUNDLY MENTALLY RETARDED PERSONS

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CONTENTS

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ABSTRACT

Many institutionalized mentally retarded persons currently receive maintenance medication for behavior problems. Prolonged use of certain antipsychotic medication can produce adverse side-effects. A double-blind, placebo-controlled study was conducted to assess the effects of intermittent drug therapy. Six profoundly retarded males all of whom had received maintenance antipsychotic medication for more than three years, participated in the study. Formal observations were made across a broad spectrum of subject behaviors during baseline and four subsequent phases of reduced drug dosage. A multiple baseline across subjects design was utilized for this eight-month investigation. No clinically significant effects were found when baseline and subsequent phases were compared. The results suggested that maintenance medication of institutionalized profoundly retarded residents may be reduced substantially without concomitant changes in overall drug effects.

Mentally retarded persons are frequently distinguished from the general population by their diverse range of learning problems, involving both behavioral deficits and excesses. Their maladaptive behaviors are of considerable concern to institutional staff and a great deal of time, effort and money is expended in attempts to reduce such behaviors. Behavioral problems are also troublesome for parents of mentally retarded persons and may often lead to institutionalization of the mentally retarded. Since maladaptive behaviors represent a highly prevalent and significant problem, it is crucial that parents and institutional staff have effective means of treating them. Effective treatment procedures are advantageous for practical, ethical, legal and economical reasons.

Currently, there are a number of ways in which institutional staff deal with the behavior problems of mentally retarded persons. Often environmental variables are manipulated in order to suppress behavioral excesses such as aggressive/destructive and self-injurious behaviors. Usually, either a staff member or a mechanical device (e.g., straitjacket) physically restricts the person and prevents the continued occurrence of the maladaptive behavior. However, restraint procedures can be problematic for both ethical (e.g., long-term use of mechanical restraints) and practical reasons (e.g., with physically aggressive residents).

Isolation is another technique often employed by institutional staff to deal with behavior problems. Although purported to be useful, this procedure may not be effective in a number of situations. Few, if any, structured behavior modification programs are implemented in many institutions for the mentally retarded. Although some techniques, such as verbal reprimand, are frequently but inconsistently employed, these appear to be largely ineffective. By far, the most common method of dealing with the behavior problems in institutionalized mentally retarded persons is via pharmacological intervention.

Prevalence of Drug Usage

A number of surveys have examined the incidence of psychotropic drug prescription among the institutionalized mentally retarded. In general terms, these surveys indicate that between 40% to 50% of mentally retarded residents receive psychotropic medication prescribed specifically for behavior problems. Table 1 provides a detailed description of prevalence studies.

Insert Table 1 about here

The three most commonly used psychotropic drugs are thioridazine (Mellaril), chlorpromazine (Largactil, Thorazine), and haloperidol (Haldol, Serenace). (DiMascio, Note 1; Lipman, 1970; Sprague, 1977; Pulman, Pook & Singh, 1979; Sewell & Werry, 1976; Tu & Smith, 1979). If, due to their recognised significant impact on behavior and cognition, the anticonvulsants are added to the psychotropic prevalence figure, the total prevalence of psychoactive drugs (i.e., any agents causing cognitive, behavioral or emotional changes) is between 51% to 68%.

Davis, Cullari and Breuning (1982) reported similar figures for 3,750 mentally retarded people in community foster homes. Fifty-eight percent of these individuals received an antipsychotic drug, with the most commonly used being thioridazine. Seventy-four percent of individuals received psychoactive medication. The only other study which investigated drug prevalence in the community was a survey by Gadow (1978). Gadow (1978) reported that 18% of his subjects received psychotropic or antiepileptic drugs. Further information concerning drug prevalence with the mentally retarded can be found in Aman (1983); Aman and Singh (in press); Breuning and Poling (1982) and Lipman (1982).

TABLE 1

PREVALENCE OF DRUG TREATMENT IN THE MENTALLY RETARDED

Authors	Number of patients surveyed	% receiving psychotropic medication	% receiving anticonvulsant drugs	Total percentage	Most common drugs prescribed
Lipman, 1970	Residents of 109 institutions	51%*	?	?	thioridazine, chlorpromazine, trifluoperazine, diazepam, chlordiazepoxide
Spencer, 1974	585	22%+ (antipsychotics only surveyed)	24%	51%+	phenobarbitone, haloperidol, chlorpromazine, phenytoin, thioridazine
Bullmore (in Kirman, 1975)	617	?	27%	60%	Not reported
Sewell & Werry, 1976	254	40%	Not reported	Not reported	thioridazine, chlorpromazine, methotrimeprazine, nitrazepam
Cohen & Sprague, 1977	1,924	51%	36%	66%	thioridazine, phenytoin, phenobarbital, diazepam, primadone, mesoridazine
Hughes, 1977	219	Not reported	Not reported	68%	phenobarbital, phenytoin, diazepam (usually as an anticonvulsant), chlorpromazine, thioridazine, haloperidol
Pulman, Pook & Singh, 1979	435	47%	34%	60%	phenytoin, diazepam, carbamazepine, trimeprazine, haloperidol, phenobarbitone promethazine
Silva, 1979	260	?	24%	66%	phenytoin, phenobarbital, thioridazine, hydroxyzine, primadone
Tu, 1979	2,238	42%	27%	58%	thioridazine, chlorpromazine, mesoridazine, diazepam, thioxanthene
Jonas, 1980	596	?	?	70%	chloral hydrate, carbamazepine, thioridazine, diazepam, haloperidol, phenytoin, sodium valproate
Gadow & Kalachnik, 1981	3,306 TMR pupils	7%	12%	18%	phenytoin, phenobarbital, methylphenidate, primadone, thioridazine, diazepam
Davis, Cullari & Breuning, 1982	3,496 residents of community group homes	58% (antipsychotics only)	46%	74%	thioridazine, phenytoin, phenobarbital, chlorpromazine, diazepam, haloperidol

Note: Since there is overlap (some patients received both psychotropic and anticonvulsant drugs), the two component percentages will not necessarily equal the total percentage.

* This figure may represent an overestimate of drug incidence since the survey asked how many patients had been, or were currently being, treated with psychotropic medication.

From: Aman & Singh (in press).

PHARMACOTHERAPY WITH THE MENTALLY RETARDED

Thirty years ago, scarce use was made of drugs to modify behavior. However, following the introduction of chlorpromazine in the 1950's, the development and prescription of psychotropic drugs became widespread. With few exceptions, drug prescription trends in mental retardation have paralleled those in adult psychiatry, with drugs being prescribed to the mentally retarded shortly after their administration to the mentally ill. Currently, a wide variety of psychotropic drugs are available for administration to the mentally retarded. Of these, only the antipsychotics are of direct relevance to this study.

Antipsychotics

Antipsychotics are the most prescribed drugs with the mentally retarded. Surveys have consistently indicated that 40% to 50% of the institutionalized mentally retarded receive an antipsychotic drug (e.g., Lipman, 1970; Sprague, 1977). The surveys also show that antipsychotics are often used for long periods of time and in doses exceeding those recommended by the drug's manufacturer. Antipsychotics consist of four main classes: phenothiazines, butyrophenones, thioxanthenes, and rauwolfia alkaloids. By far the most frequently prescribed of the antipsychotics are chlorpromazine, thioridazine (both phenothiazines) and haloperidol (a butyrophenone) and these are usually prescribed to treat aggression, destructiveness, self-injury, self-stimulation and hyperactivity.

Chlorpromazine: Chlorpromazine (Largactil) is one of the oldest and most used psychotropic drugs with the mentally retarded. Early studies which were poorly controlled (see reviews by Lipman, DiMascio, Reatig & Kirson, 1978; Freeman, 1970; Sprague & Werry, 1971) reported that chlorpromazine reduced problem behaviors of the mentally retarded. However, more recent and methodologically sound investigations suggest that chlorpromazine is not beneficial and may in fact have a negative effect on

adaptive behaviors (Marholin, Touchette & Stewart, 1979; Moore, 1960). However, no definitive conclusions can be drawn since there are few well-controlled studies of the effects of chlorpromazine on the behavior of mentally retarded persons.

Thioridazine (Mellaril): In a review of the effects of thioridazine in childhood disorders (including mental retardation), Aman and Singh (1980) found most studies to be methodologically inadequate or to make only global evaluations of efficacy. The few well-controlled studies which have been conducted indicate that thioridazine may improve hyperactivity, aggression, eating behavior and stereotypy, (e.g., Alexandris & Lundell, 1968; Breuning, 1982; Davis, Sprague & Werry, 1969; Heistad & Zimmerman, 1979; Singh & Aman, 1981. Moreover, two studies (Breuning, 1982; Singh & Aman, 1981) have found that lower doses of thioridazine are as beneficial as higher doses. Of two operant-based investigations, one found no significant drug-related changes (Davis, 1971) and the other suggested that thioridazine impaired discrimination learning (Wysocki, Fuqua, Davis & Breuning, 1981). In addition, the few studies investigating cognitive effects of thioridazine suggest that this drug may impair learning performance (see Aman, in press).

In summary, while the quality of thioridazine studies has varied, they generally indicate that this drug is useful in altering some maladaptive behaviors. However, there are some disadvantages associated with the drug, e.g., cognitive impairment.

Haloperidol (Haldol, Serenace): Haloperidol is often prescribed for hyperactivity, aggression and impulsive behaviors of the mentally retarded. Few studies have investigated the effects of haloperidol on the behavior of mentally retarded persons and, as with the phenothiazines, the majority of investigations are methodologically deficient. Two poorly controlled studies (Grabowski, 1973a; 1973b) indicated that haloperidol improved the behavior of children and adolescents. In a placebo-controlled invest-

igation, Burk and Menolascino (1968) evaluated its effects in global terms and found that haloperidol produced significant improvement in the behavior of the subjects. Finally, Claghorn (1972), Ucer and Kreger (1969) and Le Vann (1970) reported haloperidol to be superior to the phenothiazines and potentially beneficial for reducing hyperactive, aggressive and self-stimulatory behavior. However, further research is required before firm conclusions can be drawn.

Recent Studies on Antipsychotics

The findings concerning the effects of antipsychotics on the mentally retarded are quite ambiguous. Recent, methodologically sound studies of antipsychotics are briefly reviewed to present a more meaningful picture.

Researchers have evaluated antipsychotics by measuring their effects on different variables, most commonly on their ability to reduce behavioral problems, e.g., aggression, stereotypy. For example, four studies found antipsychotic drugs to be effective in reducing stereotyped behaviors, (Davis, Sprague & Werry, 1969; Hollis, 1968; Singh & Aman, 1981; Zimmerman & Heistad, 1982). However, other well-controlled studies (Breuning, Ferguson, Davidson & Poling, in press; Breuning, O'Neill & Ferguson, 1980; Marholin et al., 1979; McConahey, Thompson & Zimmerman, 1977) have shown adverse or no drug effect on clinical measures other than stereotypy. While further research is essential, in general terms it can be said that antipsychotics may be effective in reducing stereotypic behavior in some mentally retarded persons but their effects on other antisocial behaviors are unclear.

A number of researchers have studied the effects of antipsychotic medication on cognitive performance (see Aman, in press). Of the three studies indicating significant changes in learning, two showed improvement (Alexandris & Lundell, 1968; Bair & Herold, 1955) and one showed worsening (Moore, 1960). Unfortunately, these studies were methodologically deficient and their findings need to be replicated in better controlled investigations.

A more rigorous study (Wysocki, Fuqua, Davis & Breuning, 1981) suggested that thioridazine impeded learning for four retarded adults performing a matching-to-sample task. Further, a series of studies by Breuning, O'Neill & Ferguson (1980) has shown that the antipsychotics interfere with token economy programs. Recent studies (Breuning & Davidson, 1981; Breuning, Ferguson, Davidson & Poling, in press) have shown that even with very low doses, the antipsychotics may impair the subject's responding to external reinforcement. While these studies suggest that the antipsychotics impair learning performance, Aman (in press) has pointed out several flaws in these investigations, making further research necessary.

Side Effects of Antipsychotics

The antipsychotics are also known to have a number of side effects which can be both enduring and severe. Short-term side effects such as mild drowsiness, apathy, lethargy, dry mouth, blurred vision, urinary retention, abdominal pain and constipation are quite common. Other short-term effects include akathesia (distinguished by motor restlessness), dystonic reactions (abrupt spasms of the head, neck and upper back), and Parkinsonian reactions (characterized by body rigidity, masklike expression, and shuffling gait). Withdrawal dyskinesias are another side effect following abrupt discontinuation.

Long-term side effects include weight gain, corneal edema, and persistent tardive dyskinesias. The latter are distinguished from withdrawal dyskinesias in that withdrawal dyskinesias occur only for 12-16 weeks after drug discontinuation. Tardive dyskinesias may be irreversible and no effective treatment is currently available. Although current prevalence figures are highly variable and range from 1% to 41% of subjects treated with antipsychotics (Shepherd & Watt, 1977), it appears that mentally retarded persons have a high risk of developing this disorder (Gualtieri & Hawk, 1980).

Methodology

It is unfortunate that a large majority of drug studies with the mentally retarded are of abysmal quality (see Sprague & Werry, 1971). This lack of methodological rigor was even more prevalent prior to the 1970's when most drug studies employed group designs, with few studies incorporating some of the more important requirements of placebo-controlled, double-blind, crossover designs. In recent years, a wide range of experimental designs has been developed, including the refinement of single-subject methology. In addition, Sprague and Werry's (1971) proposal of six minimal criteria for well-controlled drug studies has had some impact on the research in this area. The criteria include (1) placebo control, (2) random assignment to drug groups, (3) "blind" evaluation of drug effects, (4) standardized dosages, (5) standardized evaluations, and (6) appropriate statistical analysis. Aman & Singh (1980) added a further criterion, that trials should be free of other confounding drugs.

In previous research, all the above principles were frequently ignored, the most common violation being the inappropriate use of statistics. However, it appears that the calibre of drug studies with the mentally retarded has improved over recent years. For a more comprehensive discussion of the methodology of psychopharmacological studies, see Aman (1983), Aman and Singh (in press), Breuning, Davis and Poling (1982), Hersen and Barlow (1976), Liberman and Davis (1975), Marholin and Phillips (1976), Sprague and Baxley, (1978), Sprague and Werry, (1971), and Wysocki and Fuqua, (1982). In summary, more knowledge is required about the behavioral effects of even the more commonly used drugs with the mentally retarded. As yet, we cannot assume that the antipsychotics are beneficial to the majority of mentally retarded persons.

REDUCTION OF DRUG USE

Since antipsychotics are widely prescribed for the mentally retarded

and their effects and side-effects have not been adequately evaluated, a number of researchers have developed ways of reducing the dosage of anti-psychotics when these are used as maintenance medication.

Fielding, Murphy, Reagan, and Peterson (1981) devised a two-phase assessment program, with the first phase involving alternating periods of medication and non-medication in an attempt to identify those individuals who could effectively participate in treatment without their prescribed medication. The second phase involved only those individuals who responded adversely during non-medication periods. In this phase, their doses were reduced gradually, until the minimum effective dose was reached. The occurrence of all maladaptive behaviors of each resident was monitored for 90 days. This drug assessment program was reported to be highly successful in terms of subject behavior, staff time, and cost effectiveness. However, no formal behavioral observations were undertaken and the responses of the clients could not be objectively assessed.

Ferguson, Cullari, Davidson & Breuning (1982) employed an ABAB design to evaluate the use of data-based review with 250 mentally retarded residents. Dosages were typically reduced by 25% to 50% per 30-day period but only after the residents' behavior had stabilized. Evaluations of the individual resident's behaviors were based on 24-hour frequency counts of inappropriate behaviors. The authors suggested that the program was successful in reducing the antipsychotic medication for ninety-seven percent of the subjects. Unfortunately, these findings are questionable since no observational data were reported.

LaMendola, Zaharia, and Carver (1980) reported a study in which the subjects' antipsychotic medication was reduced to low levels. The subjects' behaviors were monitored and a team approach to drug reduction was employed. Again no formal behavioral observations were made and the results are difficult to interpret. Further, it is not clear how drug reduction decisions were made.

In a naturalistic study, Singh & Winton (in press) utilized behavioral observations to assess the effects of psychoactive drugs on the self-injurious behavior of a mentally retarded boy. The effects of three drugs (carbamazepine, thioridazine and chlorpromazine) were assessed at several different dose levels. This study showed that medication was not effective in suppressing the behavior of the boy and, consequently all medication was withdrawn. It would seem that behavioral monitoring is a precise, objective and reliable method for assessing drug effects. Individual behavioral observations are useful for determining the efficacy of medication at various doses in the treatment of behavioral problems. Via this procedure, drug dosages can be increased or decreased to optimum levels.

Drug Holidays: Another method of reducing drug dosages is via drug holidays. A drug holiday means that the resident is given a "holiday" from his maintenance medication. Usually, a holiday of 4 to 6 weeks is prescribed. Thus a resident who is on a maintenance dose of an anti-psychotic may have a 4 to 6 week drug free period at given intervals, usually once or twice each year.

Heistad, Zimmerman and Doebler, (1982), discontinued the use of thioridazine by 106 mentally retarded residents for a period of four to five weeks. Prior to and during the drug withdrawal period, the subjects' behaviors were monitored via time-sampling. A significant increase in the rate of self-stimulation and active negative behavior was found. Work and life skills also decreased during the drug-free condition. In contrast to the majority of subjects, a few patients showed significant improvement during this phase. Patients whose behavior worsened most during the drug-free phase made more favourable long-term progress once medication was restored. Unfortunately, only the mean data are presented and few details on individual responses are provided in this study.

Marholin et al (1979) provided data on five subjects whose medication was withdrawn for a maximum of 23 days in any one period. Their results

showed that the residents' behavior was heavily influenced by chlorpromazine withdrawal only in some cases and virtually unaffected in others. Some subjects showed significant increases in undesirable behavior, while others made significant behavioral improvement.

Intermittent Drug Therapy: As the name implies, patients who are on maintenance medication may have their medication on an intermittent basis. The usual method is to provide medication only on certain days of the week (e.g., Monday, Wednesday and Friday) or during certain months of the year (e.g., alternate months). Although there are no examples of intermittent drug therapy with the mentally retarded, the psychiatric literature contains a small number of relevant studies. In the first study to employ intermittent drug therapy (Olson & Peterson, 1962), 90 chronic schizophrenics were randomly assigned to groups in which (1) chlorpromazine or thioridazine was administered daily for 6 months, (2) chlorpromazine or thioridazine was administered daily for first, third and fifth months, with placebo for the other three months, or (3) chlorpromazine or thioridazine was administered daily for the first, third and fifth months and no medication was administered for the other three months. Relapse (regression requiring resumption of previous medication) occurred in 8% of the first group, 29% of the second, and 85% of the third group.

In another study, Prien, Gillis and Caffey (1973) randomly assigned 375 chronic schizophrenics to one of the following groups (1) daily schedule of normal medication, (2) prestudy dosages Monday to Friday, with placebo on Saturday and Sunday, (3) placebo on Tuesday and Saturday, normal medication on the other five days, (4) prestudy dosages Monday to Thursday with placebo from Friday to Sunday, and (5) placebo Tuesday, Thursday and Saturday, with prestudy dosages on the other days. After 16 weeks, relapse had occurred in 1% of daily schedule patients (Group 1), 6% of Group 2, 8% of Group 3, 7% of Group 4, and 6% of Group 5. None of these percentages was significantly different from one another. Thus, this study suggests that short-term withdrawal can be advantageous for

patients and staff in institutional settings.

In a double-blind study reported by Caffey, Diamond, Frank, Grassberger, Herman, Klett & Rothstein (1964), 348 chronic schizophrenics received either (1) antipsychotic medication daily, (2) antipsychotic medication on Monday, Wednesday and Friday with placebos on the other days, or (3) placebos on Monday, Wednesday and Friday with drug-free days in between. After 16 weeks, 5% of continuous treatment patients had relapsed, 15% on intermittent medication had relapsed, and 45% on no medication had relapsed. While the results appear favorable for intermittent medication, the authors noted that borderline patients may have only been tolerated since they were also involved in the study.

Other investigations on intermittent drug therapy have also found that a large majority of subjects can tolerate low levels of medication without relapse, (e.g., Chien & DiMascio, 1971; Greenberg & Roth, 1966). The effects of weekend drug-free schedules for chronic schizophrenics have been evaluated in two studies, with both showing no significant difference between weekend-free and control groups (Chien & DiMascio, 1971; Fireman & Tynes, 1967).

In summary, current research suggests that intermittent drug therapy is a useful and effective way of reducing maintenance medication of psychiatric patients. It is advantageous ethically, since it minimizes negative side effects of antipsychotics, and practically, because it saves institutional time and money.

Since intermittent drug therapy has not yet been investigated with mentally retarded persons, and few reduction procedures have been assessed with this population, it was considered informative to try this technique with the mentally retarded. The present study, then, investigated the utility of intermittent drug therapy, a novel procedure for mentally retarded populations.

In addition, this study attempted to answer a number of questions concerning the effects of antipsychotics on behavior of mentally retarded

subjects. The few studies conducted have had mixed results, some showing antipsychotics to be largely ineffective, others indicating lower dosages to be more effective than higher ones. The present study attempted to overcome previous methodological problems found by being well-controlled (multiple baseline across subjects design, formal behavioral observations, placebos, interobserver reliability, double-blind, follow-up period). Further, it assessed antipsychotic effects across a broad spectrum of behaviors, and with six subjects, unlike most previous studies.

In general terms then, the present study aimed to maximize the effectiveness of antipsychotic medication, and to simultaneously minimize any adverse effects. This was considered useful in the light of the widespread use of antipsychotics with the mentally retarded.

METHOD

Subjects and Setting

Six profoundly retarded young men participated in the study. All were residents of an institution for mentally retarded persons. These residents had been maintained on antipsychotics (for three to seven years) for the management of behavior problems that included stereotypy, self-injury, aggressive and destructive behavior.
Further information about the participants is presented in Table 2. Informed consent was obtained from the residential authorities before the study was commenced, and the protocol for this study was approved by the Ethics Committee of the North Canterbury Hospital Board.

Insert Table 2 about here

The villa/ward in which this study was conducted housed 43 profoundly and severely retarded males. The residents spent most of their time in the dayroom which is a large, sparsely furnished room. A variety of recreational activities were encouraged by staff in the villa. Apart from these daily activities, the subjects were not involved in any treatment or training programs throughout the study.

Response Definitions

Ten categories of behavior were observed. These categories were formulated prior to the study by observing the subjects for two weeks on a daily basis. The categories and their definitions are presented in Table 2. A large number of behaviors, involving desirable and undesirable, were observed in an effort to derive as much information as possible about the specific effects of intermittent drug therapy on adaptive functioning.

TABLE 2

SUBJECT CHARACTERISTICS

Subjects	Etiology[a]	Age (Yrs)	Language Age (Mths)[b]	Behavioral Age (Mths)[c]	Social Age (Mths)[d]	Drug	Mg/Day	Mg/Kg	Yrs on
Hugh	Profoundly mentally retarded of unknown etiology	22	12	17.6	17.3	Veractil	150	2.4	5
Richard	Profoundly mentally retarded and right Hemaplegia due to cerebral palsy	12	12	12	19.1	Veractil	125	5	3
Craig	Profoundly mentally retarded due to maternal rubella	17	12	7.5	11.6	Veractil	150	3.5	3
Ian	Profoundly mentally retarded of unknown etiology	20	6	17.6	20.2	Veractil	75	1.3	7
Dennis	Profoundly mentally retarded due to maternal rubella	18	2	7.9	17.6	Largactil	75	2.2	6
Kevin	Profoundly mentally retarded of unknown etiology	37	1.5	3.4	2.5	Largactil	150	3	6

[a] On AAMD criteria (Grossman, 1977)

[b] Fairview language age

[c] Fairview behavioral age

[d] Vineland social age

Insert Table 3 about here

Data Collection and Reliability

Four observers with some experience in behavioral observation procedures were given additional training prior to and throughout the experiment. Data were collected by one observer, randomly assigned on a daily basis. A second observer was also randomly assigned on 25% of the sessions during each phase for reliability checks. An interval-recording technique was used to collect data on a daily basis in an unstructured ward setting. All observations were scheduled between 9.am and 11.am, five days a week. No observations were scheduled in the weekends. Each observation session of 15 minutes was divided into 90 consecutive 10-second intervals. The end of each 10-second interval was signalled through earplugs to the primary observer who recorded the behaviors observed in each interval. The same signal was used for the reliability observer, when present.

Baseline observations were undertaken only when the interobserver agreement between randomly assigned observer-pairs was above 85% on the Weighted-Agreement (W-A) index (Harris & Lahey, 1978). The W-A index was used since it provides the most conservative agreement measure and appears to be the index of choice for behavioral drug studies (see Towns, Singh & Beale, in press).

The W-A index was calculated using the following formula:

$$W\text{-}A = (S\text{-}I \times U) + (U\text{-}I \times S)$$

where S-I is the Scored-Interval index,

U-I is the Unscored-Interval index,

U is (the proportion of intervals left unscored by the primary observer plus the proportion of intervals left unscored by the second observer) divided by 2, and

S is (the proportion of intervals scored by the primary observer

TABLE 3

RESPONSE DEFINITIONS OF BEHAVIOR OBSERVED

Categories	Definitions
Aggressive/ Destructive	Any violent or negative physical behavior directed at people or objects; e.g., biting, scratching, hitting or forceful pushing of others, and, hitting, throwing or slamming objects in the dayroom.
Stereotypy - Object	Any repetitive manipulation of objects, e.g., spinning, rubbing, tapping, fiddling with objects.
Stereotypy - Body	Any repetitive movements involving only body parts, e.g., body-rocking or swaying, repetitive hand, finger, limb or head movements, teeth grinding, masturbation.
Vocal Sound	Repetitive or continuous vocal sounds without communicative intent, e.g., humming, inappropriate laughter, screaming without provocation, uttering meaningless syllable combinations.
Pica	Placing inedible or non-nutritive objects in mouth, chewing and/or swallowing them, e.g., string, clothing, cigarette butts.
Social Interaction	Any positive prosocial behavior directed at staff or residents, e.g., touching, patting, hand-holding, eye contact, smiling, or friendly-sounding vocalization with communicative intent.
Self-injury	Any deliberate action causing harm to resident's own body, e.g., hand-biting, head-banging, face-scratching.
Walking/Skipping	When a resident makes two or more steps in the same direction (for Craig, crawling on all fours is included in this category).
Toy Play	The manipulation of toys in an appropriate manner, e.g., throwing ball to another person, block-building.
Other	When the subject is not engaged in any specific activity but rather is motionless, asleep, staring into space of engaging in small non-repetitive movements.

plus the proportion of intervals scored by the second observer) divided by 2.

The S-I index was calculated by dividing the number of agreements on occurrence in each interval by the number of agreements on occurrence plus the number of disagreements. If both observers agreed that no occurrence had occurred in the session the index was scored as 100% agreement. The U-I index was calculated by dividing the number of agreements on nonoccurrences in each interval by the number of agreements on nonoccurrences plus the number of disagreements. If both observers agreed that the behavior had occurred in every interval, the U-I index was scored as 100% agreements.

The interobserver agreements summed across the six subjects were (with ranges in parentheses) : Aggressive/destructive - 94% (87%-99%), stereotypy (objects) - 98% (94%-100%), stereotypy (body) - 91% (87%-95%), vocal sound - 84% (76%-92%), pica - 100%, social interaction - 98% (95%-100%), self-injury - 97% (91%-100%), walking/skipping - 95% (87%-98%), toy play - 87% (79%-94%), and other behaviors - 89% (85%-91%). Where both observers agreed on total occurrence or total nonoccurrence of a behavior in a session, the W-A index was scored as 100%. Percentage agreements were calculated by multiplying all indices by 100.

Experimental Design

A multiple baseline across subjects design (Baer, Wolf & Risley, 1968) was used to explore the effects of intermittent drug therapy on the behavior of each subject. The study contained five experimental phases : baseline, reduction, intermittent drug therapy, open and maintenance. Table 4 details the number of days spent by each subject in the different experimental phases.

This was a double-blind, placebo-controlled study. Before baseline observations were initiated, the subjects' medication was changed from

tablets to capsule form. Medication was given with meals, three times a day, for all subjects. Each resident received only one capsule at each meal throughout the study. During the intervention phases when intermittent drug therapy was in effect, placebo capsules were substituted for active medication capsules. The placebo capsules were individually prepared to taste, smell and look exactly like the active medication for each subject. Each dose was individually packaged and had the subject's name, date, and time of administration written on it. Double-blind conditions were maintained during the first three phases, and single-blind conditions were maintained during the fourth phase. Placebos were withdrawn in the final phase during which the subjects received their regular medication (in tablet form) on four days and no medication on the other three days of each week.

Insert Table 4 about here

Four observers, blind to the study's purpose and procedures, made daily recordings of the subjects' behavior. The experimenter, nursing staff, hospital physicians, and others in contact with the subjects and observers were also blind to the experimental conditions. The research supervisor alone knew the order of subject entry, duration, and dosage level associated with each condition for all subjects. A sealed envelope containing this information was given to the subjects' physician and another was placed in the subjects' medical files.

Phase 1 : Baseline. Throughout the baseline phase, all subjects received their usual drug and dosage as outlined in Table 1. For Hugh, Richard, Craig, Ian, Dennis and Kevin the baseline lasted 10, 15, 20, 25, 30 and 35 days, respectively.

TABLE 4

DAYS SPENT IN EXPERIMENTAL PHASES

	PHASES				
Subjects	Baseline	Reduction	Intermittent	Open	Maintenance
Hugh	10	15	30	15	104
Richard	15	15	30	15	98
Craig	20	15	30	15	93
Ian	25	15	30	15	88
Dennis	30	15	30	15	83
Kevin	35	15	30	15	80

Phase 2 : Reduction. Following baseline, all subjects participated in the dose-reduction phase which lasted three weeks. During Week 1, all subjects ceased to receive active medication for one day of the week (i.e., Monday). Active medication was still administered on six days, with placebo on the seventh. During Week 2, active medication was replaced by placebo on two days (i.e., Monday and Wednesday). The subjects received their usual drugs on the other five days. During the third week, active medication was replaced by placebo on three days (i.e., Monday, Wednesday and Friday). Active medication was administered on the other four days.

Phase 3 : Intermittent drug therapy. Following the reduction phase, the days on which the placebos were administered were changed to make the procedure more economical and practical from a nursing point of view. In the first week, the drug-free day on Friday was changed to Saturday and in the second week, the drug-free day on Monday was changed to Sunday. Thus, from Week 2 onwards all subjects received placebos on Sunday, Wednesday and Saturday and active medication on Monday, Tuesday, Thursday and Friday. They continued to receive the active medication in the same dosages as before the study. In effect, all subjects had their weekly medication levels reduced by three-sevenths. However the subjects, observers, and nursing staff members were unaware of these reductions.

Phase 4 : Open Phase. In this phase, placebos continued to be administered as described above, but the nursing staff were informed that all subjects were on active medication only on four days and on placebos on the other three days. They were not told on which days the subjects received the active medication.

Phase 5 : Maintenance. This condition lasted a minimum of eighty days, and differed from the previous phase on only one point. No placebos were administered on the three drug-free days. Thus, staff were fully aware of the days on which subjects did not receive drugs.

RESULTS

The daily rate of stereotyped behavior, both body and object across all experimental phases is presented in Figure 1. Only the stereotyped behaviors have been graphed because they occurred at a relatively stable rate during baseline and had the highest rate of occurrence. All other behaviors were usually episodic. The phase means of all behaviors observed across all subjects are presented in Table 5.

Insert Figure 1 and Table 5 about here

Intermittent Drug Therapy : Overall Behavioral Effects

Aggressive/Destructive Behavior. Overall, there was little change in the subjects' aggressive/destructive behaviors throughout the study. Five of the six subjects' aggressive/destructive behavior remained at extremely low levels despite reductions in the weekly dosage of their maintenance medication.

Stereotypy. A slight increase was observed in all but one subject's object stereotypy from baseline to maintenance conditions. However, some degree of inter-phase variability occurred. As far as body stereotypy was concerned, it decreased in three subjects and increased in the other three. Again much inter-phase variation occurred.

Vocal Sound. Vocal sound generally altered little across phases. Only one subject's responses showed some increase.

Pica. The mean rate of pica varied little and, in general, intermittent drug therapy appeared to have only minor effects on this behavior.

Social Interaction. Social interaction showed a slight, clinically insignificant reduction in rate from baseline to the maintenance phase.

Self-injury. Self-injurious behavior showed little change, although one subject's response rate increased slightly.

FIGURE CAPTION

Figure 1. Percent occurrence of stereotyped behaviors (object and body) across all experimental conditions. For the reduction and intermittent phases, the small letters with arrows beside them indicate the days on which placebos were given each week. Where these letters finish, placebos continue to be administered as indicated by the last letters (i.e., SWS).

Gaps in the data occur where the subject was asleep, sick or away from the hospital during the observation period.

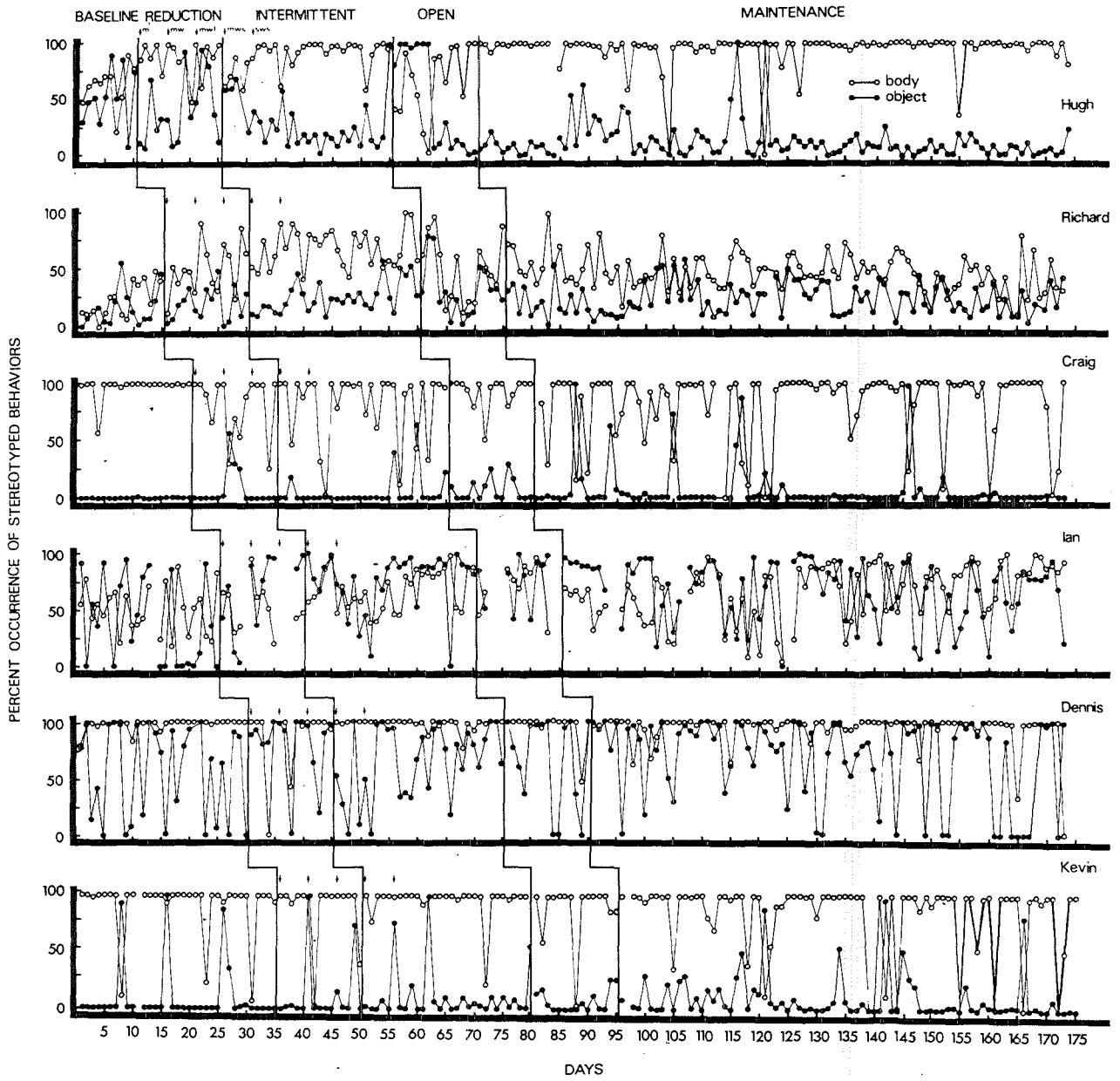
BASELINE
REDUCTION
INTERMITTENT
OPEN
MAINTENANCE
body
object
Hugh
Richard
Craig
Ian
Dennis
Kevin
100
50
0
PERCENT OCCURRENCE OF STEREOTYPED BEHAVIORS
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175
DAYS

TABLE 5

PERCENT OCCURRENCE OF BEHAVIORS ACROSS EXPERIMENTAL CONDITIONS

Experimental Condition	Aggressive/ Destructive	Stereotypy		Vocal Sound	Other	Pica	Social Interaction	Self Injury	Walking/ Skipping	Toy Play
		Object	Body							
1. HUGH										
Baseline	4.7	53.3	63.6	19.1	8.3	0.1	0.0	0.1	11.6	0.0
Reduction	1.7	40.5	87.8	11.5	1.8	0.9	0.6	0.5	5.1	0.1
Intermittent Drug Therapy	0.5	29.4	89.9	8.9	1.9	0.0	0.1	0.0	1.8	0.0
Open	0.5	50.5	67.5	13.5	2.3	0.0	0.0	0.0	4.9	1.4
Maintenance	0.1	13	93.3	18.3	3.1	0.1	0.3	0.0	2.1	0.4
2. RICHARD										
Baseline	0.2	16.5	23.5	38.5	3.7	8.5	7.9	5.3	74.1	4.4
Reduction	0.0	19.5	51.1	46.5	3.7	4.9	11.5	9.5	43.9	13.4
Intermittent Drug Therapy	0.2	24.9	68.7	37	1.4	24.4	9.2	7.2	41.1	1.9
Open	0.5	31.1	49.5	43	4.3	13.9	8.6	5.4	57.7	2.0
Maintenance	0.2	22.5	46.4	33.1	7.7	13.6	6.9	5.0	51.4	2.3
3. CRAIG										
Baseline	0.0	0.1	97.6	1.5	1.1	0.1	0.1	0.0	1.1	0.0
Reduction	0.0	7.7	81.7	0.0	8.6	0.0	0.0	0.0	0.0	0.0
Intermittent Drug Therapy	0.0	4.9	81.7	0.1	12.4	0.0	0.0	0.4	0.0	0.0
Open	0.2	7.3	92.7	3.7	1.4	0.0	0.0	0.1	2.3	0.0
Maintenance	0.0	6.3	78.6	13.6	12.7	0.0	0.1	1.9	1.1	0.0
4. IAN										
Baseline	0.0	39.5	50.8	2.8	8.1	6.0	1.8	0.0	32.2	0.0
Reduction	0.0	51	41.8	1.3	29.2	0.5	2.1	0.0	19.5	0.1
Intermittent Drug Therapy	0.0	75.1	69	0.8	1.8	2.1	0.4	0.0	37.6	0.0
Open	0.0	55.3	53.7	0.1	1.9	3.8	0.0	0.0	18.7	0.0
Maintenance	0.0	63.8	63.7	4.8	10.4	4.9	0.4	0.0	34.8	0.1
5. DENNIS										
Baseline	0.0	57.6	98.2	5.3	0.3	0.0	0.3	0.3	1.5	0.0
Reduction	0.0	80.2	88.8	0.1	4.9	0.0	0.1	0.1	1.2	0.0
Intermittent Drug Therapy	0.1	63.8	98	5	0.1	0.0	0.2	0.5	2.8	0.3
Open	0.0	66.3	95.9	8.3	3.7	0.0	0.0	0.3	3	0.0
Maintenance	0.0	67.5	94.5	6.5	1.3	0.1	0.1	0.3	3.6	0.0
6. KEVIN										
Baseline	0.0	9.2	86.3	0.0	7.3	0.0	0.0	0.0	0.0	0.0
Reduction	0.0	13	88.9	0.1	11.2	0.0	0.0	0.0	0.0	0.0
Intermittent Drug Therapy	0.0	11.4	96.1	0.6	3.9	0.1	0.0	0.0	0.0	3.1
Open	0.0	7.3	89	0.4	9.7	0.0	0.0	0.0	0.0	0.0
Maintenance	0.0	10.5	84	1.7	11.7	0.0	0.0	0.1	0.0	0.0

Walking/Skipping. The rate of walking/skipping decreased in two subjects (Hugh, Richard) and remained constant in the others (Craig, Dennis, Ian, Kevin) when baseline and maintenance phases were compared.

Toy Play. Toy play responses varied little across all phases.

Few behaviors showed marked changes when baseline rates were compared to the maintenance rates. The only trend noticeable in Figure 1 is the slight increase in object stereotypy of most subjects. No dramatic increases or decreases occurred in any behavior in any of the subjects. Overall, the reduction in the number of days of maintenance medication per week had little impact on the behaviors measured.

Intermittent Drug Therapy : Behavioral Effects for Each Subject

Hugh. Prior to this study, Hugh was well-known for his aggressive outbursts towards other people and objects. However, during the course of this study, his aggressive/destructive behavior decreased dramatically. Following the baseline phase, when Hugh's medication was reduced to 4 days a week, the frequency of his aggressive/destructive responses decreased by an average of 36 percent. During the intermittent drug therapy and open phases, the rate decreased further to about 11 percent of the baseline. Finally, during the maintenance phase, his aggressive/destructive responses decreased on average to 2 percent of the baseline rate.

Hugh's object stereotypy also decreased dramatically, from baseline to maintenance, however a large increase in such behavior occurred during the open phase. No such increases were apparent in other behaviors during this phase. Body stereotypy increased substantially from baseline to the maintenance phase, with a large reduction occurring in the open phase. If these two categories of stereotyped behaviors are taken together, then there is a minor decrease across phases in Hugh's rate of stereotypy. His rate of total stereotypy decreased in the maintenance phase to 91 percent of the baseline rate.

Hugh's rate of vocalizing varied little across the five conditions,

although some reduction occurred during the intermittent drug phase. Pica and self-injury remained at very low levels throughout the study, although both increased marginally during the reduction phase before returning to baseline levels in the other phases. Social interaction and toy play occurred at very low rates throughout the study. Finally, walking/skipping gradually decreased across conditions.

Richard. The mean rate of Richard's aggressive/destructive behavior remained stable and very low throughout the five phases.

Object stereotypy increased systematically from baseline through reduction, intermittent drug therapy and open phases, and decreased in the maintenance phase to near-baseline level. In terms of body stereotypy, there was a near-doubling of the mean rate from 24% in baseline to 46% in the maintenance phase. Body stereotypy was highest in the intermittent drug phase. Thus, the mean rate of total stereotypy increased markedly. After an initial increase in the reduction phase, vocalization decreased gradually to lower than the baseline level in the final phase. However, this reduction was not clinically significant. The mean rate of pica dropped in the reduction phase by 58% when compared to the baseline, but increased in the maintenance phase to 160% of the baseline.

Richard's frequency of social interaction was higher than baseline levels in the reduction, intermittent drug therapy and open phases, but dropped to slightly lower than baseline level in the maintenance phase. Similarly, self-injurious responses decreased by only 6% when baseline and maintenance phases were compared. Reduction and intermittent drug phases showed a slight increase in rate of such responses though. Walking/skipping responses decreased for all phases following baseline. Finally, toy play increased substantially from baseline to the reduction phase, but decreased subsequently to lower than baseline levels in the last three phases.

Craig. Craig's aggressive/destructive behavior was minimal through-

out the study, with the highest rate occurring in the open phase. Social interaction and toy play were also at a low rate and indicated no or little change across conditions.

Results of the two forms of stereotypy were opposite, with object stereotypy increasing across phases, while body stereotypy decreased across conditions. However, body stereotypy was still emitted at a high level. Craig's vocalization also reached higher levels in the maintenance phase when compared to pre-maintenance conditions. Pica remained at zero levels following the baseline phase. The mean rate of self-injurious responses increased slightly across treatment phases. Craig's walking/skipping showed no change when baseline and maintenance phases were compared although there were minor changes in rate during the three middle conditions. Overall change across categories such as aggressive/destructive, pica, social interaction, skipping/walking and toy play were minimal.

Ian. Overall, Ian's behavior varied little across the different treatment phases. Two undesirable behaviors, aggressive/destructive and self-injury, remained at zero for all treatment phases.

The two types of stereotypy increased somewhat from baseline to the maintenance phase. Object stereotypy was higher in all phases following baseline, but peaked in the intermittent drug therapy condition where it was almost twice the baseline rate. Body stereotypy increased less markedly from baseline to the maintenance phase but also reached its peak during the intermittent drug phase. The mean rate of vocal sound, walking/skipping and toy play responses increased minimally from baseline to the maintenance phase. The rate of walking/skipping was lower than baseline in the reduction and open phases but was slightly higher than baseline in the intermittent drug phase and the final treatment phase. Pica decreased substantially from baseline to the reduction phase and then slowly increased in the next 3 phases, although remaining lower than the baseline level. Social interaction also decreased slightly from baseline to the

maintenance phase, despite an initial increase during the reduction phase.

Dennis. Dennis' aggressive/destructive behavior remained at zero or near-zero level across all conditions. Object stereotypy increased somewhat from baseline to the maintenance phase, with its highest rate occurring in the reduction phase. Body stereotypy, however, was lowest during the reduction phase, decreasing slightly overall from baseline to the maintenance phase. The mean rate of vocal sound and walking/skipping increased slightly from baseline to the maintenance phase, although both behaviors were lower than baseline during the reduction phase. Pica and self-injury varied little across conditions. Social interaction and toy play also varied little across the five phases. Thus, only object stereotypy changed noticeably from baseline to the maintenance phase.

Kevin. Kevin's behavior showed no clinically significant changes from baseline to the maintenance phase. For three undesirable behaviors, aggressive/destructive, pica and self-injury, little or no change occurred throughout the study.

Stereotypy also showed minimal change across conditions. Object stereotypy increased slightly in all post-baseline phases except in the open phase. However, body stereotypy showed a minor decrease when baseline and the maintenance phases were compared. All three middle phases had response rates higher than baseline. The three desirable behaviors, social interaction, walking/skipping and toy play also showed little or no change across all phases. Finally the frequency of vocalizations increased slightly from baseline to the maintenance phase, with all four post-baseline phases exceeding the baseline rate.

Statistical Analyses

To complement a visual analysis, a series of statistical analyses appropriate for N=1 designs were carried out (see Kazdin, 1982). A parametric test could not be used because some if its assumptions were violated

(e.g., homogeneity). Instead, the nonparametric randomization test was used. The first eight data points of the baseline and the last eight data points of the maintenance phase were compared. For this test, object and body stereotypy were combined. No differences were found, except on five occasions. Hugh walked/skipped less in the maintenance phase when compared to the baseline. For Richard, the reduction in drug dosage appeared to result in an increase in total stereotypy and an increase in frequency of pica. Richard also engaged in less walking/skipping and less toy play after drug withdrawal. Thus, only two undesirable behaviors increased during the maintenance phase. All other undesirable behaviors (i.e., twenty-two in total) showed no change when baseline and maintenance phases were compared. It should be noted that a few categories (e.g., Craig's vocal sound) could not be tested with this method, due to the episodic nature of the behaviors.

The statistical analyses confirm the visual analyses in that the subjects' behaviors did not show any systematic change due to a change in their medication schedule. Although statistical analyses are not obligatory in studies of this nature, these were performed because of the variability of some of the behaviors of the subjects. In such cases, it has been suggested that statistical analyses may increase the strength of the data (see Kazdin, 1982).

DISCUSSION

The present study investigated the effects of substantially reduced antipsychotic medication for a group of mentally retarded persons. Two areas were studied, namely, the effects of antipsychotics on a wide range of subject behaviors, and, the utility of a novel drug-reduction procedure with the mentally retarded.

The results are not clearcut due to the multitude of variables assessed (i.e., observations were made on ten behaviors for each subject across five experimental phases). The data are also highly individualistic and difficult to summarize statistically. Nevertheless, a general trend of no clinically significant difference in subject behavior from baseline to maintenance phases is noticeable. When subjects are considered individually, and changes in their desirable behaviors are weighed against changes in their undesirable behaviors, the results are positive for all subjects. Negative changes were minor and were outweighed by far by changes in the positive direction. No subject had an increase in either aggressive/destructive or total stereotyped behavior from baseline to maintenance phases. This is a highly significant finding, given that these two classes of behavior appear to be the most common reason for the prescription of antipsychotic medication. It is interesting that all subjects in this study were first prescribed veractil or largactil for an aggressive outburst or stereotyped behavior.

It appears from the above finding, that these subjects were receiving inappropriately high dosages of antipsychotics to control their behavior problems. It is unfortunate that as a general rule, medication is not periodically withdrawn or given on an intermittent basis and behavioral data collected on the effects of this regimen. This might ensure that residents are not kept on unnecessarily high dosages. Relevant to this finding is the suggestion that the original reason for medication may

have long ceased to operate for a resident, and hence medication may no longer be necessary (Lipman, 1982). Furthermore, with some residents, adverse side-effects may develop as a result of maintenance medication.

In the present study, the overall results were the same for the child on the highest dosage (i.e., Richard) and the child on the lowest dosage (i.e., Ian) prior to the intervention. Regardless of their dosage level, subjects consistently exhibited little change across behaviors from baseline to maintenance phases. Unlike most studies on the effects of antipsychotics, the present study investigated the effects of a range of individual dosages. Thus the findings of no change for all subjects may be realistically generalized to the broader population of mentally retarded persons.

Lipman (1982) stated that studies involving drug-withdrawal conditions represent tests of the need to maintain residents on medication. The present study compared high versus lower weekly dosage levels. For all subjects involved, the lower weekly dosage resulted in similar or better behavior than the higher dosage. The dosages these subjects were receiving prior to intervention need not have been as high. Despite the small subject sample, it could be argued from these results that lowered dosages would prove beneficial for other institutionalized mentally retarded individuals. One would predict that no clinically significant behavioral changes would occur, and the negative side-effects associated with higher dosages of antipsychotics would be lessened considerably.

It would seem from the results of this study that veractil and largactil are similar in terms of their general action. No clinically significant differences were found between subjects on veractil and subjects receiving largactil.

The results of this study can be discussed with respect to other relevant investigations. However, it should be noted that such comparisons are hindered by the great discrepancy between the studies' methodologies. Unlike many of the early chlorpromazine studies, (see

reviews by Freeman, 1970; Lipman, DiMascio, Reatig & Kirson, 1978; Sprague & Werry, 1971), the present study did not find medium to high dosages of chlorpromazine to effectively reduce the maladaptive behavior of mentally retarded people. The frequency of stereotyped behavior was very high for most subjects on maintenance dosages. Also, lower dosages of the same agent were found to be as beneficial as higher dosages. A recent, well-controlled study reported much variation in individual responses to chlorpromazine (Marholin et al., 1979). Marholin et al. reported that while results varied from subject to subject, the general trend was an increase in desirable subject behavior when chlorpromazine was discontinued. Furthermore, the abrupt drug withdrawal and short placebo phase may have biassed the above study against positive results since withdrawal emergent symptoms (e.g., withdrawal dyskinesias) may not have had time to subside. Thus, the above investigation and the present study both found the prescribed chlorpromazine medication of mentally retarded subjects to be excessive, and decreased dosages to be more beneficial.

While Lipman (1982) has stated that chlorpromazine is capable of reducing stereotyped movements and suppressing aggressive and self-destructive behaviors, he cites no studies in his review which support his contention. In fact, no well-controlled investigations could be found which have shown chlorpromazine to suppress stereotyped and aggressive behavior. The present study also provides little support for chlorpromazine's beneficial effects.

Several methodologically sound studies have been conducted with antipsychotics other than chlorpromazine. In a drug-withdrawal study (Singh & Aman, 1981), a low and a high dosage of thioridazine were compared using twenty mentally retarded subjects. The low dosage was found to be just as effective in suppressing stereotyped behavior as the higher dosage. The present study, then, reports findings consistent with the above study, although methodologically the two studies are

somewhat different.

Heistad, Zimmerman and Doebler (1982) investigated the effects of thioridazine discontinuation and found that some mentally retarded subjects improved significantly when medication was temporarily withdrawn. However, an increase in stereotypy and active negative behavior, as well as decreased life and work skills occurred in other subjects. These results provide mixed support for the present investigation. Other investigations on thioridazine have reported data more consistent with the present study. Davis (1971), for example, reported no significant changes in the behavior of two subjects during thioridazine and placebo conditions. Finally, Breuning (1982) showed that different dosages of thioridazine were optimal in reducing different inappropriate behaviors in patients known to be drug-responders. For non-responders, the frequency of inappropriate behaviors increased as thioridazine increased. The present study also indicated that drug withdrawal may have different effects on different subjects. However, the general finding of no significant behavioral change during intermittent drug therapy suggests that other mentally retarded persons might benefit from lower dosages of maintenance medication.

The present study, unlike most other drug investigations, provides strong support for attempts to lower the maintenance medication of the mentally retarded. The present findings can be cited as evidence to institutional staff that periodic reductions in medication levels may be beneficial to institutionalized mentally retarded persons. This is an important finding particularly in view of the number of negative side-effects of antipsychotic medication. For instance, a number of investigators (Breuning, Davis, Matson & Ferguson, 1982; Paulson, Rizvi & Crane, 1975; Kumar, 1976) have found tardive dyskinesia to be a problem, particularly when antipsychotic dosages are high and/or prescribed for long periods of time. Further, current research suggests that high dosages of antipsychotics may impair learning performance of

mentally retarded persons (Breuning & Davidson, 1981; Breuning, Ferguson, Davidson & Poling, in press; Wysocki, Fuqua, Davis & Breuning, 1981). It is crucial then, that levels of maintenance medication are kept to a minimum.

The results of this study are also interesting since they provide more knowledge on the type of strategy that may be useful in achieving minimum dosage levels. The present study evaluates the utility of intermittent drug therapy in the context of a number of conditions (i.e., gradual drug reduction, intermittent drug therapy, open and maintenance conditions). This is the first study in the area of pharmacotherapy with the mentally retarded to use and evaluate such a procedure.

At present, no comparative data are available on methods of regulating drug prescription with regards to efficacy and long-term benefits for mentally retarded persons. While the inherent differences between the present study and other drug reduction studies are recognised, a comparison of the results is considered useful. The Fielding et al. (1980) study involved a phase of gradual drug reduction (dosages reduced by 25% or 100mg after each 30-day period of appropriate subject reaction) similar to the reduction phase of the present investigation. Likewise, they reported that the majority of subjects benefitted from reduced dosages, in that their maladaptive behaviors did not significantly worsen. However, Fielding et al.'s initial period of non-medication may have resulted in some unpleasant withdrawal-related side-effects for the subjects.

In a study similar to that of Fielding et al., but with more gradual drug withdrawal for all subjects, Ferguson et al. (1982) reported that 97 percent of their subjects had either discontinued or decreased maintenance medication without significant deterioration. While these results were consistent with those of the present study, formal behavioral observations were an added advantage of the latter.

LaMendola et al. (1980) also reported the benefits of reduced and discontinued medication, similar to the present study. Unfortunately,

LaMendola et al.'s drug assessment was not derived from data-based behavioral observations.

Heistad et al.'s (1982) investigation reported findings contrary to those of the present study, since the majority of their subjects exhibited more negative behaviors during the placebo condition. However the negative results could have represented in part, negative side-effects of abrupt drug withdrawal (see Gualtieri & Hawk, 1980). Further, it should be noted that such drug holiday studies differ considerably from studies using intermittent drug therapy, as in the present investigation. This may be one reason why results are often dissimilar.

Most of the research in the area of intermittent drug therapy has shown that the majority of subjects can tolerate low dosages without relapse. Also consistent with the present study was Caffey et al's (1964) study with schizophrenics where only fifteen percent of those receiving antipsychotic medication three days a week relapsed, compared to five percent on continuous medication. Perhaps the study most relevant to the present investigation was by Prien et al. (1973) in which a large group of schizophrenics received one of five different conditions. The results showed a relapse rate of six to eight percent for the four intermittent drug therapy groups (i.e., no antipsychotic medication for two, three or four days a week) compared to one percent in the full medication group. While the Prien et al. (1973) study represents a relatively well-controlled investigation, once again formal observational recording was not employed.

It is unfortunate that the few studies relevant to the present investigation usually lacked methodological rigor. A common flaw was the use of informal evaluations to assess the global effects of drugs. Admittedly drug evaluation studies dealing with large numbers of subjects and using daily behavioral observations can be extremely time consuming and costly to conduct. Perhaps researchers interested in large subject groups and their reactions to drug withdrawal should randomly select a

small sample of these subjects for behavioral observation as well.

Many of the studies investigating specific methods of drug reduction are also methodologically deficient. Some studies failed to use double-blind controls or paid little attention to extraneous variables related to abrupt drug withdrawal. The present investigation should be helpful to those researchers who are interested in developing and refining drug-reduction and drug-withdrawal procedures.

The present study represents a relatively novel way of reducing dosage levels and evaluating on a daily basis, the client's reaction to drug withdrawal. Gradual withdrawal of antipsychotic medication, as in this study, facilitates the subject's adjustment to lower dosage levels and reduces the likelihood of the occurrence of drug withdrawal emergent symptoms. Other advantages are the double-blind aspect of this study, formal behavioral observations on a daily basis for eight months, the use of a robust interobserver reliability index, and the use of the multiple baseline design. The long duration of the study meant that drug effects and subject reactions to intermittent drug therapy could be assessed over a long time period. Further, any drug withdrawal effects had sufficient time to subside. Formal observations were made across a broad spectrum of behaviors, including stereotypy and self-injury, two behaviors frequently exhibited by the mentally retarded but about which little is currently known with respect to drug therapy.

An additional benefit with intermittent drug therapy is its ease of implementation. Once established, the Friday and weekends off procedure is easily maintained in the institutional setting where fewer staff are employed in the weekends. This study then, investigated a technique which is a practical and viable alternative to daily maintenance medication in the institutional setting. It is also advantageous in that it considerably reduces expenditure related to pharmacological agents. Moreover, the the benefits are obvious in terms of savings in staff time usually spent in the preparation and administration of drugs.

The present study has a number of merits. Firstly, it improved on previous research in the area. A number of researchers have emphasized the need for well-controlled efficacy studies with the antipsychotics (e.g., Aman, 1983; Aman & Singh, 1980; Lipman, 1982). Specifically it has been suggested that the effects of different dosages be explored, that efficacy studies last longer than three to six months, that a range of behaviors, both adaptive and maladaptive be observed, and that adequate research designs be employed. This study, then, has contributed directly to the area of drug efficacy and dosage-related research. Moreover, the present results challenge the common assumption that raising the dosage will result in greater and more beneficial effects. In fact, it would seem from the current research that antipsychotics (and perhaps psychotropic drugs in general) do not act in a linear fashion. Rather, as Aman (1983) has suggested, it is likely that quite different dose-response relationships will be found between optimal social functioning versus optimal cognitive functioning.

Of major concern currently is the question of which dosage level is safest for the mentally retarded, and still effective. For a number of ethical and practical reasons it is important that researchers determine the lowest, most therapeutic level of medication for the mentally retarded. Retarded persons are passive recipients of pharmacological agents, and must often endure the adverse effects associated with drug therapy, including potential cognitive learning impairment, negative physiological effects and extrapyramidal side-effects. Given that antipsychotics are still the most popular choice of medication for the mentally retarded, studies such as the present one contribute to the determination of the optimal dosage level of these drugs.

Although the generality of the present findings needs to be established through replication, this study does suggest that discontinuing antipsychotic maintenance medication for three days per week is a safe, viable, easily implemented, cost-effective, and potentially valuable

procedure which can be used with mentally retarded institutionalized persons.

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